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COMMONWEALTH OF MASSACHUSETTS

massDOT
Massachusetts Department of Transportation
Highway Division

CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	608460-130088
P.V. =	$6,230,000.00
PLANS	YES

FOR

Federal Aid Project No. NHP(BRR-ON)-003S(813)X
Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

in the Town of

HADLEY

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS and BRIDGES dated 2025

This Proposal to be opened and read: **WEDNESDAY, SEPTEMBER 3, 2025 at 2:00 P.M.**

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Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Monica Tibbits-Nutt, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

September 2, 2025

608460-130088

ADDENDUM NO. 2

To Prospective Bidders and Others on:

HADLEY
Federal Aid Project No. NHP(BRR-ON)-003S(813)X
Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

PROPOSALS TO BE OPENED AND READ: WEDNESDAY, SEPTEMBER 3, 2025 at 2:00 P.M.

Transmitting revisions to the Contract Documents as follows:

QUESTIONS AND RESPONSES: 1 page.

DOCUMENT A00801: Revised page 197.

Take note of the above, substitute the revised page for the original, and acknowledge Addendum No. 2 in your Expedite Proposal file before submitting your bid.

Very truly yours,

Eric M. Cardone Digitally signed by Eric M. Cardone Date: 2025.09.02 10:30:38 -04'00'

Eric M. Cardone, P.E.
Construction Contracts Engineer

EMC/kal
cc: Anthony Christakis, Project Manager

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
mass.gov/massdot

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Atlantic Bridge, email dated August 27, 2025:

Question #3: Please note that the weight of the structural steel – uncoated (14,500 lbs.) as listed in the lump sum breakdown for Item No. 993.5 – Temporary Walkway Structure is significantly less than what is actually required to be provided (22,500 lbs. +/-).

Response #3: Refer to revised Document A00801 page 197 in this addendum.

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Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Monica Tibbits-Nutt, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

August 29, 2025

608460-130088

ADDENDUM NO. 1

To Prospective Bidders and Others on:

HADLEY
Federal Aid Project No. NHP(BRR-ON)-003S(813)X
Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

PROPOSALS TO BE OPENED AND READ: WEDNESDAY, SEPTEMBER 3, 2025 at 2:00 P.M.

Transmitting revisions to the Contract Documents as follows:

RESPONSE TO BIDDER QUESTIONS:	1 page.
DOCUMENT 00104:	Revised page 3.
DOCUMENT 00813:	Deleted document in its entirety and inserted new document (4 pages).
DOCUMENT 00880:	Revised pages 3 through 27.

Take note of the above, substitute the revised pages for the originals, delete document as noted, insert new document in proper order, and acknowledge Addendum No. 1 in your Expedite Proposal file before submitting your bid.

Very truly yours,

Eric M. Cardone Digitally signed by Eric M. Cardone Date: 2025.08.29 15:11:14 -04'00'

Eric M. Cardone, P.E.
Construction Contracts Engineer

EMC/kal
cc: Anthony Christakis, Project Manager

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
mass.gov/massdot

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Q1 Atlantic Bridge, email dated August 27, 2025:

Question #1: Please confirm that the exterior beams for the Temporary Walkway Structure as shown on Bridge Sheets 34 & 35 are to be W27x114's and not W27x84's as called out in the Temp. Walkway at Utility Support (Looking North) section on Sheet 34 and in the Temp. Walkway at Wingwall (Looking North) section shown on Sheet 35.

Response #1: We confirm that the exterior beams for the Temporary Walkway Structure as shown on Bridge Sheets 34 & 35 are to be W27x114's and not W27x84's.

Question #2: Please confirm that it is intended that the W27x114 beam ends at the temporary footings only bear on elastomeric bearing pads with no steel sole plates as is shown on in Section 24 on Bridge Sheet 35. If sole plates are required then please provide the required dimensions.

Response #2: Sole plates are required as detailed in the "Temporary W27x114 Section at Bearing" on sheet 35. Sole plates shall be 12"x12"x1.5". Steel sole plates shall conform to AASHTO M270 grade 36 or grade 50 and shall be hot-dip galvanized or metalized. Center the elastomeric pad under to sole plate during beam erection.

Question #3: Please note that the weight of the structural steel – uncoated (14,500 lbs.) as listed in the lump sum breakdown for Item No. 993.5 – Temporary Walkway Structure is significantly less than what is actually required to be provided (22,500 lbs. +/-).

Response #3: Response to be provided in a future addendum.

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DOCUMENT 00104

NOTICE TO CONTRACTORS

Electronic proposals for the following project will be received through the internet using www.bidx.com until the date and time stated below and will be posted on www.bidx.com forthwith after the bid submission deadline. No paper copies of bids will be accepted. All Bidders must have a valid vendor code issued by MassDOT in order to bid on projects. Bidders need to apply for a Digital ID at least 14 days prior to a scheduled bid opening date with www.bidx.com.

WEDNESDAY, SEPTEMBER 3, 2025 at 2:00 P.M. **
HADLEY
Federal Aid Project No. NHP(BRR-ON)-003S(813)X
Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River
****Date Subject to Change**

PROJECT VALUE = $6,230,000.00

Bidders must be pre-qualified by the Department in the BRIDGE - CONSTRUCTION category to bid on the above project. An award will not be made to a Contractor who is not pre-qualified by the Department prior to the opening of Proposals.

All prospective Bidders who intend to bid on this project must obtain "Request Proposal Form (R109)". The blank "Request Proposal Form (R109)" can be obtained at: https://www.mass.gov/prequalification-of-horizontal-construction-firms.

All prospective Bidders must complete and e-mail an electronic copy of "Request Proposal Form (R109)" to the MassDOT Director of Prequalification for approval: prequal.r109@dot.state.ma.us.

Proposal documents for official bidders are posted on www.bidx.com. Other interested parties may receive informational Contract Documents containing the Plans and Special Provisions, free of charge.

Bids will be considered, and the contract awarded in accordance with statutes governing such contracts in accordance with Massachusetts General Laws Chapter 30 § 39M.

The Project Bids File Attachments folder for proposals at www.bidx.com shall be used for submitting at the time of bid required information such as the Bid Bond required document, and other documents that may be requested in the proposal.

NOTICE TO CONTRACTORS (Continued)

All parties who wish to have access to information plans and specification must send a "Request for Informational Documents" to MassDOTBidDocuments@dot.state.ma.us.

A Proposal Guaranty in the amount of 5% of the value of the bid is required.

This project is subject to the schedule of prevailing wage rates as determined by the Commissioner of the Massachusetts Department of Labor and Workforce Development, and the Division of Occupational Safety, and the United States Department of Labor.

The Massachusetts Department of Transportation, in accordance with Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby affirmatively ensures that for any contract entered into pursuant to this advertisement, all bidders, including disadvantaged business enterprises, will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin in consideration for an Award.

This Proposal contains the "STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)". The goals and timetables applicable to this proposal for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all work, are contained in Appendices A and B-80 of the above specifications.

The Contractor (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this Contract as contained in Appendices C and D of the above specifications.

① Addendum No. 1, August 29, 2025

NOTICE TO CONTRACTORS (Continued)

PRICE ADJUSTMENTS

① This Contract contains price adjustments for hot mix asphalt and Portland cement mixtures, diesel fuel, and gasoline. For reference the base prices are as follows: liquid asphalt $635.00 per ton, Portland cement $425.13 per ton, diesel fuel $2.924 per gallon, and gasoline $2.449 per gallon, and Steel Base Price Index 354.8. MassDOT posts the **Price Adjustments** on their Highway Division's website at
https://www.mass.gov/massdot-contract-price-adjustments

This Contract contains Price Adjustments for steel. See Document 00813 - PRICE ADJUSTMENT FOR STRUCTURAL STEEL AND REINFORCING STEEL for their application and base prices.

MassDOT projects are subject to the rules and regulations of the Architectural Access Board (521 CMR 1.00 et seq.)

Prospective bidders and interested parties can access this information and more via the internet at WWW.COMMBUYS.COM.

BY: Monica G. Tibbits-Nutt, Secretary and CEO, MassDOT
Jonathan L. Gulliver, Administrator, MassDOT Highway Division
SATURDAY, APRIL 26, 2025

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DOCUMENT 00210

REQUIREMENTS OF MASSACHUSETTS GENERAL LAWS
CHAPTER 30, SECTION 39R;
CHAPTER 30, SECTION 39O

July 1, 1981, updated October 2016

M.G.L. c. 30, § 39R. Award of Contracts; Accounting Statements; Annual Financial Statements; Definitions.

(a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) “Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) “Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) “Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) “Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) “Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) Until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) If the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) If the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) If the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

(1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).

M.G.L. c. 30, § 39O: Suspension, Delay, or Interruption or Failure to Act by Awarding Authority; Adjustment in Contract Price; Submission of Claims.

Section 39O. Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

<<<<<<<<<<>>>>>>>>>>

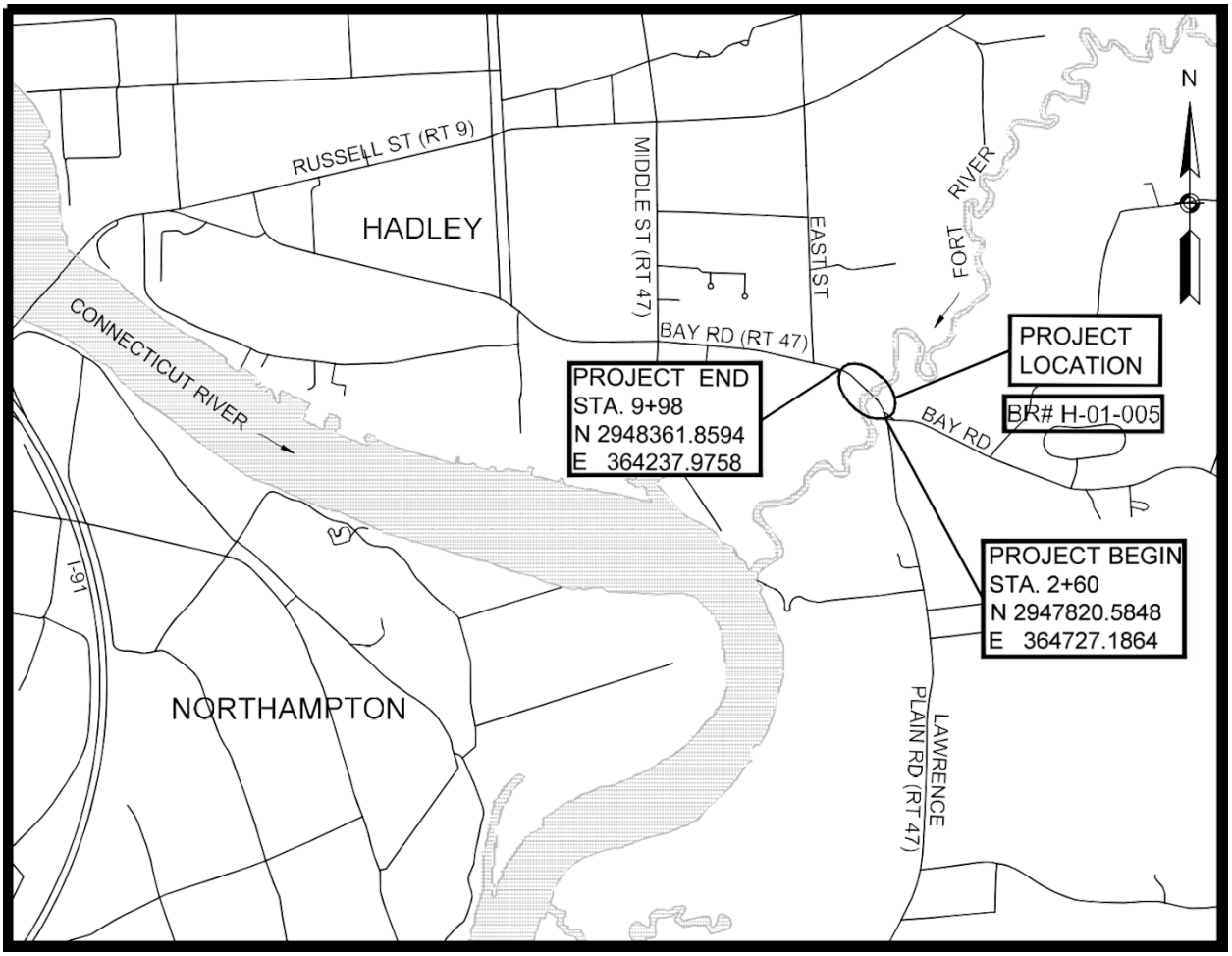
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DOCUMENT 00331

LOCUS MAP

HADLEY
Federal Aid Project No. NHP(BRR-ON)-003S(813)X
Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River



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DOCUMENT 00439

Final Report ☐

Interim Report ☐

CONTRACTOR PROJECT EVALUATION FORM

For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010

Date: _____

City/Town: _____ Contractor: _____

Project: _____ Address: _____

F.A. No. _____ Contract Number: _____

Bid Price: _____ Notice to Proceed: _____

Funds: State: _____ Fed Aid: _____ Current Contract Completion Date: _____

Date Work Started: _____ Date Work Completed*: _____

Contractor's Superintendent: _____

Division: (indicates class of work) Highway: _____ Bridge: _____ Maintenance: _____

*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1=
5. Subcontractors Performance								x 1=
6. Field Supervision/ Superintendent								x 1=
7. Contract Compliance								x 0.5=
8. Equipment								x 0.5=
9. Payment of Accounts								x 0.5=
(use back for additional comments)						**Overall Rating:**		

(Give explanation of items 1 through 9 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)

_____ _____

District Construction Engineer's Signature/Date Resident Engineer's Signature/Date

_____

Contractor's Signature Acknowledging Report/Date

Contractor Requests Meeting with the District: No ☐ Yes ☐ Date Meeting Held: _____

Contractor's Comments/Meeting Notes (extra sheets may be added to this form and noted here if needed): _____

_____

_____

CONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.
A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR
(*Write Yes or No in space provided*)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 9:_____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00440

Final Report ☐

Interim Report ☐

SUBCONTRACTOR PROJECT EVALUATION FORM

For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010

Date: _____

City/Town: _____ Subcontractor: _____

Project: _____ Address: _____

F.A. No.: _____ Contract Number: _____

Prime Contractor _____ Current Contract Completion Date: _____

Date Work Started: _____ Date Work Completed*: _____

Subcontractor's Superintendent: _____

Type of Work Performed by Subcontractor: _____

*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1.5=
5. Field Supervision/ Superintendent								x 1=
6. Contract Compliance								x 1=
7. Equipment								x 0.5=
8. Payment of Accounts								x 0.5=
(use back for additional comments)							**Overall Rating:**	

(Give explanation of items 1 through 8 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)

_____ _____

District Construction Engineer's Signature/Date Resident Engineer's Signature/Date

_____ _____

Contractor Signature Acknowledging Report/Date Subcontractor Signature Acknowledging Report/Date

Subcontractor Requests Meeting with the District: No ☐ Yes ☐ Date Meeting Held: _____

Subcontractor's Comments / Meeting Notes (extra sheets may be added to this form and noted here if needed):

_____

_____

Contractor's Comments: _____

_____

SUBCONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.
A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR
(*Write Yes or No in space provided*)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 8: _____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 04-16-25

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2025, the SUPPLEMENTAL SPECIFICATIONS, the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the CONSTRUCTION STANDARD DETAILS are available online at https://www.mass.gov/massdot-highway-division-manuals-and-publications

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

The Contractor's attention is directed to Massachusetts General Laws, Chapter 111F, commonly known as the Right-To-Know Act, and to the regulations promulgated pursuant thereto. Among the provisions of the Right-To-Know Act is a requirement that employers make available to employees Materials Safety Data Sheets (MSDS) for any substance on the Massachusetts Substance List (MSL) to which employees are, have been, or may be exposed.

To ensure prompt compliance with these regulations and legislation, the Contractor shall:

1. Deliver to the Department, prior to the start of any work under this contract, copies of MSDS for all MSL substances to be used, stored, processed or manufactured at the worksite by the Contractor.

2. Train employees of the Department, who may be exposed to MSL substances as a result of the Contractor's work under this contract, with regard to those specific substances in accordance with requirements of the Right-To-Know Act.

3. Observe all safety precautions recommended on the MSDS for any MSL substance to be used, stored, processed, or manufactured at the worksite by the Contractor.

4. Inform the Department in writing regarding specific protective equipment recommended in the MSDS for MSL substances to which employees of the Department may be exposed as a result of the Contractor's work under this contract.

The Department shall not be liable for any delay or suspension of work caused by the refusal of its employees to perform any work due to the Contractor's failure to comply with the Right-To-Know Act. The Contractor agrees to hold the Department or the Commissioner of the Department harmless and fully indemnified for any and all claims, demands, fines, actions, complaints, and causes of action resulting from or arising out of the Contractor's failure to comply with the requirements of the Right-To-Know Act.

ALTERNATIVE DISPUTE RESOLUTION
Forum, Choice of Law and Mediations:

Any actions arising out of a contract shall be governed by the laws of Massachusetts and shall be brought and maintained in a State or federal court in Massachusetts which shall have exclusive jurisdiction thereof. MassDOT and the Contractor may both agree to mediation of any claim and will share the costs of such mediation pro rata based on the number of parties involved.

*** END OF DOCUMENT ***

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DOCUMENT 00715

SUPPLEMENTAL SPECIFICATIONS

JUNE 30, 2025

The 2025 *Standard Specifications for Highways and Bridges* are amended by the following modifications, additions and deletions. These Supplemental Specifications prevail over those published in the Standard Specifications.

The Specifications Committee has issued these Supplemental Specifications for inclusion into each proposal until such time as they are updated or incorporated into the next Standard Specifications.

Contractors are cautioned that these Supplemental Specifications are dated and will change as they are updated.

DIVISION I

GENERAL REQUIREMENTS AND COVENANTS

SECTION 2.00: PROPOSAL REQUIREMENTS AND CONDITIONS

Subsection 2.09: Rejection of Proposals
Replace bullet (i) in the third paragraph with the following:

(i.) award of the contract would result in the Bidder exceeding the Aggregate Bonding Capacity or the Single Bonding Capacity established by its Surety Company, or the Bidder's Proposal exceeds its Single Contract Limit, or the Bidder was not prequalified in the specified class of work on or before the time of bid opening; or

SECTION 7.00: LEGAL RELATIONS AND RESPONSIBILITY TO PPUBLIC

Subsection 7.05: Insurance Requirements
Change the title of paragraph A to Workers' Compensation Insurance

Subsection 7.22: Labor, Lodging, Board, Maximum Hours of Employment, Weekly Payment, Keeping of Payroll Records.
In the second paragraph replace the word "workman" to "worker" and the word "workmen" to "workers".

Replace the third paragraph with the following:

Attention of Bidders is called to MGL Chapter 149, Section 148 requiring the weekly payment of employee wages.

SECTION 9.00: MEASUREMENT AND PAYMENT

Subsection 9.03: Payment for Extra Work

Replace paragraph B., first paragraph, numbers (2) and (3) with the following.

(2) Plus 13 percent of direct labor, for the estimated costs of Federal Insurance Contribution Act (FICA) including Medicare; Federal Unemployment Tax Act (FUTA); State Unemployment Tax Act (SUTA), which includes Unemployment Insurance, the Workforce Training Fund Program,-Employer Medical Assistance Contribution, and COVID-19 Recovery Assessment; Earned Sick Time (EST) Law (940 CMR 33.00); and Paid Family and Medical Leave (PFML) Act (458 CMR 2.00); or, as an alternative to the above 13 percent, the Contractor may elect to use actual rates for FICA, FUTA, SUTA, EST and PFML provided the actual rates are supported with verifiable documentation and shall be subject to review by MassDOT Audit Operations.

(3) Plus the estimated cost of Workers' Compensation and Liability Insurance, Health, Welfare and Pension benefits, and such additional fringe benefits which the Contractor is required to pay as a result of Union Labor Agreements and/or is required by authorized governmental agencies;

In paragraph B., second paragraph, number (3), replace the word "Workmen's" with "Workers'" .

DIVISION II

CONSTRUCTION DETAILS

SECTION 300: WATER SYSTEMS

SUBSECTION 301: WATER SYSTEMS

Subsection 301.60G: Laying Pipe
Revise the third paragraph to read as follows:

Pipe sections shall be laid with the bell on the upgrade end. Before laying the pipe, the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry.

Subsection 301.80: Method of Measurement
Delete the words cast iron in the first paragraph.

Replace the second paragraph with the following;

Fittings, consisting of bends, tees, caps, wyes, sleeves, reducers, increasers, blow-off fittings and other special fittings, apply only when new materials are necessary and which are not specifically provided for under other items in the Proposal. Fittings other than new will not be paid separately but only under the applicable pipe items. When new fittings are measured separately for payment, the length of pipe occupied by the fittings will not be measured for payment.

SECTION 800: TRAFFIC CONTROL DEVICES

SUBECTION 850: TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE OPERATIONS

Subsection 850.29: Temporary Barrier and Temporary Barrier Removed and Reset
Delete this subsection.

Subsection 850.49: Temporary Barrier
Delete this subsection.

Subsection 850.69: Temporary Barrier and Temporary Barrier Removed and Reset
Delete this subsection.

Subsection 850.80: Method of Measurement
Delete the fifth paragraph from the end of this subsection.

Subsection 850.81: Basis of Payment
Delete the sixth and seventh paragraphs from the end of this subsection.

SUBECTION 853: TEMPORARY BARRIER

Subsection 853.: Temporary Barrier
Add this new subsection:

DESCRIPTION

853.20: General

Work under this Subsection consists of furnishing, placing, adjusting, resetting, maintaining, and removing temporary barrier.

MATERIALS

853.40: General

Materials shall meet the requirements specified in the following Subsections of Division III, Materials:

Material	Section
Precast, Prestressed, and Prefabricated Concrete Products	M4.09.0
Temporary Barrier	M10.16.0
Limited Deflection Temporary Barrier	M10.16.1
Delineators for Temporary Barrier	M10.16.2

The Contractor shall supply a temporary barrier system that meets or exceeds the Test Level (TL) designated in the description of the bid item.

If the Contractor uses a proprietary temporary barrier system, it shall be listed on the QTCE.

Temporary barrier segments that appear to be damaged or in otherwise unsuitable condition may be rejected or ordered to be replaced by the Engineer at no additional cost.

853.41: Deflection

The deflection of a temporary barrier system is defined as the measured deflection, permanent and/or dynamic, during MASH Test Designation 2-11 (for TL-2) or Test Designation 3-11 (for TL-3).

The Contractor shall supply a temporary barrier system that is equal to or less than the maximum allowable deflection (permanent and/or dynamic) for each run of temporary barrier, as shown in the Plans or stated in the Special Provisions. If no distinction between permanent and temporary deflection is shown in the plans or Special Provisions, then dynamic deflection shall govern.

853.42: Precast Concrete Barriers

Precast Concrete Barriers used as temporary barriers shall be fabricated in accordance with M4.09.0: Precast, Prestressed, and Prefabricated Concrete Products. The Contractor shall submit a Certificate of Compliance (CoC) attesting to meeting this requirement.

853.43: Delineation

Delineators installed at 20-ft intervals throughout the entire barrier run shall be included. The delineators shall conform to M10.16.2: Delineators for Temporary Barrier. Delineators that may act as a washer on a bolted connection shall not be used unless specifically allowed by the barrier manufacturer. Delineators that are damaged, are no longer reflective, or go missing while temporary barrier is deployed shall be replaced in kind by the Contractor.

Delineators may be top or side-mounted to the barrier and oriented in a manner to maximize reflectivity to approaching traffic.

Temporary barrier placed on the right side of the travel way, or top-mounted and separating two or more lanes traveling in the same direction, shall use white delineators. Temporary barrier placed on the left side of the travel way shall use amber or yellow delineators; if separating two-way traffic and top-mounted, the delineator shall be double-sided.

853.44: Anchored Barrier

Temporary barrier systems that include an anchor system in order to meet performance requirements of the contract and/or meet MASH testing requirements may be accepted for use at the discretion of the Department.

Barrier that utilizes an anchor system shall use the same pattern, placement, and material of anchors that was used in MASH crash testing.

853.45: Shop Drawings

Within 30 days of the Notice to Proceed, the Contractor shall provide Shop Drawings showing the proposed temporary barrier system and confirming that it conforms to 853.40: General and will meet the allowable deflection requirements as described in 853.41: Deflection.

If anchors are proposed, the means, methods, pattern, placement, and materials for anchoring and subsequent pavement and/or deck repairs following removal of the temporary barrier system shall be included in the Shop Drawing submittal. If the use of an anchor system is rejected by the Department, the Contractor shall select an unanchored system that meets or exceeds the contract specified performance requirements, at no additional cost.

Shop Drawings for proprietary barrier systems shall include manufacturer's instructions for installation.

CONSTRUCTION METHODS

853.60: General

A Traffic Management Plan approved by the Department is required prior to the installation of the temporary barrier system.

The Contractor shall install temporary barrier systems in accordance with the Plans.

Barrier ends shall not be exposed to approaching traffic during installation. Crashworthy shielding or attenuation shall be provided at all times.

Proprietary temporary barrier systems shall be installed per the manufacturer's instructions.

The Contractor shall not place any breaks in the temporary barrier system that will result in sections that are shorter than the tested minimum length-of-need (LON) under MASH Test 2-11 (for TL-2) or 3-11 (for TL-3). Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints, if those barrier segment types have been determined to be crashworthy per MASH.

Temporary barrier shall not be placed on unpaved surfaces, unless otherwise shown in the Plans.

The Contractor shall not store materials, vehicles, or other equipment within the measured dynamic deflection envelope, as defined in 853.41: Deflection.

853.61: Temporary Barrier Removed and Reset

Temporary Barrier Removed and Reset consists of relocating a string of temporary barrier from one alignment to another to support the sequence and phasing of construction, as shown in the Plans.

Temporary Barrier Removed and Reset does not include moving all or a portion of the temporary barrier system to gain access to a work area, for the convenience of the Contractor, or to realign units that have moved due to construction activities or a traffic incident.

853.62: Quality Control Inspection

After temporary barrier installation is completed, the Contractor shall perform a Quality Control (QC) Inspection in the presence of the Engineer. QC Inspection activities shall include, but are not limited to the following reviews:

- Installation location per the approved Plans.
- Alignment and connection mechanism between adjacent barrier segments.
- Alignment and connection mechanism between barrier segment and attenuator, if present.
- Anchor system installation, if present.

For proprietary barrier systems, the QC Inspection shall also include any manufacturer-specific inspection details or criteria found in the installation instructions.

Work behind the barrier shall not commence until the QC Inspection has been accepted by the Engineer.

COMPENSATION

853.80: Method of Measurement

Temporary Barrier will be measured by the foot installed, in place.

Temporary Barrier Removed and Reset will be measured by the foot removed and reset.

853.81: Basis of Payment

Temporary Barrier will be paid for at the contract unit price per foot which shall provide full compensation for fabrication, storage, transport, furnishment, installation, delineation, alignment, maintenance, repair, and final removal of the temporary barrier.

Temporary Barrier Removed and Reset will be paid for at the contract unit price per foot which shall provide full compensation for removing, relocating, transporting, and installing new anchorage (if used). If more than one accepted temporary barrier system is approved for use in a single contract, the unit cost for Temporary Barrier Removed and Reset shall not differ among systems.

All costs associated with fabrication, installation, and maintenance of temporary barrier delineators shall be considered incidental to the cost of the item.

All costs associated with Shop Drawings and COCs shall be considered incidental to the item.

All costs associated with patching or repairing the road surface or bridge deck due to the installation and removal of temporary barrier and/or anchors for a temporary barrier system shall be considered incidental to the cost of the item.

853.82: Payment Items

Item number	Description	Unit
853.2	Temporary Barrier (TL-2)	Foot
853.21	Temporary Barrier Removed and Reset	Foot
853.23	Temporary Barrier (TL-3)	Foot
853.33	Temporary Barrier – Limited Deflection (TL-3)	Foot

SECTION 900: STRUCTURES

SUBECTION 902: ULTA HIGH PERFORMANCE CONCRETE

Subsection 902.32: Mockup
In Table 902.32-1 change the Link Slab width to 2 ft – 0 in. and change the Joint Header width to 0 ft – 6 in. .

Subsection 902.32: - 902.38
Renumber section 902.32 Surface Preparation to 902.33 Surface Preparation and renumber section 902.33 through 902.38 to 902.34 through 902.39.

DIVISION III

MATERIALS SPECIFICATIONS

SECTION M2: AGGREGATES AND RELATED MATERIALS

Subsection M2.01.0 Crushed Stone
Replace the fourth paragraph and the associated asterisk notes with the following;

The crushed stone shall have a maximum 45% wear as determined by the Los Angeles Abrasion Test (AASHTO T 96)

SECTION M5: PIPE, CULVERT SECTIONS AND CONDUIT

Subsection M5.01.0 Joint Materials for Pipe
Replace this subsection with the following;

- Jute or oakum furnished for use in pipe joints shall be of an accepted grade approved for common usage.
- Mortar shall conform to the requirements of M4.04.0: Cementitious Grout, Mortar and Concrete Products
- Standard couplers as approved by the manufacturer shall be used to join corrugated metal pipe
- Rubber ring or plastic gaskets for concrete pipe joints, or manholes section joints shall be of tough, flexible, chemical-resistant material, and of such size and shape as to ensure satisfactory pipe joints when incorporated in the work and shall conform to AWWA C153.
- Rubber gasket joints for ductile iron pipe shall be Styrene-Butadiene Rubber (SBR), Ethylene Propylene Diene Monomer (EPDM) or Nitrile and conform to AWWA C111

Subsection M5.05.03.B Gate Valves
Replace this subsection with the following;

Gate valves shall conform to the requirements of AWWA Standard C500 and/or to the type used by the municipality as specified in the Special Provisions.

SECTION M7: PAINTS, PROTECTIVE COATINGS AND PAVEMENT MARKINGS

Subsection M7.01.04 Fast Drying White and Yellow Waterborne Traffic Paint
Replace the subsection with the following;

Approved waterborne traffic paint shall be tested in accordance with AASHTO M 348 and be listed on the QCML The dry paint film shall be under the Toxicity Characteristic Leaching Procedure (TCLP) limits for all contaminants listed in 40 CFR 261.24. The markings shall be installed using reflective glass beads meeting the requirements of M7.01.07. For waterborne yellow paint use Organic Yellow No. 65 or No. 75 pigment.

SECTION M9: MISCELLANEOUS MATERIALS

Subsection M9.12.0 Reflectors for Barriers
Delete this subsection.

SECTION M10: TRAFFIC CONTROL DEVICES

Subsection M10.16.0: Temporary Barrier
Subsection M10.16.1: Limited Deflection Temporary Barrier
Subsection M10.16.2: Delineators for Temporary Barrier
Add these new subsections.

M10.16.0: Temporary Barrier

All Temporary Barrier shall be tested to MASH crash testing standards and the results of the following crash test designations must fall within the acceptable impact tolerances and evaluation criteria shown in Table 2-2A of MASH:

- Test Level 2: 2-10, 2-11
- Test Level 3: 3-10, 3-11

M10.16.1: Limited Deflection Temporary Barrier

To be classified as a Limited Deflection Temporary Barrier, the results of MASH Test Designation 3-11 must result in a measured dynamic deflection of 24 in. or less.

M10.16.2: Delineators for Temporary Barrier

Delineators for Temporary Barrier shall consist of a housing, retroreflective material, and an adhesive or mechanical fastener.

Housings for Delineators for Temporary Barrier shall be fabricated from a lightweight polymer material. Metal housings shall not be permitted.

Retroreflection shall be achieved using an acrylic reflector or retroreflective sheeting directly applied to the housing. If used, retroreflective sheeting shall be factory applied and conform to ASTM D4956 Type IV, Type V, or Type IX. A minimum of 8 $in.^2$ of reflective material shall be visible on any traffic-facing portion of the delineator.

Delineators shall be attached to temporary barriers using a manufacturer-approved adhesive or mechanical fastener.

<<<<<<<<<<>>>>>>>>>>

END OF SUPPLEMENTAL SPECIFICATIONS

DOCUMENT 00719

(Revised September 14, 2023 – for all Federally Aided Projects)

SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES

(IMPLEMENTING TITLE 49 OF THE CODE OF FEDERAL REGULATIONS, PART 26)

Section: Page 00719-

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POLICY

The Massachusetts Department of Transportation (MassDOT) receives Federal financial assistance from the Federal Highway Administration (FHWA), United States Department of Transportation (U.S. DOT), and as a condition of receiving this assistance, has signed an assurance that it will comply with 49 CFR Part 26 (Participation By Disadvantaged Business Enterprises In Department Of Transportation Financial Assistance Programs). The U.S. DOT Disadvantaged Business Enterprise Program is authorized by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users ("SAFETEA-LU"), as amended, at Title 23, United States Code, § 1101.

Accordingly, MassDOT has established a Disadvantaged Business Enterprise (DBE) Program in accordance with 49 CFR Part 26. It is the policy of MassDOT to ensure that DBEs have an equal opportunity to receive and participate in U.S. DOT assisted Contracts, without regard to race, color, national origin, or sex. To this end, MassDOT shall not directly, or through contractual or other arrangements, use criteria or methods of administration that have the effect of defeating or substantially impairing accomplishment of the program objectives stated below:

- To ensure nondiscrimination in the award and administration of U.S. DOT assisted Contracts;
- To create a level playing field on which DBEs can compete fairly for U.S. DOT assisted Contracts;
- To ensure that the DBE Program is narrowly tailored in accordance with applicable law;
- To ensure that only firms that fully meet 49 CFR Part 26 eligibility standards are permitted to participate as DBEs;
- To help remove barriers to the participation of DBEs in U.S. DOT assisted Contracts; and
- To assist the development of firms that can compete successfully in the market place outside the DBE Program.

The Director of Civil Rights of MassDOT has been designated as the DBE Liaison Officer. The DBE Liaison Officer is responsible for implementing all aspects of the DBE Program. Other MassDOT employees are responsible for assisting the Office of Civil Rights in carrying out this obligation. Implementation of the DBE Program is accorded the same priority as compliance with all other legal obligations incurred by MassDOT in its financial assistance agreements with each operating administration of the U.S. DOT. Information on the Federal requirements and MassDOT's policies and information can be found at:

Type of Info	***Website***	***Description***
MassDOT Highway Division Policies and Info	https://www.mass.gov/disadvantaged-business-enterprise-goals-2019-2022	*MassDOT–Highway Div'n Page*
For copies of the Code of Federal Regulations	http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR	FDsys – US Gov't Printing Office
For information about the U.S.DOT DBE Program	https://www.transportation.gov/civil-rights/disadvantaged-business-enterprise	U.S. DOT/ FHWA page

1. DEFINITIONS

As used in these provisions, the terms set out below are defined as follows:

"Broker", for purposes of these provisions, shall mean a DBE Entity that has entered into a legally binding relationship to provide goods or services delivered or performed by a third party. A broker may be a DBE Entity that arranges or expedites transactions but performs no work or installation services.

"Contractor", "General" or "Prime" Contractor, "Bidder," and "DB Entity" shall mean a person, firm, or other entity that has contracted directly with MassDOT to provide contracted work or services.

"Contract" shall mean the Contract for work between the Contractor and MassDOT.

"DBB" or "Design-Bid-Build" shall mean the traditional design, bid and project delivery method consisting of separate contracts between awarding authority and a designer resulting in a fully designed project; and a separate bidding process and Contract with a construction Contractor or Bidder.

"DB" or "Design-Build" shall mean an accelerated design, bid and project delivery method consisting of a single contract between the awarding authority and a DB Entity, consisting of design and construction companies that will bring a project to full design and construction.

"Disadvantaged Business Enterprise" or "DBE" shall mean a for-profit, small business concern:

(a) that is at least fifty-one (51%) percent owned by one or more individuals who are both socially and economically disadvantaged, or, in the case of any corporation, in which at least fifty-one (51%) percent of the stock is owned by one or more such individuals; and

(b) where the management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

"FHWA" shall mean the Federal Highway Administration," an agency within U.S. DOT that supports State and local governments in the design, and maintenance of the Nation's highway system (Federal Aid Highway Program).

"Good faith efforts" shall mean efforts to achieve a DBE participation goal or other requirement of these Special Provisions that, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement. Such efforts must be deemed acceptable by MassDOT.

"Joint Venture" shall mean an association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their property, capital, efforts, skills and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the Contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

"Approved Joint Venture" shall mean a joint venture, as defined above, which has been approved by MassDOT's Prequalification Office and Office of Civil Rights for DBE participation on a particular Contract.

"Manufacturer" shall mean a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles or equipment required under the contract and of the general character described by the specifications.

"Regular Dealer" shall mean a DBE firm that owns, operates, or maintains a store, warehouse, or other establishment in which materials, supplies, articles or equipment of the general character described by the specifications and required under the Contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

(a) To be a regular dealer, the firm must be an established, regular business that engages, as its principal business, and under its own name, in the purchase and sale of the products in question.

(b) A person may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided above if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by long term lease agreement and not on an ad hoc or contract by contract basis.

(c) Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers within the meaning of this definition.

"Responsive" and "Responsible" refers to the bidder's submittal meeting all of the requirements of the advertised request for proposal. The term responsible refers to the ability of the Contractor to perform the work. This ability can be determined prior to bid invitations.

"Small Business or Small Business Concern" shall mean a small business concern or company as defined in Section 3 of the Small Business Act and SBA regulations implementing it (13 CFR Part 121); and is a business that does not exceed the cap on annual average gross receipts established by the U.S. Secretary of Transportation pursuant to 49 CFR Part 26.65; see also 49 CFR Part 26.39.

"SDO" shall mean the Massachusetts Supplier Diversity Office, formerly known as the State Office of Minority and Women Business Assistance (SOMWBA). In 2010, SOMWBA was abolished and the SDO was established. *See* St. 2010, c. 56. The SDO has assumed all the functions of SOWMBA. SDO is an agency within the Commonwealth of Massachusetts Executive office of Administration and Finance (ANF) Operational Services Division (OSD). The SDO mandate is to help promote the development of business enterprises and non-profit organizations owned and operated by minorities and women.

"Socially and economically disadvantaged individuals" shall mean individuals who are citizens of the United States (or lawfully admitted permanent residents) and who are:

(a) Individuals found by SDO to be socially and economically disadvantaged individuals on a case by case basis.

(b) Individuals in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged:

(1) "Black Americans" which includes persons having origin in any of the Black racial groups of Africa; (2) "Hispanic Americans" which include persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race; (3) "Native Americans" which include persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians; (4) "Asian Pacific Americans" which includes persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kiribati, Tuvalu, Nauru, Federated States of Micronesia, or Hong Kong; (5) "Subcontinent Asian Americans" which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka; (6) Women; or (7) Any additional groups whose members are designated as socially and economically disadvantaged by the Small Business Administration (SBA), at such time as the SBA designation becomes effective.

Other terms and definitions applicable to the U.S. DOT DBE Program may be found at 49 CFR Part 26 and related appendices and guidance pages.

2. DBE PARTICIPATION

a. Goal

On this Contract, MassDOT has established the following goal(s) for participation by firms owned and controlled by socially and economically disadvantaged persons. At least half of the goal must be met in the form of DBE Subcontractor construction activity as opposed to material supplies or other services. The applicable goal remains in effect throughout the life of the contract regardless of whether pre-identified DBE Subcontractors remain on the Project or under Contract.

☒ Design-Bid-Build Projects: DBE Participation Goal **10 %**
(*One half of this goal shall be met in the form of Subcontractor construction activity*)

☐ Design-Build Projects: DBE Design Participation Goal ____**%** and DBE Construction Participation Goal **%**
(One half of the Construction Goal shall be met in the form of Subcontractor construction activity)

b. Bidders List

Pursuant to the provisions of 49 CFR Part 26.11(c), Recipients such as MassDOT, must collect from all Bidders who seek work on Federally assisted Contracts the firm full company name(s), addresses and telephone numbers of all firms that have submitted bids or quotes to the Bidders in connection with this Project. All bidders should refer to the Special Provision Document "A00801" of the Project proposal for this requirement.

In addition, MassDOT must provide to U.S. DOT, information concerning contractors firm status as a DBE or non-DBE, the age of the firm, and the annual gross receipts of the firm within a series of brackets (e.g., less than $500,000; $500,000–$1 million; $1–2 million; $2–5 million, etc.). The status, firm age, and annual gross receipt information will be sought by MassDOT regularly prior to setting its DBE participation goal for submission to U.S. DOT. MassDOT will survey each individual firm for this information directly.

Failure to comply with a written request for this information within fifteen (15) business days may result in the suspension of bidding privileges or other such sanctions, as provided for in Section 9 of this provision, until the information is received.

3. CONTRACTOR ASSURANCES

No Contractor or any Subcontractor shall discriminate on the basis of race color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in all respects and as applicable prior to, or subsequent to, award of U.S. DOT assisted Contracts. The Contractor agrees to affirmatively seek out and consider DBE firms as Contractors, Subcontractors, and/or suppliers of materials and services for this Contract. No Contract will be approved until MassDOT has reviewed Bidders'/Contractors' affirmative actions concerning DBEs. Failure to carry out these requirements is a material breach of this Contract which may result in the termination of the Contract or such other remedy as MassDOT or FHWA deem appropriate.

4. REQUIRED SUBCONTRACT PROVISIONS

The Prime Contractor shall include the provisions of Section 3 above in every subcontract, making those provisions binding on each Subcontractor; in addition, the Prime Contractor shall include a copy of this Special Provision, in its entirety, in every subcontract with a DBE firm which is, or may be, submitted for credit toward the Contract participation goal.

5. ELIGIBILITY OF DBES

Only firms that have been certified by SDO and confirmed by MassDOT as eligible in accordance with 49 CFR Part 26 to participate as DBEs on federally aided MassDOT Contracts may be used on this Contract for credit toward the DBE participation goal.

a. Massachusetts DBE Directory

MassDOT makes available to all bidders the most current Massachusetts Disadvantaged Business Enterprise Directory. This directory is made available for Contractors' convenience and is informational only. The Directory lists those firms that have been certified as eligible in accordance with the criteria of 49 CFR Part 26 to participate as DBEs on federally aided MassDOT contracts. The Directory also lists the kinds of work each firm is certified to perform but does not constitute an endorsement of the quality of performance of any business and does not represent MassDOT Subcontractor approval.

Contractors are encouraged to make use of the DBE Directory maintained by SDO on the Internet. This listing is updated daily and may be accessed at the SDO's website at:
https://www.diversitycertification.mass.gov/BusinessDirectory/BusinessDirectorySearch.aspx

b. DBE Certification

A firm must apply to SDO, currently acting as certification agent for MassDOT, for DBE certification to participate on federally aided MassDOT Contracts. A DBE application may be made in conjunction with a firm's application to SDO for certification to participate in state-funded minority and women business enterprise programs or may be for DBE certification only. An applicant for DBE certification must identify the area(s) of work it seeks to perform on U.S. DOT funded projects.

c. Joint Venture Approval

To obtain recognition as an approved DBE Joint Venture, the parties to the joint venture must provide to MassDOT's Office of Civil Rights and Prequalification Office, at least fourteen (14) business days before the bid opening date, an Affidavit of DBE/Non-DBE Joint Venture in the form attached hereto, and including, but not limited to the following:

1. a copy of the Joint Venture Agreement;
2. a description of the distinct, clearly defined portion of the contract work that the DBE will perform with its own forces; and,
3. all such additional information as may be requested by MassDOT for the purpose of determining whether the joint venture is eligible.

6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS

In order for DBE participation to count toward the Contract participation goal, the DBE(s) must have served a commercially useful function in the performance of the Contract and must have been paid in full for acceptable performance.

a. Commercially Useful Function

(1) In general, a DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. With respect to materials and supplies used on the Contract, the DBE must be responsible for negotiating price, determining quality and quantity, ordering the material, installing (where applicable) and paying for the material itself.

(2) To determine whether a DBE is performing a commercially useful function, MassDOT will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and other relevant factors.

(3) A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation. In determining whether a DBE is such an extra participant, MassDOT will examine similar transactions, particularly those in which DBEs do not participate.

b. Counting Participation Toward The Contract Participation Goal

DBE participation which serves a commercially useful function shall be counted toward the DBE participation goal in accordance with the Provisions of 49 CFR Part 26.55(a) to (h), as follows:

(1) When a DBE participates in a construction Contract, MassDOT will count the value of the work performed by the DBE's own forces. MassDOT will count the cost of supplies and materials obtained by the DBE for the work of its contract, including supplies purchased or equipment leased by the DBE. Supplies, labor, or equipment the DBE Subcontractor uses, purchases, or leases from the Prime Contractor or any affiliate of the Prime Contractor will not be counted.

(2) MassDOT will count the entire amount of fees or commissions charged by a DBE firm for providing bona fide services, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a U.S. DOT assisted Contract, toward DBE participation goals, provided it is determined that the fee is reasonable and not excessive as compared with fees customarily allowed for similar services.

(3) When a DBE performs as a participant in a joint venture, MassDOT will count toward DBE participation goals a portion of the total dollar value of the contract that is equal to the distinct, clearly defined portion of the work of the Contract that the DBE performs with its own forces.

(4) MassDOT will use the following factors in determining whether a DBE trucking company is performing a commercially useful function:

(i) the DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract; there cannot be a contrived arrangement for the purpose of meeting DBE participation goals.

(ii) the DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the Contract.

(iii) the Contractor will receive DBE credit for the total value of the transportation services the DBE provides on the Contract using trucks owned, insured, and operated by the DBE itself and using drivers the DBE employs alone.

(iv) the DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The Contractor who has a contract with a DBE who leases trucks from another DBE will receive credit for the total value of the transportation services of the lease.

(v) the DBE may also lease trucks from a non-DBE firm, including an owner-operator. The Contractor who has a Contract with a DBE who leases trucks from a non-DBE is entitled to credit for the total value of the transportation services provided by non-DBE lessees not to the exceed the value of transportation services provided by DBE-owned trucks on the Contract. Additional participation by non-DBE lessees receives credit only for the fee or commission it receives as a result of the lease arrangement, fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.

(vi) the lease must indicate that the DBE has exclusive use of, and control over, the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

(5) MassDOT will count the Prime Contractor's expenditures with DBEs for materials or supplies toward DBE participation goals as follows:

(i) if the materials or supplies are obtained from a DBE manufacturer, as defined in Section 1 above, MassDOT will count one hundred (100%) percent of the cost of the materials or supplies toward DBE participation goals, provided the DBE meets the other requirements of the regulations.

(ii) if the materials or supplies are purchased from a DBE regular dealer, as defined in Section 1 above, MassDOT will count sixty (60%) percent of the cost of the materials or supplies toward the Contract participation goal, provided the DBE meets the other requirements of the regulations.

(iii) for materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer, MassDOT will count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site toward the Contract participation goal, provided that MassDOT determines the fees to be reasonable and not excessive as compared with fees customarily allowed for similar services; the cost of the materials and supplies themselves will not be counted; and provided the DBE meets the other requirements of the regulations.

c. Joint Check Policy

MassDOT recognizes that the use of joint checks may be a business practice required by material suppliers and vendors in the construction industry. A joint check is a two-party check issued by a/the Prime Contractor to a DBE third party such as a regular dealer of material or supplies. The Prime Contractor issues the check as payor to the DBE and the third party jointly as payees to guarantee payment to the third party for materials or supplies obtained or to be used by the DBE. FHWA has established criteria to ensure that DBEs are in fact performing a commercially useful function ("CUF") while using a joint check arrangement. Contractors and DBEs must meet and conform to these conditions and criteria governing the use of joint checks.

In the event that a Contractor or DBE Subcontractor desires to a use joint check, MassDOT will require prior notice and will closely monitor the arrangement for compliance with FHWA regulations and guidance. MassDOT may allow a joint check arrangement and give credit to a Contractor for use of the DBE where one or more of the following conditions exist:

- The use of a joint check is in fact required by this type of vendor or supplier as a standard industry practice that applies to all Contractors (DBEs and non-DBEs); or is required by a specific vendor or supplier;
- Payment for supplies or materials would be delayed for an unreasonably extended period without the joint check arrangement;
- The DBE (or any of its Subcontractors) has a pattern or history of not paying a vendor or supplier within a reasonable time or has not established enough of a credit history with the supplier or vendor; and/or
- The presence of severe adverse economic conditions, where credit resources may be limited and such practices may be necessary or required to effect timely payments.

Other factors MassDOT may consider:

- Whether there is a requirement by the Prime Contractor that a DBE should use a specific vendor or supplier to meet their Subcontractor specifications;
- Whether there is a requirement that a DBE use the Prime Contractor's negotiated price;
- The independence of the DBE;
- Whether approval has been sought prior to use of a joint check arrangement; and
- Whether any approved joint check arrangement has exceeded a reasonable period of use;
- The operation of the joint check arrangement; and
- Whether the DBE has made an effort to establish alternate arrangements for following periods (i.e., the DBE must show it can, or has, or why it has not, established or increased a credit line with the vendor or supplier).

Even with the use of a Joint Check, both the Contractor and DBE remain responsible for compliance with all other elements under 49 CFR § 26.55 (c) (1), and must still be able to prove that a commercially useful function is being performed for the Contractor.

d. Joint Check Procedure(s)

- The DBE advises its General or Prime Contractor that it will have to use a Joint Check and provide proof of such requirement.
- The General or the Prime Contractor submits a request for approval to MassDOT, using MassDOT's approved Joint Check Request form (Document B00855) and by notification on the DBE Letter of Intent (Document B00854), and any other relevant documents. Requests that are not initiated during the bid process should be made in writing and comply with the procedure.
- The MassDOT Office of Civil Rights will review the request and render a decision as part of the approval process for DBE Schedules and Letters of Intent.
- Review and Approval will be project specific and relevant documents will be made part of the project Contract file.
- Payments should be made in the name of both the DBE and vendor or supplier. Payments should be issued and signed by the Contractor as only the guarantor for prompt payment of purchases to the vendor or supplier. The payment to the vendor or supplier should be handled by the DBE (i.e. if possible, funds or the joint check should be processed by the DBE and sent by the DBE to the vendor or supplier).
- MassDOT may request copies of cancelled checks (front and back) and transmittal information to verify any payments made to the DBE and vendor or supplier.
- MassDOT may request other information and documents, and may ask questions of the Contractor, Subcontractor and vendor or supplier prior to, during, and after the project performance to ascertain whether the Subcontractor is performing a commercially useful function and all parties are complying with DBE Program policies and procedures as part of the Subcontractor approval process.

7. AWARD DOCUMENTATION AND PROCEDURES

a. The two lowest bidders/the two bidders with the lowest price per quality score point, shall submit, by the close of business on the third (3rd) business day after the bid opening, a completed Schedule of Participation by DBEs (Document B00853) which shall list:

(1) The full company name, address and telephone number of each DBE with whom the bidder intends to make a commitment.

(2) The contract item(s), by number(s) and quantity(ies), if applicable, or specific description of other business activity to be performed by each DBE as set forth in the Letters of Intent. The Bidder shall list only firms which have the capacity to perform, manage and supervise the work proposed in accordance with the requirements of 49 CFR Part 26 and Section **6.b** of these Special Provisions.

(3) The total dollar amount to be paid to each DBE. (Bidders are cautioned that at least one half of the participation goal must be met with construction activity work.)

(4) The total dollar amount to be paid to each DBE that is eligible for credit toward the DBE participation goal under the counting rules set out in Section **6.b**.

(5) The total creditable DBE participation as a percentage of the total bid price.

b. All firms listed on the Schedule must be currently certified.

c. The two lowest bidders/the two bidders with the lowest price per quality score point, shall each submit, with their Schedules of Participation, fully completed, signed Letters of Intent (Document B00854) from each of the DBEs listed on the Schedule. The Letters of Intent shall be in the form attached and shall identify specifically the contract activity the DBE proposes to perform, expressed as contract item number, if applicable, description of the activity, NAICS code, quantity, unit price and total price. In the event of discrepancy between the Schedule and the Letter of Intent, the Letter of Intent shall govern.

d. Evidence of good faith efforts will be evaluated by MassDOT in the selection of the lowest responsible bidder.

All information requested by MassDOT for the purpose of evaluating the Contractor's efforts to achieve the participation goal must be provided within three (3) calendar days and must be accurate and complete in every detail. The apparent low bidder's attainment of the DBE participation goal or a satisfactory demonstration of good faith efforts is a prerequisite for award of the Contract.

e. Failure to meet, or to demonstrate good faith efforts to meet, the requirements of these Special Provisions shall render a bid non-responsive. Therefore, in order to be eligible for award, the bidder (1) must list all DBE's it plans to employ on the Schedule of Participation; and provide the required Letters of Intent for, DBE participation which meets or exceeds the Contract goal in accordance with the terms of these Special Provisions or (2) must demonstrate, to the satisfaction of MassDOT, that good faith efforts were made to achieve the participation goal. MassDOT will adhere to the guidance provided in Appendix A to 49 CFR Part 26 on the determination of a Contractor's good faith efforts to meet the DBE participation goal(s) set forth in Section 2 herein.

f. If MassDOT finds that the percentage of DBE participation submitted by the bidder on its Schedule does not meet the Contract participation goal, or that Schedule and Letters of Intent were not timely filed, and that the bidder has not demonstrated good faith efforts to comply with these requirements, it shall propose that the bidder be declared ineligible for award. In that case, the bidder may request administrative reconsideration. Such requests must be sent in writing within three (3) calendar days of receiving notice of proposed ineligibility to: The Office of the General Counsel, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA, 02116.

g. If, after administrative reconsideration, MassDOT finds that the bidder has not shown that sufficient good faith efforts were made to comply with the requirements of these Special Provisions, it shall reject the bidder's proposal and may retain the proposal guaranty.

h. Actions which constitute evidence of good faith efforts to meet a DBE participation goal include, but are not limited to, the following examples, which are set forth in 49 CFR Part 26, Appendix A:

(1) Soliciting through all reasonable and available means (e.g., attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the Contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.

(2) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE participation goal will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Prime Contractor might otherwise prefer to perform these work items with its own forces.

(3) Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(4) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE Subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE Subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone number of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.

A bidder using good business judgment would consider a number of factors in negotiating with Subcontractors, including DBE Subcontractors, and would take a firm's price and capabilities as well as Contract participation goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the Contract DBE participation goal, as long as such costs are reasonable. Also, the ability or desire of a Prime Contractor to perform the work of a Contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime Contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

(5) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. Contractors should be careful of adding additional requirements of performance that would in effect limit participation by DBEs or any small business. The Contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. nonunion employee status) are not legitimate causes for the rejection or non-solicitation of bids in the Contractor's efforts to meet the Contract participation goal.

(6) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.

(7) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

(8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case by case basis to provide assistance in the recruitment and placement of DBEs.

8. COMPLIANCE

a. All activity performed by a DBE for credit toward the Contract participation goal must be performed, managed and supervised by the DBE in accordance with all commercially useful function requirements of 49 CFR Part 26. The Prime Contractor shall not enter into, or condone, any other arrangement.

b. The Prime Contractor shall not perform with its own organization, or assign to any other business, an activity designated for the DBE(s) named on the Schedule(s) submitted by the Prime Contractor under Section 7 or under paragraph **8.f** of this section, without the approval of MassDOT in accordance with the requirements of paragraphs **8.f** and **8.j** of this section.

c. MassDOT may suspend payment for any activity that was not performed by the DBE to whom the activity was committed on the approved Schedule of Participation, or that was not performed in accordance with the requirements of Section 6.

d. MassDOT retains the right to approve or disapprove of any or all Subcontractors. Requests by the Prime Contractor for approval of participation by a DBE Subcontractor for credit toward the Contract participation goal must include, in addition to any other requirements for Subcontractor approval, the following:

(1) A copy of the proposed subcontract. The subcontract must be for at least the dollar amount, and for the work described, in the Bidder's Schedule of Participation.

(2) A resume stating the qualifications and experience of the DBE Superintendent and/or foreperson who will supervise the on-site work. A new resume will be required for any change in supervisory personnel during the progress of the work.

(3) A Schedule of Operations indicating when the DBE is expected to perform the work.

(4) A list of (1) equipment owned by the DBE to be used on the Project, and (2) equipment to be leased by the DBE for use on the Project.

(5) A list of: (1) all projects (public and private) which the DBE is currently performing; (2) all projects (public and private) to which the DBE is committed; and (3) all projects (public and private) to which the DBE intends to make a commitment. For each Contract, list the contracting organization, the name and telephone number of a contact person for the contracting organization, the dollar value of the work, a description of the work, and the DBE's work schedule for each project.

e. If, pursuant to the Subcontractor approval process, MassDOT finds that a DBE Subcontractor does not have sufficient experience or resources to perform, manage and supervise work of the kind proposed in accordance with the requirements of 49 CFR Part 26, approval of the DBE Subcontractor may be denied. In the event of such denial, the Prime Contractor shall proceed in accordance with the requirements paragraphs **8.f** and **8.j** of this section.

f. If, for reasons beyond its control, the Prime Contractor cannot comply with its DBE participation commitment in accordance with the Schedule of Participation submitted under Section 7, the Prime Contractor shall submit to MassDOT the reasons for its inability to comply with its obligations and shall submit, and request approval for, a revised Schedule of Participation. If approved by MassDOT, the revised Schedule shall govern the Prime Contractor's performance in meeting its obligations under these Special Provisions.

g. A Prime Contractor's compliance with the participation goal in Section 2 shall be determined by reference to the established percentage of the total contract price, provided, however, that no decrease in the dollar amount of a bidder's commitment to any DBE shall be allowed without the approval of MassDOT.

h. If the contract amount is increased, the Prime Contractor may be required to submit a revised Schedule of Participation in accordance with paragraphs **8.f** and **8.j** of this section.

i. In the event of the decertification of a DBE scheduled to participate on the Contract for credit toward the participation goal, but not under subcontract, the Contractor shall proceed in accordance with paragraphs **8.f** and **8.j** of this section.

j. The Prime Contractor shall notify MassDOT immediately of any facts that come to its attention indicating that it may or will be unable to comply with any aspect of its DBE obligation under this Contract.

k. Any notice required by these Special Provisions shall be given in writing to: (1) the Resident Engineer; (2) the District designated Compliance Officer; and (3) the DBE Liaison Officer, MassDOT Office of Civil Rights, 10 Park Plaza, – 3rd Floor - West, Boston, MA, 02116 and cc'd to the Deputy Chief of External Programs.

l. The Prime Contractor and its Subcontractors shall comply with MassDOT's Electronic Reporting System Requirements (MassDOT Document 00821) and submit all information required by MassDOT related to the DBE Special Provisions through the Equitable Business Opportunity Solution ("EBO"). MassDOT reserves the right to request reports in the format it deems necessary anytime during the performance of the Contract.

m. Termination of DBE by Prime Contractor

(1) A Prime Contractor shall not terminate a DBE Subcontractor or an approved substitute DBE firm without the prior written consent of MassDOT. This includes, but is not limited to, instances in which a Prime Contractor seeks to perform work originally designated for a DBE Subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

(2) MassDOT may provide such written consent only if MassDOT agrees, for reasons stated in its concurrence document, that the Prime Contractor has good cause to terminate the DBE firm.

(3) For purposes of this paragraph, good cause includes the following circumstances:

(i) The DBE Subcontractor fails or refuses to execute a written contract;

(ii) The DBE Subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Good cause, however, does not exist if the failure or refusal of the DBE Subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Prime Contractor;

(iii) The DBE Subcontractor fails or refuses to meet the Prime Contractor's reasonable, nondiscriminatory bond requirements.

(iv) The DBE Subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;

(v) The DBE Subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1,200 or applicable State law;

(vi) (vii) MassDOT has determined that the listed DBE Subcontractor is not a responsible contractor;

(vii) The listed DBE Subcontractor voluntarily withdraws from the Project and provides written notice of its withdrawal;

(viii) The listed DBE is ineligible to receive DBE credit for the type of work required;

(ix) A DBE owner dies or becomes disabled with the result that the listed DBE Contractor is unable to complete its work on the Contract;

(x) Other documented good cause that MassDOT determines compels the termination of the DBE Subcontractor. Good cause, however, does not exist if the Prime Contractor seeks to terminate a DBE it relied upon to obtain the Contract so that the Prime Contractor can self-perform the DBE work or substitute another DBE or non-DBE Contractor after Contract Award.

(4) Before transmitting to MassDOT a request to terminate and/or substitute a DBE Subcontractor, the Prime Contractor must give notice in writing to the DBE Subcontractor, with a copy to MassDOT, of its intent to request to terminate and/or substitute, and the reason for the request.

(5) The Prime Contractor must give the DBE five (5) business days to respond to the Prime Contractor's notice. The DBE must advise MassDOT and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why MassDOT should not approve the Prime Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), MassDOT may provide a response period shorter than five (5) business days.

(6) In addition to post-award terminations, the provisions of this section apply to pre-award deletions of or substitutions for DBE firms.

n. Prompt Payment.

Contractors are required to promptly pay Subcontractors under this Prime Contract within ten (10) business days from the receipt of each payment the Prime Contractor receives from MassDOT. Failure to comply with this requirement may result in the withholding of payment to the Prime Contractor until such time as all payments due under this provision have been received by the Subcontractor(s) and/or referral to the Prequalification Committee for action which may affect the Contractor's prequalification status.

9. SANCTIONS

If the Prime Contractor does not comply with the terms of these Special Provisions and cannot demonstrate to the satisfaction of MassDOT that good faith efforts were made to achieve such compliance, MassDOT may, in addition to any other remedy provided for in the Contract, and notwithstanding any other provision in the Contract:

a. Retain, in connection with final acceptance and final payment processing, an amount determined by multiplying the total contract amount by the percentage in Section 2, less the amount paid to approved DBE(s) for work performed under the Contract in accordance with the provisions of Section 8.

b. Suspend, terminate or cancel this Contract, in whole or in part, and call upon the Prime Contractor's surety to perform all terms and conditions in the Contract.

c. In accordance with 720 CMR 5.05(1)(f), modify or revoke the Prime Contractor's Prequalification status or recommend that the Prime Contractor not receive award of a pending Contract. The Prime Contractor may appeal the determination of the Prequalification Committee in accordance with the provisions of 720 CMR 5.06.

d. Initiate debarment proceedings pursuant to M.G.L. c. 29 §29F and, as applicable, 2 CFR Parts 180, 215 and 1,200.

e. Refer the matter to the Massachusetts Attorney General for review and prosecution, if appropriate, of any false claim or pursuant to M.G.L. c. 12, §§ 5A to 5O (the Massachusetts False Claim Act).

f. Refer the matter to the U.S. DOT's Office of the Inspector General or other agencies for prosecution under Title 18, U.S.C. § 1001, 49 CFR Parts 29 and 31, and other applicable laws and regulations.

10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND CONFIDENTIALITY.

a. Any proposed DBE, bidder, or Contractor shall provide such information as is necessary in the judgment of MassDOT to ascertain its compliance with the terms of this Special Provision. Further, pursuant to 49 CFR, Part 26.107:

(1) If you are a firm that does not meet the eligibility criteria of 49 CFR, Parts 26.61 to 26.73 ("subpart D"), that attempts to participate in a DOT- assisted program as a DBE on the basis of false, fraudulent, or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, MassDOT or FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.

(2) If you are a firm that, in order to meet DBE Contract participation goals or other DBE Program requirements, uses or attempts to use, on the basis of false, fraudulent or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, another firm that does not meet the eligibility criteria of subpart D, FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.

(3) In a suspension or debarment proceeding brought either under subparagraph a.(1) or b.(2) of this section, the concerned operating administration may consider the fact that a purported DBE has been certified by a recipient. Such certification does not preclude FHWA from determining that the purported DBE, or another firm that has used or attempted to use it to meet DBE participation goals, should be suspended or debarred.

(4) FHWA may take enforcement action under 49 CFR Part 31, Program Fraud and Civil Remedies, against any participant in the DBE Program whose conduct is subject to such action under 49 CFR Part 31.

(5) FHWA may refer to the Department of Justice, for prosecution under 18 U.S.C. 1001 or other applicable provisions of law, any person who makes a false or fraudulent statement in connection with participation of a DBE in any DOT-assisted program or otherwise violates applicable Federal statutes.

b. Pursuant to 49 CFR Part 26.109, the rules governing information, confidentiality, cooperation, and intimidation or retaliation are as follows:

(1) Availability of records.

(i) In responding to requests for information concerning any aspect of the DBE Program, FHWA complies with provisions of the Federal Freedom of Information and Privacy Acts (5 U.S.C. 552 and 552a). FHWA may make available to the public any information concerning the DBE Program release of which is not prohibited by Federal law.

(ii) MassDOT shall safeguard from disclosure to unauthorized persons information that may reasonably be considered as confidential business information, consistent with Federal and Massachusetts General Law (M.G.L. c. 66, § 10, M.G.L. c. 4, §7 (26), 950 CMR 32.00).

(2) Confidentiality of information on complainants. Notwithstanding the provisions of subparagraph b.(1) of this section, the identity of complainants shall be kept confidential, at their election. If such confidentiality will hinder the investigation, proceeding or hearing, or result in a denial of appropriate administrative due process to other parties, the complainant must be advised for the purpose of waiving the privilege. Complainants are advised that, in some circumstances, failure to waive the privilege may result in the closure of the investigation or dismissal of the proceeding or hearing.

(3) Cooperation. All participants in FHWA's DBE Program (including, but not limited to, recipients, DBE firms and applicants for DBE certification, complainants and appellants, and Contractors using DBE firms to meet Contract participation goals) are required to cooperate fully and promptly with U.S. DOT and recipient compliance reviews, certification reviews, investigations, and other requests for information. Failure to do so shall be a ground for appropriate action against the party involved (e.g., with respect to recipients, a finding of noncompliance; with respect to DBE firms, denial of certification or removal of eligibility and/or suspension and debarment; with respect to a complainant or appellant, dismissal of the complaint or appeal; with respect to a Contractor which uses DBE firms to meet participation goals, findings of non-responsibility for future Contracts and/or suspension and debarment).

(4) Intimidation and retaliation. No recipient, Contractor, or any other participant in the program, may intimidate, threaten, coerce, or discriminate against any individual or firm for the purpose of interfering with any right or privilege secured by this part or because the individual or firm has made a complaint, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under this part. If any recipient or contractor violates this prohibition, that entity is in noncompliance with this 49 CFR Part 26.

11. LIST OF ADDITIONAL DOCUMENTS.

a. The following documents shall be completed and signed by the bidder and designated DBEs in accordance with Section 7 - Award Documentation and Procedures. These documents must be returned by the bidder to MassDOT's Bid Document Distribution Center:

- □ Schedule of DBE Participation (Document B00853)
- □ Letter of Intent (Document B00854)
- □ DBE Joint Check Arrangement Approval Form (Document B00855), if Contractor and DBE plan, or if DBE is required to use a Joint Check

b. The following document shall be signed and returned by Contractor and Subcontractors/DBEs to the MassDOT District Office overseeing the Project, as applicable:

- □ Contractor/Subcontractor Certification Form (Document No. 00859) (a checklist of other documents to be included with every subcontract (DBEs and non-DBEs alike)).

c. The following document shall be provided to MassDOT's Office of Civil Rights and Prequalification Office at least fourteen (14) business days before the bid opening date, if applicable:

- □ Affidavit of DBE/Non-DBE Joint Venture (Document B00856)

d. The following document shall be provided to MassDOT's District Office of Civil Rights within 30 calendar days after the work of the DBE is completed, or no later than 30 calendar days after the work of the DBE is on a completed and processed CQE. This document shall be completed and submitted by the Prime Contractor:

- □ Certificate of Completion by a Minority/Women or Disadvantaged Business Enterprise (M/W/DBE) (Form No. CSD-100)

*** END OF DOCUMENT ***

DOCUMENT 00760

FHWA-1273 – Revised October 23, 2023

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. General
II. Nondiscrimination
III. Non-segregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
XI. Certification Regarding Use of Contract Funds for Lobbying
XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (*see* 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:
(1) Withholding monthly progress payments;
(2) Assessing sanctions;
(3) Liquidated damages; and/or
(4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than $10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act (40 U.S.C. 3141(2)(B)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH–1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in 29 CFR part 1, a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is used in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

d. *Fringe benefits not expressed as an hourly rate.* Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in § 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

3. Records and certified payrolls (29 CFR 5.5)

a. *Basic record requirements* (1) *Length of record retention.* All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) *Information required.* Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) *Additional records relating to fringe benefits.* Whenever the Secretary of Labor has found under paragraph 1.e. of this section that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(4) *Additional records relating to apprenticeship.* Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. *Certified payroll requirements* (1) *Frequency and method of submission.* The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) *Information required.* The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (*e.g.,* the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH–347 or in any other format desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division website at *https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347/.pdf* or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) *Statement of Compliance.* Each certified payroll submitted must be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) *Use of Optional Form WH–347.* The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 will satisfy the requirement for submission of the “Statement of Compliance” required by paragraph 3.b.(3) of this section.

(5) *Signature.* The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification.* The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 3729.

(7) *Length of certified payroll retention.* The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents.* The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access* (1) *Required record disclosures and access to workers.* The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements.* If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under 29 CFR part 6 any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures.* Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices* (1) *Rate of pay.* Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits.* Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio.* The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates.* Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity.* The use of apprentices and journeyworkers under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

c. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeyworkers shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility. a. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, 18 U.S.C. 1001.

11. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or 29 CFR part 1 or 3; or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or 29 CFR part 1 or 3.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchpersons and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1. of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or

mechanic, including watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1. of this section.

* $31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

4. Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or

d. Informing any other person about their rights under CWHSSA or this part.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term “perform work with its own organization” in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of $150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1**. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

* * * * *

3. **Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily

excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

* * * * *

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B) This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

DOCUMENT 00811

SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES
Revised: 02/03/2023

This provision applies to all projects using greater than 100 tons of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

Price Adjustments will be based on the variance in price, for the liquid asphalt component only, between the Base Price and the Period Price. They shall not include transportation or other charges. Price Adjustments will occur on a monthly basis.

Base Price
The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined by the Department at the time of the bid using the same method as the determination of the Period Price detailed below. The Base Price shall be used in all bids.

Period Price
The Period Price is the price of liquid asphalt for each monthly period as determined by the Department using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. The Department will post this Period Price on its website at https://www.mass.gov/service-details/massdot-current-contract-price-adjustments following its receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted the Department the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor.

Price Adjustment Determination, Calculation and Payment
The Contract Price of the HMA mixture will be paid under the respective item in the Contract. Price Adjustments, as herein provided, either upwards or downwards, will be made after the work has been performed using the monthly period price for the month during which the work was performed.

Price Adjustments will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the approved Job Mix Formula.

Price Adjustments will be separate payment items. The pay item numbers are 999.401 for a positive price adjustment (a payment) and 999.402 for a negative price adjustment (a deduction). Price Adjustments will be calculated using the following equation:

Price Adjustment = Tons of HMA Placed X Liquid Asphalt Content % X RAP Factor X (Period Price - Base Price)

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00812

SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE –
ENGLISH UNITS
Revised: 02/01/2021

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department's web site https://www.mass.gov/service-details/massdot-current-contract-price-adjustments for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made during each month.

This adjustment will be effected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The fuel price adjustment will apply only to the following items of work at the fuel factors shown:

ITEMS COVERED	FUEL FACTORS	
	Diesel	Gasoline
Excavation: and Borrow Work: Items 120, 120.1, 121, 123, 124, 125, 127, 129.3, 140, 140.1, 141, 142, 143, 144, 150, 150.1, 151 and 151.1 (Both Factors used)	0.29 Gallons / CY.	0.15 Gallons / CY
Surfacing Work: All Items containing Hot Mix Asphalt	2.90 Gallons / Ton	Does Not Apply

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Addendum No. 1, August 29, 2025

DOCUMENT 00813

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

August 14, 2025

This special provision applies to all projects containing the use of structural steel and/or reinforcing steel as specified elsewhere in the Contract work. It applies to all structural steel and all reinforcing steel, as defined below, on the project. Compliance with this provision is mandatory, i.e., there are no "opt-in" or "opt-out" clauses. Price adjustments will be handled as described below and shall only apply to unfabricated reinforcing steel bars and unfabricated structural steel material, consisting of rolled shapes, plate steel, sheet piling, pipe piles, steel castings and steel forgings.

Price adjustments will be variances between Base Prices and Period Prices. Base Prices and Period Prices are defined below.

Price adjustments will only be made if the variances between Base Prices and Period Prices are 5% or more. A variance can result in the Period Price being either higher or lower than the Base Price. Once the 5% threshold has been achieved, the adjustment will apply to the full variance between the Base Price and the Period Price.

Price adjustments will be calculated by multiplying the number of pounds of unfabricated structural steel material or unfabricated reinforcing steel bars on a project by the index factor calculated as shown below under Example of a Period Price Calculation.

Price adjustments will ***not*** include guardrail panels or the costs of shop drawing preparation, handling, fabrication, coatings, transportation, storage, installation, profit, overhead, fuel costs, fuel surcharges, or other such charges not related to the cost of the unfabricated structural steel and unfabricated reinforcing steel.

The weight of steel subject to a price adjustment shall not exceed the final shipping weight of the fabricated part by more than 10%.

Base Prices and Period Prices are defined as follows:

Base Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are fixed prices determined by the Department and found in the table below. While it is the intention of the Department to make this table comprehensive, some of a project's unfabricated structural steel and/or unfabricated reinforcing steel may be inadvertently omitted. Should this occur, the Contractor shall bring the omission to the Department's attention so that a contract alteration may be processed that adds the missing steel to the table and its price adjustments to the Contract.

The Base Price Date is the month and year of the most recent finalized period price index at the time that MassDOT opened bids for the project. The Base Price Index for this contract is the Steel PPI listed in the Notice to Contractors.

Period Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are variable prices that have been calculated using the Period Price Date and an index of steel prices to adjust the Base Price.

The Period Price Date is the date the steel was delivered to the fabricator as evidenced by an official bill of lading submitted to the Department containing a description of the shipped materials, weights of the shipped materials and the date of shipment. This date is used to select the Period Price Index.

The index used for the calculation of Period Prices is the U.S. Department of Labor Bureau of Labor Statistics Producer Price Index (PPI) Series ID WPU101702 (Not Seasonally Adjusted, Group: Metals and Metal Products, Item: Semi-finished Steel Mill Products.) As this index is subject to revision for a period of up to four (4) months after its original publication, no price adjustments will be made until the index for the period is finalized, i.e., the index is no longer suffixed with a "(P)".

Period Prices are determined as follows:

Period Price = Base Price X Index Factor
Index Factor = Period Price Index / Base Price Index

Example of a Period Price Calculation:

Calculate the Period Price for December 2009 using a Base Price from March 2009 of $0.82/Pound for 1,000 Pounds of ASTM A709 (AASHTO M270) Grade A36 Structural Steel Plate.

The Period Price Date is December 2009. From the PPI website*, the Period Price Index = 218.0.

The Base Price Date is March 2009. From the PPI website*, the Base Price Index = 229.4.

Index Factor = Period Price Index / Base Price Index = 218.0 / 229.4 = 0.950
Period Price = Base Price X Index Factor = $0.82/Pound X 0.950 = $0.78/Pound

Since $0.82 - $0.78 = $0.04 is less than 5% of $0.82, no price adjustment is required.

If the $0.04 difference shown above was greater than 5% of the Base Price, then the price adjustment would be 1,000 Pounds X $0.04/Pound = $40.00. Since the Period Price of $0.78/Pound is less than the Base Price of $0.82/Pound, indicating a drop in the price of steel between the bid and the delivery of material, a credit of $40.00 would be owed to MassDOT. When the Period Price is higher than the Base Price, the price adjustment is owed to the Contractor.

* To access the PPI website and obtain a Base Price Index or a Period Price Index, go to http://data.bls.gov/cgi-bin/srgate

End of example.

The Contractor will be paid for unfabricated structural steel and unfabricated reinforcing steel under the respective contract pay items for all components constructed of either structural steel or reinforced Portland cement concrete under their respective Contract Pay Items.

Price adjustments, as herein provided for, will be paid separately as follows:

Structural Steel
Pay Item Number 999.449 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.457 for negative (-) pay adjustments (credits to MassDOT Highway Division)

Reinforcing Steel
Pay Item Number 999.466 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.467 for negative (-) pay adjustments (credits to MassDOT Highway Division)

No price adjustment will be made for price changes after the Contract Completion Date, unless the MassDOT Highway Division has approved an extension of Contract Time for the Contract.

TABLE

Steel Type		Price per Pound
1	ASTM A615/A615M Grade 60 (AASHTO M31 Grade 60 or 420) Reinforcing Steel	$0.55
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	$0.76
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$0.76
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$0.78
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	$0.82
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	$0.77
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	$0.82
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	$0.77
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	$0.85
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	$0.78
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	$0.85
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	$0.78
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	$0.89
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	$0.96
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	$1.47
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	$0.85
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	$0.78
18	ASTM A276 Type 316 Stainless Steel	$4.42
19	ASTM A240 Type 316 Stainless Steel	$4.42
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	$1.52
21	ASTM A53 Grade B Structural Steel Pipe	$0.96
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$0.96
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$0.76
24	ASTM 252, Grade 2 Permanent Steel Casing	$0.76
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	$0.80
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$1.45
27	ASTM A572 / A572M, Grade 50 Sheetpiling	$1.45
28	ASTM A36/36M, Grade 50	$0.82
29	ASTM A570, Grade 50	$0.80
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$0.82
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$0.96
32	AREA 140 LB Rail and Track Accessories	$0.50

NOTE: Steel Castings are generally used only on moveable bridges. Cast iron frames, grates and pipe are not “steel” castings and will not be considered for price adjustments.

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DOCUMENT 00814

SPECIAL PROVISIONS
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES

January 12, 2009

This provision applies to all projects using greater than 100 Cubic Yards (76 Cubic Meters) of Portland cement concrete containing Portland cement as stipulated in the Notice to Contractors section of the Bid Documents. This Price Adjustment will occur on a monthly basis.

The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price. It shall not include transportation or other charges.

The Base Price of Portland cement on a project is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price (see below) and found in the Notice to Contractors.

The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the **Construction Economics** section of *ENR Engineering News-Record* magazine or at the ENR website http://www.enr.com under **Construction Economics**. The Period Price will be posted on the MassDOT website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01. No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00820

THE COMMONWEALTH OF MASSACHUSETTS SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

I. Definitions

For purposes of this contract,

"Minority" means a person who meets one or more of the following definitions:

(a) American Indian or Native American means: all persons having origins in any of the original peoples of North America and who are recognized as an Indian by a tribe or tribal organization.
(b) Asian means: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian sub-continent, or the Pacific Islands, including, but Not limited to China, Japan, Korea, Samoa, India, and the Philippine Islands.
(c) Black means: All persons having origins in any of the Black racial groups of Africa, including, but not limited to, African-Americans, and all persons having origins in any of the original peoples of the Cape Verdean Islands.
(d) Eskimo or Aleut means: All persons having origins in any of the peoples of Northern Canada, Greenland, Alaska, and Eastern Siberia.
(e) Hispanic means: All persons having their origins in any of the Spanish-speaking peoples of Mexico, Puerto Rico, Cuba, Central or South America, or the Caribbean Islands.

"State construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility, or a contract for the construction, reconstruction, alteration, remodeling or repair of a public work undertaken by a department, agency, board, or commission of the commonwealth.

"State assisted construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility undertaken by a political subdivision of the commonwealth, or two or more political subdivisions thereof, an authority, or other instrumentality and whose costs of the contract are paid for, reimbursed, grant funded, or otherwise supported, in whole or in part, by the commonwealth.

II. Equal Opportunity, Non-Discrimination and Affirmative Action

During the performance of this Contract, the Contractor and all subcontractors (hereinafter collectively referred to as "the Contractor") for a state construction contract or a state assisted construction contract, for him/herself, his/her assignees and successors in interest, agree to comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

In connection with the performance of work under this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability, shall not discriminate in the selection or retention of subcontractors, and shall not discriminate in the procurement of materials and rentals of equipment.

The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising, layoff or termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship or on-the-job training opportunity. The Contractor shall comply with the provisions of chapter 151B of the Massachusetts General Laws, as amended, and all other applicable anti-discrimination and equal opportunity laws, all of which are herein incorporated by reference and made a part of this Contract.

The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter l51 B).

In connection with the performance of work under this contract, the Contractor shall undertake, in good faith, affirmative action measures to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. Such affirmative action measures shall entail positive and aggressive measures to ensure nondiscrimination and to promote equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, apprenticeship and on-the-job training programs. A list of positive and aggressive measures shall include, but not be limited to, advertising employment opportunities in minority and other community news media; notifying minority, women and other community-based organizations of employment opportunities; validating all job specifications, selection requirements, and tests; maintaining a file of names and addresses of each worker referred to the Contractor and what action was taken concerning such worker; and notifying the administering agency in writing when a union with whom the Contractor has a collective bargaining agreement has failed to refer a minority or woman worker. These and other affirmative action measures shall include all actions required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. One purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Commonwealth public construction projects.

III. Minority and Women Workforce Participation

Pursuant to his/her obligations under the preceding section, the Contractor shall strive to achieve on this project the labor participation goals contained herein. Said participation goals shall apply in each job category on this project including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers and those classes of work enumerated in Section 44F of Chapter 149 of the Massachusetts General Laws. The participation goals for this project shall be 15.3% for minorities and 6.9% for women. The participation goals, as set forth herein, shall not be construed as quotas or set-asides; rather, such participation goals will be used to measure the progress of the Commonwealth's equal opportunity, non-discrimination and affirmative action program. Additionally, the participation goals contained herein should not be seen or treated as a floor or as a ceiling for the employment of particular individuals or group of individuals.

IV. Liaison Committee

At the discretion of the agency that administers the contract for the construction project there may be established for the life of the contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering the contract for the construction project, hereinafter called the administering agency, a representative from the Office of Affirmative action, and such other representatives as may be designated by the administering agency. The Contractor (or his/her agent, if any, designated by him/her as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

V. Reports and Records

The Contractor shall prepare projected workforce tables on a quarterly basis when required by the administering agency. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also, when updated, to the administering agency and the Liaison Committee when required.

The Contractor shall prepare weekly reports in a form approved by the administering agency, unless information required is required to be reported electronically by the administering agency, the number of hours worked in each trade by each employee, identified as woman, minority, or non-minority. Copies of these shall be provided at the end of each such week to the administering agency and the Liaison Committee.

Records of employment referral orders, prepared by the Contractor, shall be made available to the administering agency on request.

The Contractor will provide all information and reports required by the administering agency on instructions issued by the administering agency and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the administering agency to effect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary non-discrimination, equal opportunity and access and opportunity contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency and shall set forth what efforts he has made to obtain the information.

VI. Access to Work Site

A designee of the administering agency and a designee of the Liaison Committee shall each have a right to access the work site.

VII. Solicitations for Subcontracts, and for the Procurement of Materials and Equipment

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this contract relative to non-discrimination and equal opportunity.

VIII. Sanctions

Whenever the administering agency believes the General or Prime Contractor or any subcontractor may not be operating in compliance with the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B), the administering agency may refer the matter to the Massachusetts Commission Against Discrimination ("Commission") for investigation.

Following the referral of a matter by the administering agency to the Massachusetts Commission Against Discrimination, and while the matter is pending before the MCAD, the administering agency may withhold payments from contractors and subcontractors when it has documentation that the contractor or subcontractor has violated the Fair Employment Practices Law with respect to its activities on the Project, or if the administering agency determines that the contractor has materially failed to comply with its obligations and the requirements of this Section. The amount withheld shall not exceed a withhold of payment to the General or Prime Contractor of 1/100 or 1% of the contract award price or $5,000, whichever sum is greater, or, if a subcontractor is in non-compliance, a withhold by the administering agency from the General Contractor, to be assessed by the General Contractor as a charge against the subcontractor, of 1/100 or 1% of the subcontractor price, or $1,000 whichever sum is greater, for each violation of the applicable law or contract requirements. The total withheld from anyone General or Prime Contractor or subcontractor on a Project shall not exceed $20,000 overall. No withhold of payments or investigation by the Commission or its agent shall be initiated without the administering agency providing prior notice to the Contractor.

If, after investigation, the Massachusetts Commission Against Discrimination finds that a General or Prime Contractor or subcontractor, in commission of a state construction contract or state-assisted construction contract, violated the provisions of the Fair Employment Practices Law, the administering agency may convert the amount withheld as set forth above into a permanent sanction, as a permanent deduct from payments to the General or Prime Contractor or subcontractor, which sanction will be in addition to any such sanctions, fines or penalties imposed by the Massachusetts Commission Against Discrimination.

No sanction enumerated under this Section shall be imposed by the administering agency except after notice to the General or Prime Contractor or subcontractor and an adjudicatory proceeding, as that term is used, under Massachusetts General Laws Chapter 30A, has been conducted.

IX. Severability

The provisions of this section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

X. Contractor's Certification

After award and prior to the execution of any contract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall certify that it will comply with all provisions of this Document 00820 Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, by executing Document 00859 Contractor/Subcontractor Certification Form.

XI. Subcontractor Requirements

Prior to the award of any subcontract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall provide all prospective subcontractors with a complete copy of this Document 00820 entitled "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" and will incorporate the provisions of this Document 00820 into any and all contracts or work orders for all subcontractors providing work on the Project. In order to ensure that the said subcontractor's certification becomes a part of all subcontracts under the prime contract, the Prime or General Contractor shall certify in writing to the administering agency that it has complied with the requirements as set forth in the preceeding paragraph by executing Document 00859 Contractor/Subcontractor Certification Form.

Rev'd 03/07/14

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DOCUMENT 00821

ELECTRONIC REPORTING REQUIREMENTS
CIVIL RIGHTS PROGRAMS AND CERTIFIED PAYROLL

Implemented on March 2, 2009 Revised June 04, 2019

The Massachusetts Department Of Transportation (MassDOT) has replaced the CHAMP reporting system with Equitable Business Opportunity Solution (EBO), a new web-based civil rights reporting software system. This system is capable of handling both civil rights reporting requirements and certified payrolls. The program's functions include the administration of Equal Employment Opportunity (EEO) requirements, On-The-Job Training requirements (OJT), Disadvantage Business Enterprise (DBE) and/or Minority / Women's Business Enterprise (M/WBE) subcontracting requirements, and the electronic collection of certified payrolls associated with MassDOT projects. In addition, this system is used to generate various data required as part of the American Recovery and Reinvestment Act (ARRA). Contractors are responsible for all coordination with all sub-contractors to ensure timely and accurate electronic submission of all required data.

Contractor and Sub-Contractor EBO User Certification

All contractors and sub-contractors must use the EBO software system. The software vendor, Internet Government Solutions (IGS), has developed an online EBO Training Module that is available to contractors and sub-contractors. This module is a self-tutorial which allows all users in the company to access the training, complete the tutorial, and become certified as EBO users for a one time fee of $75.00. This is the only cost to contractors and sub-contractors associated with the EBO software system. The online EBO Training Module can be accessed at www.ebotraining.com. Click the "Register My Company" button on the login page to begin your training registration. Questions regarding EBO online training should be directed to Gerry Anguilano, IGS at (440) 238-1684.

MassDOT will track contractors and sub-contractors who have successfully completed the on-line training module. All persons performing civil rights program and/or certified payroll functions should be EBO certified.

Vetting of Firms and Designated Firm Individuals

Contractors must authorize a Primary Log-In ID Holder who has completed EBO on-line training to have access to the EBO system by completing and submitting the "Request For EBO System Log-In/Password Form" located on the MassDOT website at: https://www.mass.gov/how-to/how-to-get-an-ebo-login
Contractors must also agree to comply with the EBO system user agreement located on the MassDOT website.

All subcontracts entered into on a project must include language that identifies the submission and training requirements that the sub-contractor must perform. Sub-contractors will be approved by the respective District Office of MassDOT through the existing approval process. When new sub-contractors, who have not previously worked for MassDOT, are initially selected by a general contractor, the new sub-contractor must be approved by the District before taking the EBO on-line training module.

Interim Reporting Requirements

Until MassDOT is satisfied that the EBO system is fully operational and functioning as designed, contractors and sub-contractors will be required to submit certified payrolls manually. There will be a transition period where dual reporting, through manual and electronic submission, will be required. MassDOT, however, will notify contractors and sub-contractors when they may cease manual submission of certified payrolls.

*** END OF DOCUMENT ***

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DOCUMENT 00859

CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM ‡

The contractor shall submit this completed document 00859 to MassDOT for each subcontract.

_____ **(Contractor)** **Date:**_____

_____**(Subcontractor)** ☐ District Approved Subcontractor

Contract No: 130088 **Project No.** 608460 **Federal Aid No.:** NHP(BRR-ON)-003S(813)X

Location: HADLEY

Project Description: Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

PART 1 CONTRACTOR CERTIFICATION: I hereby certify, as an authorized official of this company, that to the best of my knowledge, information and belief, the company is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices, that the company will not discriminate in their employment practices, that the company will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained in Contract Document 00820 The Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, and that the company will comply with the special provisions and documentation indicated below (as checked).

I further hereby certify, as an authorized official of this company, that the special provisions and documentation indicated below (as checked) have been or are included in, and made part of, the Subcontractor Agreement entered into with the firm named above.

☐ **This is not a Federally-aided construction project**

Document #

☐ 00718 –Participation By Minority Or Women's Business Enterprises and SDVOBE†
☐ 00761 –Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
☐ 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program
☐ 00821 – Electronic Reporting Requirements, Civil Rights Programs, and Certified Payroll
☐ 00859 – Contractor/Subcontractor Certification Form (this document)
☐ 00860 – MA Employment Laws
☐ 00861 – Applicable State Wage Rates in the Contract Proposal**
☐ B00842 – MA Schedule of Participation By Minority or Women Business Enterprises (M/WBEs)†
☐ B00843 – MA Letter of Intent – M/WBEs†

** Does not apply to Material Suppliers, unless performing work on-site
† Applies only if Subcontractor is a M/WBE; only include these forms for the particular M/WBE Entity

☐ B00844 - Schedule of Participation By SDVOBE
☐ B00845 - Letter of Intent – SDVOBE
☐ B00846 – M/WBE or SDVOBE Joint Check Arrangement Approval Form
☐ B00847 – Joint Venture Affidavit

☐ **This is a Federally-aided construction project (Federal Aid Number is present)**

Document #

☐ 00719 – Special Provisions for Participation by Disadvantaged Business Enterprises†
☐ 00760 - Form FHWA 1273 - Required Contract Provisions for Federal-Aid Construction Contracts
☐ 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program
☐ 00821 – Electronic Reporting Requirements, Civil Rights Programs and Certified Payroll
☐ 00859 – Contractor/Subcontractor Certification Form (this document)
☐ 00860 – MA Employment Laws
☐ 00870 – Standard Federal Equal Employment Opportunity Construction Contract Specifications Executive Order 11246, (41 CFR Parts 60-4.2 and 60-4.3 (Solicitations and Equal Opportunity Clauses)*
☐ 00875 – Federal Trainee Special Provisions

☐ B00853 – Schedule of Participation by Disadvantaged Business Enterprise†
☐ B00854 – Letter of Intent – DBEs†
☐ B00855 – DBE Joint Check Arrangement Approval Form
☐ B00856 – Joint Venture Affidavit
☐ 00861/00880 - Applicable state and federal wage rates from Contract Proposal**

*Applicable only to Contracts or Subcontracts in excess of $10,000
**Does not apply to Material Suppliers, unless performing work on-site
† Applies only if Subcontractor is a DBE; only include these forms for the particular DBE Entity

Signed this _____ Day of _____, 20_____ Under The Pains And Penalties Of Perjury.

_____ _____
(Print Name and Title) (Authorized Signature)

PART 2

PART 2 SUBCONTRACTOR CERTIFICATION: I hereby certify, as an authorized official of this company, that the required documents in Part 1 above were physically incorporated in our Agreement/Subcontract with the Contractor and give assurance that this company will fully comply or make every good faith effort to comply with the same. I further certify that:

1. This company recognizes that if this is a Federal-Aid Project, then this Contract is covered by the equal employment opportunity laws administered and enforced by the United States Department of Labor ("USDOL"), Office of Federal Contract Compliance Programs ('OFCCP"). By signing below, we acknowledge that this company has certain reporting obligations to the OFCCP, as specified by 41 CFR Part 60-4.2.
2. This company further acknowledges that any contractor with fifty (50) or more employees on a Federal-aid Contract with a value of fifty-thousand ($50,000) dollars or more must annually file an EEO-1 Report (SF 100) to the EEOC, Joint Reporting Committee, on or before September 30th, each year, as specified by 41 CFR Part 60-1.7a.
3. For more information regarding the federal reporting requirements, please contact the USDOL, OFCCP Regional Office, at 1-646-264-3170 or EEO-1, Joint Reporting Committee at 1-866-286-6440. You may also find guidance at: http://www.dol.gov/ofccp/TAguides/consttag.pdf or http://www.wdol.gov/dba.aspx#0.
4. This company ☐ has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity clauses set forth in 41 CFR Part 60-4 and Executive Order 11246, and where required, has filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance Programs or the EEO Commission all reports due under the applicable filing requirements.
5. This company is in full compliance with applicable Federal and Commonwealth of Massachusetts laws, rules, and regulations and is not currently debarred or disqualified from bidding on or participating in construction contracts in any jurisdiction of the United States. See : https://www.mass.gov/service-details/contractors-and-vendors-suspended-or-debarred-by-massdot
6. This company is properly registered and in good standing with the Office of the Secretary of the Commonwealth.

Signed this _____ Day of _____, 20_____, Under The Pains And Penalties Of Perjury.

Firm: _____
Address: _____
_____
_____
Telephone Number:_____
Federal I.D. Number:_____
Estimated Start Date:_____
Estimated Completion Date:_____
Estimated Dollar Amount:_____

_____
(Print Name and Title)

_____
(Authorized Signature)

_____
(Date)

Rev'd 09/02/22

*** END OF DOCUMENT ***

DOCUMENT 00860

COMMONWEALTH OF MASSACHUSETTS PUBLIC EMPLOYMENT LAWS

Revised February 20, 2019

The Contractor's attention is directed to Massachusetts General Laws, Chapter 149, Sections 26 through 27H, and 150A. This contract is considered to fall within the ambit of that law, which provides that in general, the Prevailing Rate or Total Rate must be paid to employees working on projects funded by the Commonwealth of Massachusetts or any political subdivision including Massachusetts Department of Transportation (MassDOT).

A Federal Aid project is also subject to the Federal Minimum Wage Rate law for construction. When comparing a state minimum wage rate, monitored by the Massachusetts Attorney General, versus federal minimum wage rate, monitored by the U.S. Department of Labor Wage and Hour Division, for a particular job classification the higher wage is at all times to be paid to the affected employee.

Every contractor or subcontractor engaged in this contract to which sections twenty-seven and twenty-seven A apply will keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on this contract, and the hours worked by, and the wages paid to, each such employee, and shall furnish to the MassDOT's Resident Engineer, on a weekly basis, a copy of said record, in a form approved by MassDOT and in accordance with M.G.L. c. 149, § 27B, signed by the employer or his/her authorized agent under the penalties of perjury.

Each such contractor or subcontractor shall preserve its payroll records for a period of three years from the date of completion of the contract.

The Prevailing Wage Rate generally includes the following:

Minimum Hourly Wage + Employer Contributions to Benefit Plans = Prevailing Wage Rate or Total Rate

Any employer who does not make contributions to Benefit Plans must pay the total Prevailing Wage Rate directly to the employee.

Any deduction from the Prevailing Wage Rate or Total Rate for contributions to benefit plans can only be for a Health & Welfare, Pension, or Supplementary Unemployment plan meeting the requirements of the Employee Retirement Income Security Act (ERISA) of 1974. The maximum allowable deduction for these benefits from the prevailing wage rate cannot be greater than the amount allowed by Executive Office of Labor (EOL) for the specified benefits. Any additional expense of providing benefits to the employees is to be borne by the employer and cannot be deducted from the Minimum Hourly Wage. If the employer's benefit expense is less than that so provided by EOL the difference will be paid directly to the employee. The rate established must be paid to all employees who perform work on the project.

When an employer makes deductions from the Minimum Hourly Wage for an employee's contribution to social security, state taxes, federal taxes, and/or other contribution programs, allowed by law, the employer shall furnish each employee a suitable pay slip, check stub or envelope notifying the employee of the amount of the deductions.

No contractor or subcontractor contracting for any part of the contract week shall require or permit any laborer or mechanic to be employed on such work in excess of forty hours in any workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of forty hours in such workweek, whichever is the greater number of overtime hours.

Apprentice Rates are permitted only when there is an Apprentice Agreement registered with the Massachusetts Division of Apprentice Training in accordance with M.G.L. c. 23, § 11E-11L.

The Prevailing Wage Rates issued for each project shall be the rates paid for the entire project. The Prevailing Wage Rates must be posted on the job site at all times and be visible from a public way.

In addition, each such contractor and subcontractor shall furnish to the MassDOT's Resident Engineer, within fifteen days after completion of its portion of the work, a statement, executed by the contractor or subcontractor or by any authorized officer or employee of the contractor or subcontractor who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

Date: _____

I , _____do hereby state:
(Name of signatory party) (Title)

That I pay or supervise the payment of the persons employed by:

_____
(Contractor or Subcontractor)

on the _____
(MassDOT Project Location and Contract Number)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty-nine of the General Laws.

Signature _____

Title _____

The above-mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the MassDOT's Resident Engineer for such inspection and copying.

Massachusetts General Laws c. 149, §27, requires annual updates to prevailing wage schedules for all public construction contracts lasting longer than one year. MassDOT will request the required updates and furnish them to the Contractor. The Contractor is required to pay no less than the wage rates indicated on the annual updated wage schedules.

MassDOT will request the updates no later that two week before the anniversary of the Notice to Proceed date of the contract to allow for adequate processing by the Department of Labor Standards (DLS). The effective date for the new rates will be the anniversary date of the contract (i.e. the notice to proceed date), regardless of the date of issuance on the schedule from DLS.

All bidders are cautioned that the aforementioned laws require that employers pay to covered employees no less than the applicable minimum wages. In addition, the same laws require that the applicable prevailing wages become incorporated as part of this contract. The prevailing minimum wage law establishes serious civil and criminal penalties for violations, including imprisonment and exclusion from future public contracts. Bidders are cautioned to carefully read the relevant sections of the Massachusetts General Laws.

*** END OF DOCUMENT ***

DOCUMENT 00861

STATE PREVAILING WAGE RATES

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THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
Prevailing Wage Rates

MAURA HEALY
Governor
KIM DRISCOLL
Lt. Governor

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority:	MassDOT Highway	**City/Town:**	HADLEY
Contract Number:	130088		
Description of Work:	HADLEY: Federal Aid Project No. NHP(BRR-ON)-003S(813)X Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River		
Job Location:	Bay Road (Route 47) over the Fort River		

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.
- This annual update requirement is generally not applicable to 27F “rental of equipment” contracts. For such contracts, the prevailing wage rates issued by DLS shall remain in effect for the duration of the contract term. However, if the prevailing wage rate sheet issued does not contain wage rates for each year covered by the contract term, the Awarding Authority must request updated rate sheets from DLS and provide them to the contractor to ensure the correct rates are being paid throughout the duration of the contract. Additionally, if an Awarding Authority exercises an option to renew or extend the contract term, they must request updated rate sheets form DLS and provide them to the contractor.
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the “Wage Request Number” on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$39.95	$15.57	$20.17	$0.00	$0.00	$75.69
	6/1/2025	$40.95	$15.57	$20.17	$0.00	$0.00	$76.69
	12/1/2025	$40.95	$15.57	$21.78	$0.00	$0.00	$78.30
	1/1/2026	$40.95	$16.17	$21.78	$0.00	$0.00	$78.90
	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$40.02	$15.57	$20.17	$0.00	$0.00	$75.76
	6/1/2025	$41.02	$15.57	$20.17	$0.00	$0.00	$76.76
	12/1/2025	$41.02	$15.57	$21.78	$0.00	$0.00	$78.37
	1/1/2026	$41.02	$16.17	$21.78	$0.00	$0.00	$78.97
	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$40.14	$15.57	$20.17	$0.00	$0.00	$75.88
	6/1/2025	$41.14	$15.57	$20.17	$0.00	$0.00	$76.88
	12/1/2025	$41.14	$15.57	$21.78	$0.00	$0.00	$78.49
	1/1/2026	$41.14	$16.17	$21.78	$0.00	$0.00	$79.09
	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
For apprentice rates see "Apprentice- PILE DRIVER"							
AIR TRACK OPERATOR LABORERS	12/2/2024	$35.75	$9.90	$9.25	$8.32	$0.00	$63.22
	6/2/2025	$37.00	$9.90	$9.25	$8.32	$0.00	$64.47
	12/1/2025	$38.25	$9.90	$9.25	$8.32	$0.00	$65.72
	6/1/2026	$39.55	$9.90	$9.25	$8.32	$0.00	$67.02
	12/7/2026	$40.85	$9.90	$9.25	$8.32	$0.00	$68.32
	6/7/2027	$42.25	$9.90	$9.25	$8.32	$0.00	$69.72
	12/6/2027	$43.65	$9.90	$9.25	$8.32	$0.00	$71.12
	6/5/2028	$45.15	$9.90	$9.25	$8.32	$0.00	$72.62
	12/4/2028	$46.65	$9.90	$9.25	$8.32	$0.00	$74.12
For apprentice rates see "Apprentice- LABORER"							
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.75	$9.90	$9.25	$6.31	$0.00	$61.21
	6/1/2025	$37.00	$9.90	$9.25	$6.31	$0.00	$62.46
	12/1/2025	$38.24	$9.90	$9.25	$6.31	$0.00	$63.70
	6/1/2026	$39.54	$9.90	$9.25	$6.31	$0.00	$65.00
	12/1/2026	$40.83	$9.90	$9.25	$6.31	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6	12/1/2024	$38.52	$14.50	$4.30	$6.25	$0.00	$63.57
	6/1/2025	$39.42	$14.50	$4.30	$6.25	$0.00	$64.47
	12/1/2025	$40.32	$14.50	$4.30	$6.25	$0.00	$65.37

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ASPHALT RAKER LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.25	$9.90	$9.25	$6.31	$0.00	$60.71
	6/1/2025	$36.50	$9.90	$9.25	$6.31	$0.00	$61.96
	12/1/2025	$37.74	$9.90	$9.25	$6.31	$0.00	$63.20
	6/1/2026	$39.04	$9.90	$9.25	$6.31	$0.00	$64.50
	12/1/2026	$40.33	$9.90	$9.25	$6.31	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BACKHOE/FRONT-END LOADER OPERATOR OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BARCO-TYPE JUMPING TAMPER LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
BATCH/CEMENT PLANT - ON SITE OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BLOCK PAVER, RAMMER / CURB SETTER LABORERS	12/2/2024	$35.75	$9.90	$9.25	$8.32	$0.00	$63.22
	6/2/2025	$37.00	$9.90	$9.25	$8.32	$0.00	$64.47
	12/1/2025	$38.25	$9.90	$9.25	$8.32	$0.00	$65.72
	6/1/2026	$39.55	$9.90	$9.25	$8.32	$0.00	$67.02
	12/7/2026	$40.85	$9.90	$9.25	$8.32	$0.00	$68.32
	6/7/2027	$42.25	$9.90	$9.25	$8.32	$0.00	$69.72
	12/6/2027	$43.65	$9.90	$9.25	$8.32	$0.00	$71.12
	6/5/2028	$45.15	$9.90	$9.25	$8.32	$0.00	$72.62
	12/4/2028	$46.65	$9.90	$9.25	$8.32	$0.00	$74.12
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.75	$9.90	$9.25	$6.31	$0.00	$61.21
	6/1/2025	$37.00	$9.90	$9.25	$6.31	$0.00	$62.46
	12/1/2025	$38.24	$9.90	$9.25	$6.31	$0.00	$63.70
	6/1/2026	$39.54	$9.90	$9.25	$6.31	$0.00	$65.00
	12/1/2026	$40.83	$9.90	$9.25	$6.31	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
BOILER MAKER BOILERMAKERS LOCAL 29	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98
4	75.00	$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5	80.00	$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6	85.00	$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7	90.00	$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8	95.00	$45.71	$7.07	$13.62	$5.70	$0.00	$72.10

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3	2/1/2025	$54.21	$11.49	$15.57	$5.89	$0.00	$87.16
	8/1/2025	$56.36	$11.49	$15.57	$5.89	$0.00	$89.31
	2/1/2026	$57.71	$11.49	$15.57	$5.89	$0.00	$90.66
	8/1/2026	$59.91	$11.49	$15.57	$5.89	$0.00	$92.86
	2/1/2027	$61.31	$11.49	$15.57	$5.89	$0.00	$94.26

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.11	$11.49	$15.57	$5.89	$0.00	$60.06
2	60.00	$32.53	$11.49	$15.57	$5.89	$0.00	$65.48
3	70.00	$37.95	$11.49	$15.57	$5.89	$0.00	$70.90
4	80.00	$43.37	$11.49	$15.57	$5.89	$0.00	$76.32
5	90.00	$48.79	$11.49	$15.57	$5.89	$0.00	$81.74

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$28.18	$11.49	$15.57	$5.89	$0.00	$61.13
2	60.00	$33.82	$11.49	$15.57	$5.89	$0.00	$66.77
3	70.00	$39.45	$11.49	$15.57	$5.89	$0.00	$72.40

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
4	80.00	$45.09	$11.49	$15.57	$5.89	$0.00	$78.04
5	90.00	$50.72	$11.49	$15.57	$5.89	$0.00	$83.67

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS	12/1/2024	$47.35	$9.90	$9.25	$9.80	$0.00	$76.30
	6/1/2025	$48.85	$9.90	$9.25	$9.80	$0.00	$77.80
	12/1/2025	$50.35	$9.90	$9.25	$9.80	$0.00	$79.30
	6/1/2026	$51.90	$9.90	$9.25	$9.80	$0.00	$80.85
	12/1/2026	$53.40	$9.90	$9.25	$9.80	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER LABORERS	12/1/2024	$46.20	$9.90	$9.25	$9.80	$0.00	$75.15
	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN LABORERS	12/1/2024	$46.53	$9.90	$9.25	$9.80	$0.00	$75.48
	6/1/2025	$48.03	$9.90	$9.25	$9.80	$0.00	$76.98
	12/1/2025	$49.53	$9.90	$9.25	$9.80	$0.00	$78.48
	6/1/2026	$51.08	$9.90	$9.25	$9.80	$0.00	$80.03
	12/1/2026	$52.58	$9.90	$9.25	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
CARPENTER CARPENTERS	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME CARPENTERS	10/1/2024	$26.65	$7.02	$3.80	$1.00	$0.00	$38.47
	10/1/2025	$27.75	$7.02	$3.80	$1.00	$0.00	$39.57
	10/1/2026	$28.85	$7.02	$3.80	$1.00	$0.00	$40.67

All Aspects of New Wood Frame Work

Apprentice: CARPENTER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.47	$7.91	$0.00	$1.40	$0.00	$28.78
2	45.00	$19.47	$7.91	$0.00	$1.40	$0.00	$28.78
3	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29
8	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Apprentice: CARPENTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
7	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01
2	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01
3	65.00	$17.32	$7.02	$0.00	$1.00	$0.00	$25.34
4	70.00	$18.66	$7.02	$0.00	$1.00	$0.00	$26.68
5	75.00	$19.99	$7.02	$3.80	$1.00	$0.00	$31.81
6	80.00	$21.32	$7.02	$3.80	$1.00	$0.00	$33.14
7	85.00	$22.65	$7.02	$3.80	$1.00	$0.00	$34.47
8	90.00	$23.99	$7.02	$3.80	$1.00	$0.00	$35.81

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: CARPENTER WOOD FRAME							
Effective Date: 10/1/2025							
Step / Percent / Apprentice Base Wage							
1 / 60.00		$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
2 / 60.00		$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
3 / 65.00		$18.04	$7.02	$0.00	$1.00	$0.00	$26.06
4 / 70.00		$19.43	$7.02	$0.00	$1.00	$0.00	$27.45
5 / 75.00		$20.81	$7.02	$3.80	$1.00	$0.00	$32.63
6 / 80.00		$22.20	$7.02	$3.80	$1.00	$0.00	$34.02
7 / 85.00		$23.59	$7.02	$3.80	$1.00	$0.00	$35.41
8 / 90.00		$24.98	$7.02	$3.80	$1.00	$0.00	$36.80
CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3	7/1/2024	$44.56	$13.20	$16.30	$2.93	$1.69	$78.68
Apprentice: CEMENT MASONRY/PLASTERING							
Effective Date: 7/1/2024							
Step / Percent / Apprentice Base Wage							
1 / 50.00		$22.28	$13.20	$16.30	$0.00	$0.00	$51.78
2 / 60.00		$26.74	$13.20	$16.30	$2.93	$1.69	$60.86
3 / 65.00		$28.96	$13.20	$16.30	$2.93	$1.69	$63.08
4 / 70.00		$31.19	$13.20	$16.30	$2.93	$1.69	$65.31
5 / 75.00		$33.42	$13.20	$16.30	$2.93	$1.69	$67.54
6 / 80.00		$35.65	$13.20	$16.30	$2.93	$1.69	$69.77
7 / 90.00		$40.10	$13.20	$16.30	$2.93	$1.69	$74.22
CHAIN SAW OPERATOR LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CRANE OPERATOR OPERATING ENGINEERS LOCAL 98	12/1/2023	$43.06	$13.78	$12.15	$3.00	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DELEADER (BRIDGE) PAINTERS LOCAL 35	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

DEMO: ADZEMAN LABORERS	12/2/2024	$46.25	$9.90	$9.25	$9.65	$0.00	$75.05
	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65

For apprentice rates see "Apprentice- LABORER"

DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS	12/2/2024	$47.25	$9.90	$9.25	$9.65	$0.00	$76.05
	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65

For apprentice rates see "Apprentice- LABORER"

DEMO: BURNERS LABORERS	12/2/2024	$47.75	$9.65	$9.00	$9.40	$0.00	$75.80
	6/2/2025	$49.25	$9.65	$9.00	$9.40	$0.00	$77.30
	12/1/2025	$50.75	$9.65	$9.00	$9.40	$0.00	$78.80
	6/1/2026	$52.30	$9.65	$9.00	$9.40	$0.00	$80.35
	12/7/2026	$53.80	$9.65	$9.00	$9.40	$0.00	$81.85
	6/7/2027	$55.40	$9.65	$9.00	$9.40	$0.00	$83.45
	12/6/2027	$57.00	$9.65	$9.00	$9.40	$0.00	$85.05
	6/5/2028	$58.68	$9.65	$9.00	$9.40	$0.00	$86.73
	12/4/2028	$60.35	$9.65	$9.00	$9.40	$0.00	$88.40

For apprentice rates see "Apprentice- LABORER"

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER LABORERS	12/2/2024	$47.25	$9.90	$9.25	$9.65	$0.00	$76.05
	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR LABORERS	12/2/2024	$47.75	$9.65	$9.00	$9.40	$0.00	$75.80
	6/2/2025	$49.25	$9.65	$9.00	$9.40	$0.00	$77.30
	12/1/2025	$50.75	$9.65	$9.00	$9.40	$0.00	$78.80
	6/1/2026	$52.30	$9.65	$9.00	$9.40	$0.00	$80.35
	12/7/2026	$53.80	$9.65	$9.00	$9.40	$0.00	$81.85
	6/7/2027	$55.40	$9.65	$9.00	$9.40	$0.00	$83.45
	12/6/2027	$57.00	$9.65	$9.00	$9.40	$0.00	$85.05
	6/5/2028	$58.68	$9.65	$9.00	$9.40	$0.00	$86.73
	12/4/2028	$60.35	$9.65	$9.00	$9.40	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER LABORERS	12/2/2024	$46.25	$9.90	$9.25	$9.65	$0.00	$75.05
	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIVER PILE DRIVER LOCAL 56	8/1/2024	$78.11	$10.08	$11.62	$12.67	$0.00	$112.48
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER PILE DRIVER LOCAL 56	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
For apprentice rates see "Apprentice- PILE DRIVER"							
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
For apprentice rates see "Apprentice- PILE DRIVER"							
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELECTRICIAN (Including Core Drilling) ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$62.83	$16.28	$10.96	$10.40	$0.00	$100.47
	1/1/2026	$63.68	$16.38	$11.06	$10.70	$0.00	$101.82
	1/1/2027	$64.53	$16.48	$11.16	$11.00	$0.00	$103.17

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.42	$16.28	$0.00	$0.00	$0.00	$47.70
2	55.00	$34.56	$16.28	$10.96	$10.40	$0.00	$72.20
3	65.00	$40.84	$16.28	$10.96	$10.40	$0.00	$78.48
4	70.00	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
5	80.00	$50.26	$16.28	$10.96	$10.40	$0.00	$87.90

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.84	$16.38	$0.00	$0.00	$0.00	$48.22
2	55.00	$35.02	$16.38	$11.06	$10.70	$0.00	$73.16
3	65.00	$41.39	$16.38	$11.06	$10.70	$0.00	$79.53
4	70.00	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
5	80.00	$50.94	$16.38	$11.06	$10.70	$0.00	$89.08

ELEVATOR CONSTRUCTOR HELPER ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
	1/1/2026	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
	1/1/2027	$45.17	$16.48	$11.16	$11.00	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.25	$9.90	$9.25	$6.31	$0.00	$60.71
	6/1/2025	$36.50	$9.90	$9.25	$6.31	$0.00	$61.96
	12/1/2025	$37.74	$9.90	$9.25	$6.31	$0.00	$63.20
	6/1/2026	$39.04	$9.90	$9.25	$6.31	$0.00	$64.50
	12/1/2026	$40.33	$9.90	$9.25	$6.31	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 98	6/1/1999	$18.84	$4.80	$4.10	$0.00	$0.00	$27.74
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 98	6/1/1999	$21.33	$4.80	$4.10	$0.00	$0.00	$30.23
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 98	6/1/1999	$22.33	$4.80	$4.10	$0.00	$0.00	$31.23
FIRE ALARM INSTALLER ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: FIREMAN							
Effective Date: 12/1/2023							
Step / Percent		**Apprentice Base Wage**					
1 / 60.00		$23.42	$13.78	$12.15	$3.00	$0.00	$52.35
2 / 70.00		$27.32	$13.78	$12.15	$3.00	$0.00	$56.25
3 / 80.00		$31.22	$13.78	$12.15	$3.00	$0.00	$60.15
4 / 90.00		$35.13	$13.78	$12.15	$3.00	$0.00	$64.06
FLAGGER & SIGNALER (HEAVY & HIGHWAY) LABORERS	12/1/2024	$27.01	$9.90	$9.25	$6.31	$0.00	$52.47
	6/1/2025	$28.09	$9.90	$9.25	$6.31	$0.00	$53.55
	12/1/2025	$28.09	$9.90	$9.25	$6.31	$0.00	$53.55
	6/1/2026	$29.21	$9.90	$9.25	$6.31	$0.00	$54.67
	12/1/2026	$29.21	$9.90	$9.25	$6.31	$0.00	$54.67
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FLOORCOVERER FLOORCOVERERS LOCAL 2168	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02
Apprentice: FLOORCOVERER							
Effective Date: 3/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 45.00		$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
2 / 45.00		$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
3 / 55.00		$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4 / 55.00		$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5 / 70.00		$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6 / 70.00		$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7 / 80.00		$34.61	$7.91	$11.25	$5.52	$0.00	$59.29
8 / 80.00		$34.61	$7.91	$11.25	$5.52	$0.00	$59.29
Apprentice: FLOORCOVERER							
Effective Date: 9/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 45.00		$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2 / 45.00		$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3 / 55.00		$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4 / 55.00		$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5 / 70.00		$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6 / 70.00		$30.95	$7.91	$11.25	$4.14	$0.00	$54.25

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: FLOORCOVERER							
Effective Date: 9/1/2025							
Step / Percent		**Apprentice Base Wage**	**Health**	**Pension**	**Annuity**	**Supplemental Unemployment**	**Total Rate**
7 / 80.00		$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8 / 80.00		$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
FORK LIFT OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.25	$13.78	$12.15	$3.00	$0.00	$68.18
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GENERATORS/LIGHTING PLANTS OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 1333	6/1/2020	$39.18	$10.80	$6.70	$3.75	$0.00	$60.43
Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)							
Effective Date: 6/1/2020							
Step / Percent		**Apprentice Base Wage**	**Health**	**Pension**	**Annuity**	**Supplemental Unemployment**	**Total Rate**
1 / 50.00		$19.59	$10.80	$1.50	$0.30	$0.00	$32.19
2 / 56.25		$22.04	$10.80	$1.50	$0.30	$0.00	$34.64
3 / 62.50		$24.49	$10.80	$1.95	$0.50	$0.00	$37.74
4 / 68.75		$26.94	$10.80	$1.95	$0.50	$0.00	$40.19
5 / 75.00		$29.39	$10.80	$2.50	$0.65	$0.00	$43.34
6 / 81.25		$31.83	$10.80	$2.50	$0.65	$0.00	$45.78
7 / 87.50		$34.28	$10.80	$6.70	$3.75	$0.00	$55.53
8 / 93.75		$36.73	$10.80	$6.70	$3.75	$0.00	$57.98
GRADER/TRENCHING MACHINE/DERRICK OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER) PLUMBERS & PIPEFITTERS LOCAL 104	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC PLUMBERS & PIPEFITTERS LOCAL 104	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.75	$9.90	$9.25	$6.31	$0.00	$61.21
	6/1/2025	$37.00	$9.90	$9.25	$6.31	$0.00	$62.46
	12/1/2025	$38.24	$9.90	$9.25	$6.31	$0.00	$63.70
	6/1/2026	$39.54	$9.90	$9.25	$6.31	$0.00	$65.00
	12/1/2026	$40.83	$9.90	$9.25	$6.31	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6	9/1/2024	$45.54	$14.75	$9.52	$10.09	$0.00	$79.90
	9/1/2025	$48.27	$14.75	$9.52	$10.09	$0.00	$82.63
	9/1/2026	$51.01	$14.75	$9.52	$10.09	$0.00	$85.37

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.77	$14.75	$9.27	$5.05	$0.00	$51.84
2	60.00	$27.32	$14.75	$9.32	$6.05	$0.00	$57.44
3	70.00	$31.88	$14.75	$9.37	$7.06	$0.00	$63.06
4	80.00	$36.43	$14.75	$9.42	$8.07	$0.00	$68.67

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.14	$14.75	$9.27	$5.05	$0.00	$53.21
2	60.00	$28.96	$14.75	$9.32	$6.05	$0.00	$59.08
3	70.00	$33.79	$14.75	$9.37	$7.06	$0.00	$64.97
4	80.00	$38.62	$14.75	$9.42	$8.07	$0.00	$70.86

IRONWORKER/WELDER IRONWORKERS LOCAL 7	3/16/2024	$40.66	$8.25	$12.70	$10.00	$0.00	$71.61

Apprentice: IRONWORKER/WELDER

Effective Date: 3/16/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: IRONWORKER/WELDER							
Effective Date: 3/16/2024							
Step / Percent		**Apprentice Base Wage**					
1 / 60.00		$24.40	$8.25	$12.70	$10.00	$0.00	$55.35
2 / 70.00		$28.46	$8.25	$12.70	$10.00	$0.00	$59.41
3 / 75.00		$30.50	$8.25	$12.70	$10.00	$0.00	$61.45
4 / 80.00		$32.53	$8.25	$12.70	$10.00	$0.00	$63.48
5 / 85.00		$34.56	$8.25	$12.70	$10.00	$0.00	$65.51
6 / 90.00		$36.59	$8.25	$12.70	$10.00	$0.00	$67.54
JACKHAMMER & PAVING BREAKER OPERATOR	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
LABORERS	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
LABORER	12/2/2024	$35.50	$9.90	$9.25	$8.32	$0.00	$62.97
LABORERS	6/2/2025	$36.75	$9.90	$9.25	$8.32	$0.00	$64.22
	12/1/2025	$38.00	$9.90	$9.25	$8.32	$0.00	$65.47
	6/1/2026	$39.30	$9.90	$9.25	$8.32	$0.00	$66.77
	12/7/2026	$40.60	$9.90	$9.25	$8.32	$0.00	$68.07
	6/7/2027	$42.00	$9.90	$9.25	$8.32	$0.00	$69.47
	12/6/2027	$43.40	$9.90	$9.25	$8.32	$0.00	$70.87
	6/5/2028	$44.90	$9.90	$9.25	$8.32	$0.00	$72.37
	12/4/2028	$46.40	$9.90	$9.25	$8.32	$0.00	$73.87
Apprentice: LABORER							
Effective Date: 12/2/2024							
Step / Percent		**Apprentice Base Wage**					
1 / 60.00		$21.30	$9.90	$9.25	$8.32	$0.00	$48.77
2 / 70.00		$24.85	$9.90	$9.25	$8.32	$0.00	$52.32
3 / 80.00		$28.40	$9.90	$9.25	$8.32	$0.00	$55.87
4 / 90.00		$31.95	$9.90	$9.25	$8.32	$0.00	$59.42
Apprentice: LABORER							
Effective Date: 6/2/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 60.00		$22.05	$9.90	$9.25	$8.32	$0.00	$49.52

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: LABORER							
Effective Date: 6/2/2025							
Step / Percent		**Apprentice Base Wage**					
2 / 70.00		$25.73	$9.90	$9.25	$8.32	$0.00	$53.20
3 / 80.00		$29.40	$9.90	$9.25	$8.32	$0.00	$56.87
4 / 90.00		$33.08	$9.90	$9.25	$8.32	$0.00	$60.55
LABORER (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.00	$9.90	$9.25	$6.31	$0.00	$60.46
	6/1/2025	$36.25	$9.90	$9.25	$6.31	$0.00	$61.71
	12/1/2025	$37.49	$9.90	$9.25	$6.31	$0.00	$62.95
	6/1/2026	$38.79	$9.90	$9.25	$6.31	$0.00	$64.25
	12/1/2026	$40.08	$9.90	$9.25	$6.31	$0.00	$65.54
Apprentice: LABORER (HEAVY & HIGHWAY)							
Effective Date: 12/1/2024							
Step / Percent		**Apprentice Base Wage**					
1 / 60.00		$21.00	$9.90	$9.25	$6.31	$0.00	$46.46
2 / 70.00		$24.50	$9.90	$9.25	$6.31	$0.00	$49.96
3 / 80.00		$28.00	$9.90	$9.25	$6.31	$0.00	$53.46
4 / 90.00		$31.50	$9.90	$9.25	$6.31	$0.00	$56.96
Apprentice: LABORER (HEAVY & HIGHWAY)							
Effective Date: 6/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 60.00		$21.75	$9.90	$9.25	$6.31	$0.00	$47.21
2 / 70.00		$25.38	$9.90	$9.25	$6.31	$0.00	$50.84
3 / 80.00		$29.00	$9.90	$9.25	$6.31	$0.00	$54.46
4 / 90.00		$32.63	$9.90	$9.25	$6.31	$0.00	$58.09
LABORER: CARPENTER TENDER LABORERS	12/2/2024	$35.50	$9.90	$9.25	$8.32	$0.00	$62.97
	6/2/2025	$36.75	$9.90	$9.25	$8.32	$0.00	$64.22
	12/1/2025	$38.00	$9.90	$9.25	$8.32	$0.00	$65.47
	6/1/2026	$39.30	$9.90	$9.25	$8.32	$0.00	$66.77
	12/7/2026	$40.60	$9.90	$9.25	$8.32	$0.00	$68.07
	6/7/2027	$42.00	$9.90	$9.25	$8.32	$0.00	$69.47
	12/6/2027	$43.40	$9.90	$9.25	$8.32	$0.00	$70.87
	6/5/2028	$44.90	$9.90	$9.25	$8.32	$0.00	$72.37
	12/4/2028	$46.40	$9.90	$9.25	$8.32	$0.00	$73.87
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER LABORERS	12/2/2024	$35.00	$9.90	$9.25	$8.32	$0.00	$62.47
	6/2/2025	$36.25	$9.90	$9.25	$8.32	$0.00	$63.72
	12/1/2025	$37.50	$9.90	$9.25	$8.32	$0.00	$64.97

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	6/1/2026	$38.80	$9.90	$9.25	$8.32	$0.00	$66.27
	12/7/2026	$40.10	$9.90	$9.25	$8.32	$0.00	$67.57
	6/7/2027	$41.50	$9.90	$9.25	$8.32	$0.00	$68.97
	12/6/2027	$42.90	$9.90	$9.25	$8.32	$0.00	$70.37
	6/5/2028	$44.40	$9.90	$9.25	$8.32	$0.00	$71.87
	12/4/2028	$45.90	$9.90	$9.25	$8.32	$0.00	$73.37
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS	12/2/2024	$34.92	$9.90	$9.25	$8.45	$0.00	$62.52
	6/2/2025	$36.17	$9.90	$9.25	$8.45	$0.00	$63.77
	12/1/2025	$37.42	$9.90	$9.25	$8.45	$0.00	$65.02
	6/1/2026	$38.72	$9.90	$9.25	$8.45	$0.00	$66.32
	12/7/2026	$40.02	$9.90	$9.25	$8.45	$0.00	$67.62
	6/7/2027	$41.42	$9.90	$9.25	$8.45	$0.00	$69.02
	12/6/2027	$42.82	$9.90	$9.25	$8.45	$0.00	$70.42
	6/5/2028	$44.32	$9.90	$9.25	$8.45	$0.00	$71.92
	12/4/2028	$45.82	$9.90	$9.25	$8.45	$0.00	$73.42
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER LABORERS	12/2/2024	$38.00	$9.90	$9.25	$8.32	$0.00	$65.47
	6/2/2025	$39.25	$9.90	$9.25	$8.32	$0.00	$66.72
	12/1/2025	$40.50	$9.90	$9.25	$8.32	$0.00	$67.97
	6/1/2026	$41.80	$9.90	$9.25	$8.32	$0.00	$69.27
	12/7/2026	$43.10	$9.90	$9.25	$8.32	$0.00	$70.57
	6/7/2027	$44.50	$9.90	$9.25	$8.32	$0.00	$71.97
	12/6/2027	$45.90	$9.90	$9.25	$8.32	$0.00	$73.37
	6/5/2028	$47.40	$9.90	$9.25	$8.32	$0.00	$74.87
	12/4/2028	$48.90	$9.90	$9.25	$8.32	$0.00	$76.37
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.25	$9.90	$9.25	$6.31	$0.00	$60.71
	6/1/2025	$36.50	$9.90	$9.25	$6.31	$0.00	$61.96
	12/1/2025	$37.74	$9.90	$9.25	$6.31	$0.00	$63.20
	6/1/2026	$39.04	$9.90	$9.25	$6.31	$0.00	$64.50
	12/1/2026	$40.33	$9.90	$9.25	$6.31	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
LABORER: MULTI-TRADE TENDER LABORERS	12/2/2024	$35.50	$9.90	$9.25	$8.32	$0.00	$62.97
	6/2/2025	$36.75	$9.90	$9.25	$8.32	$0.00	$64.22
	12/1/2025	$38.00	$9.90	$9.25	$8.32	$0.00	$65.47
	6/1/2026	$39.30	$9.90	$9.25	$8.32	$0.00	$66.77
	12/7/2026	$40.60	$9.90	$9.25	$8.32	$0.00	$68.07
	6/7/2027	$42.00	$9.90	$9.25	$8.32	$0.00	$69.47
	12/6/2027	$43.40	$9.90	$9.25	$8.32	$0.00	$70.87
	6/5/2028	$44.90	$9.90	$9.25	$8.32	$0.00	$72.37
	12/4/2028	$46.40	$9.90	$9.25	$8.32	$0.00	$73.87
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER LABORERS	12/2/2024	$35.50	$9.90	$9.25	$8.32	$0.00	$62.97
	6/2/2025	$36.75	$9.90	$9.25	$8.32	$0.00	$64.22
	12/1/2025	$38.00	$9.90	$9.25	$8.32	$0.00	$65.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	6/1/2026	$39.30	$9.90	$9.25	$8.32	$0.00	$66.77
	12/7/2026	$40.60	$9.90	$9.25	$8.32	$0.00	$68.07
	6/7/2027	$42.00	$9.90	$9.25	$8.32	$0.00	$69.47
	12/6/2027	$43.40	$9.90	$9.25	$8.32	$0.00	$70.87
	6/5/2028	$44.90	$9.90	$9.25	$8.32	$0.00	$72.37
	12/4/2028	$46.40	$9.90	$9.25	$8.32	$0.00	$73.87

This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"

LASER BEAM OPERATOR LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62

For apprentice rates see "Apprentice- LABORER"

LASER BEAM OPERATOR (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.25	$9.90	$9.25	$6.31	$0.00	$60.71
	6/1/2025	$36.50	$9.90	$9.25	$6.31	$0.00	$61.96
	12/1/2025	$37.74	$9.90	$9.25	$6.31	$0.00	$63.20
	6/1/2026	$39.04	$9.90	$9.25	$6.31	$0.00	$64.50
	12/1/2026	$40.33	$9.90	$9.25	$6.31	$0.00	$65.79

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3	2/1/2025	$43.84	$11.49	$15.10	$5.68	$0.00	$76.11
	8/1/2025	$44.75	$11.49	$15.10	$5.68	$0.00	$77.02
	2/1/2026	$45.83	$11.49	$15.10	$5.68	$0.00	$78.10
	8/1/2026	$47.59	$11.49	$15.10	$5.68	$0.00	$79.86
	2/1/2027	$48.71	$11.49	$15.10	$5.68	$0.00	$80.98

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$21.92	$11.49	$15.10	$5.68	$0.00	$54.19
2	60.00	$26.30	$11.49	$15.10	$5.68	$0.00	$58.57
3	70.00	$30.69	$11.49	$15.10	$5.68	$0.00	$62.96
4	80.00	$35.07	$11.49	$15.10	$5.68	$0.00	$67.34
5	90.00	$39.46	$11.49	$15.10	$5.68	$0.00	$71.73

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.38	$11.49	$15.10	$5.68	$0.00	$54.65

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: MARBLE & TILE FINISHERS							
Effective Date: 8/1/2025							
Step / Percent		**Apprentice Base Wage**					
2 / 60.00		$26.85	$11.49	$15.10	$5.68	$0.00	$59.12
3 / 70.00		$31.33	$11.49	$15.10	$5.68	$0.00	$63.60
4 / 80.00		$35.80	$11.49	$15.10	$5.68	$0.00	$68.07
5 / 90.00		$40.28	$11.49	$15.10	$5.68	$0.00	$72.55
MECH. SWEEPER OPERATOR (ON CONST. SITES) OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MECHANIC/WELDER/BOOM TRUCK OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MILLWRIGHT (Zone 3) MILLWRIGHTS LOCAL 1121	1/6/2025	$43.48	$10.08	$11.47	$9.75	$0.00	$74.78
	1/5/2026	$45.76	$10.08	$11.47	$9.75	$0.00	$77.06
Apprentice: MILLWRIGHT (Zone 3)							
Effective Date: 1/6/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 55.00		$23.91	$10.08	$0.00	$5.36	$0.00	$39.35
2 / 65.00		$28.26	$10.08	$0.00	$6.34	$0.00	$44.68
3 / 75.00		$32.61	$10.08	$11.47	$7.31	$0.00	$61.47
4 / 85.00		$36.96	$10.08	$11.47	$8.29	$0.00	$66.80
Apprentice: MILLWRIGHT (Zone 3)							
Effective Date: 1/5/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 55.00		$25.17	$10.08	$0.00	$5.36	$0.00	$40.61
2 / 65.00		$29.74	$10.08	$0.00	$6.34	$0.00	$46.16
3 / 75.00		$34.32	$10.08	$11.47	$7.31	$0.00	$63.18
4 / 85.00		$38.90	$10.08	$11.47	$8.29	$0.00	$68.74
MORTAR MIXER LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
OILER OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.02	$13.78	$12.15	$3.00	$0.00	$63.95
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS VI OPERATING ENGINEERS LOCAL 98	12/1/2023	$32.74	$13.78	$12.15	$3.00	$0.00	$61.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

PAINTER (SPRAY OR SANDBLAST, NEW) *	1/1/2025	$41.23	$9.65	$11.85	$8.05	$0.00	$70.78
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35							

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$20.62	$9.95	$0.00	$0.00	$0.00	$30.57
2	55.00	$22.68	$9.95	$0.00	$4.43	$0.00	$37.06
3	60.00	$24.74	$9.95	$0.00	$4.83	$0.00	$39.52
4	65.00	$26.80	$9.95	$0.00	$5.23	$0.00	$41.98
5	70.00	$28.86	$9.95	$11.85	$5.64	$0.00	$56.30
6	75.00	$30.92	$9.95	$11.85	$6.04	$0.00	$58.76
7	80.00	$32.98	$9.95	$11.85	$6.44	$0.00	$61.22
8	90.00	$37.11	$9.95	$11.85	$7.25	$0.00	$66.16

PAINTER (SPRAY OR SANDBLAST, REPAINT) PAINTERS LOCAL 35	1/1/2025	$38.55	$9.95	$11.85	$8.05	$0.00	$68.40

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PAINTER / TAPER (BRUSH, NEW) *	1/1/2025	$39.83	$9.95	$11.85	$8.05	$0.00	$69.68

* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.
PAINTERS LOCAL 35

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.28	$9.95	$0.00	$0.00	$0.00	$29.23
2	55.00	$21.20	$9.95	$0.00	$4.43	$0.00	$35.58
3	60.00	$23.13	$9.95	$0.00	$4.83	$0.00	$37.91
4	65.00	$25.06	$9.95	$0.00	$5.23	$0.00	$40.24
5	70.00	$26.99	$9.95	$11.85	$5.64	$0.00	$54.43
6	75.00	$28.91	$9.95	$11.85	$6.04	$0.00	$56.75
7	80.00	$30.84	$9.95	$11.85	$6.44	$0.00	$59.08
8	90.00	$34.70	$9.95	$11.85	$7.25	$0.00	$63.75

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.92	$9.95	$0.00	$0.00	$0.00	$29.87
2	55.00	$21.91	$9.95	$0.00	$4.43	$0.00	$36.29
3	60.00	$23.90	$9.95	$0.00	$4.83	$0.00	$38.68
4	65.00	$25.89	$9.95	$0.00	$5.23	$0.00	$41.07
5	70.00	$27.88	$9.95	$11.85	$5.64	$0.00	$55.32
6	75.00	$29.87	$9.95	$11.85	$6.04	$0.00	$57.71
7	80.00	$31.86	$9.95	$11.85	$6.44	$0.00	$60.10
8	90.00	$35.85	$9.95	$11.85	$7.25	$0.00	$64.90

PAINTER / TAPER (BRUSH, REPAINT)	1/1/2025	$37.15	$9.95	$11.85	$8.05	$0.00	$67.00

PAINTERS LOCAL 35

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$18.58	$9.95	$0.00	$0.00	$0.00	$28.53
2	55.00	$20.43	$9.95	$0.00	$4.43	$0.00	$34.81
3	60.00	$22.29	$9.95	$0.00	$4.83	$0.00	$37.07
4	65.00	$24.15	$9.95	$0.00	$5.23	$0.00	$39.33
5	70.00	$26.01	$9.95	$11.85	$5.64	$0.00	$53.45
6	75.00	$27.86	$9.95	$11.85	$6.04	$0.00	$55.70
7	80.00	$29.72	$9.95	$11.85	$6.44	$0.00	$57.96

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: PAINTER / TAPER (BRUSH, REPAINT)							
Effective Date: 1/1/2025							
Step / Percent		**Apprentice Base Wage**					
8 / 90.00		$33.44	$9.95	$11.85	$7.25	$0.00	$62.49
PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) LABORERS	12/1/2024	$35.00	$9.90	$9.25	$6.31	$0.00	$60.46
	6/1/2025	$36.25	$9.90	$9.25	$6.31	$0.00	$61.71
	12/1/2025	$37.49	$9.90	$9.25	$6.31	$0.00	$62.95
	6/1/2026	$38.79	$9.90	$9.25	$6.31	$0.00	$64.25
	12/1/2026	$40.08	$9.90	$9.25	$6.31	$0.00	$65.54
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$39.78	$15.57	$20.17	$0.00	$0.00	$75.52
	6/1/2025	$40.78	$15.57	$20.17	$0.00	$0.00	$76.52
	12/1/2025	$40.78	$15.57	$21.78	$0.00	$0.00	$78.13
	1/1/2026	$40.78	$16.17	$21.78	$0.00	$0.00	$78.73
	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
Apprentice: PILE DRIVER							
Effective Date: 8/1/2024							
Step / Percent		**Apprentice Base Wage**					
1 / 45.00		$22.14	$10.08	$0.00	$2.53	$0.00	$34.75
2 / 55.00		$27.05	$10.08	$0.00	$5.07	$0.00	$42.20
3 / 70.00		$34.43	$10.08	$11.62	$7.60	$0.00	$63.73
4 / 80.00		$39.35	$10.08	$11.62	$10.14	$0.00	$71.19
PIPELAYER LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PIPELAYER (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.25	$9.90	$9.25	$6.31	$0.00	$60.71
	6/1/2025	$36.50	$9.90	$9.25	$6.31	$0.00	$61.96
	12/1/2025	$37.74	$9.90	$9.25	$6.31	$0.00	$63.20
	6/1/2026	$39.04	$9.90	$9.25	$6.31	$0.00	$64.50
	12/1/2026	$40.33	$9.90	$9.25	$6.31	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PLUMBER & PIPEFITTER PLUMBERS & PIPEFITTERS LOCAL 104	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/17/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.14	$9.55	$10.10	$0.00	$0.00	$41.79
2	50.00	$24.61	$9.55	$10.10	$0.00	$0.00	$44.26
3	55.00	$27.07	$9.55	$10.10	$0.00	$0.00	$46.72
4	60.00	$29.53	$9.55	$10.10	$0.00	$0.00	$49.18
5	65.00	$31.99	$9.55	$10.10	$0.00	$0.00	$51.64
6	70.00	$34.45	$9.55	$10.10	$0.00	$0.00	$54.10
7	75.00	$36.91	$9.55	$10.10	$0.00	$0.00	$56.56
8	80.00	$39.37	$9.55	$10.10	$0.00	$0.00	$59.02
9	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02
10	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02

PNEUMATIC CONTROLS (TEMP.) PLUMBERS & PIPEFITTERS LOCAL 104	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.25	$9.90	$9.25	$6.31	$0.00	$60.71
	6/1/2025	$36.50	$9.90	$9.25	$6.31	$0.00	$61.96
	12/1/2025	$37.74	$9.90	$9.25	$6.31	$0.00	$63.20
	6/1/2026	$39.04	$9.90	$9.25	$6.31	$0.00	$64.50
	12/1/2026	$40.33	$9.90	$9.25	$6.31	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
POWDERMAN & BLASTER LABORERS	12/2/2024	$36.00	$9.90	$9.25	$8.32	$0.00	$63.47
	6/2/2025	$37.25	$9.90	$9.25	$8.32	$0.00	$64.72
	12/1/2025	$38.50	$9.90	$9.25	$8.32	$0.00	$65.97
	6/1/2026	$39.80	$9.90	$9.25	$8.32	$0.00	$67.27
	12/7/2026	$41.10	$9.90	$9.25	$8.32	$0.00	$68.57
	6/7/2027	$42.50	$9.90	$9.25	$8.32	$0.00	$69.97
	12/6/2027	$43.90	$9.90	$9.25	$8.32	$0.00	$71.37
	6/5/2028	$45.40	$9.90	$9.25	$8.32	$0.00	$72.87
	12/4/2028	$46.90	$9.90	$9.25	$8.32	$0.00	$74.37
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS	12/1/2024	$36.75	$9.65	$9.00	$6.06	$0.00	$61.46
	6/1/2025	$38.00	$9.65	$9.00	$6.06	$0.00	$62.71

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2025	$39.24	$9.65	$9.00	$6.06	$0.00	$63.95
	6/1/2026	$40.54	$9.65	$9.00	$6.06	$0.00	$65.25
	12/1/2026	$41.83	$9.65	$9.00	$6.06	$0.00	$66.54
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER TEAMSTERS 404 - Construction Service (Northampton)	5/1/2024	$26.14	$11.82	$7.25	$0.00	$0.00	$45.21
RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
ROLLER OPERATOR OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Coal tar pitch) ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) ROOFERS LOCAL 248	10/2/2024	$41.88	$10.35	$8.70	$9.30	$0.00	$70.23
	7/16/2025	$43.38	$10.35	$8.70	$9.30	$0.00	$71.73
	10/2/2025	$44.38	$10.35	$8.70	$9.30	$0.00	$72.73
	7/16/2026	$46.38	$10.35	$8.70	$9.30	$0.00	$74.73

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 10/2/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.13	$10.35	$0.00	$0.00	$0.00	$35.48
2	65.00	$27.22	$10.35	$8.70	$9.30	$0.00	$55.57
3	70.00	$29.32	$10.35	$8.70	$9.30	$0.00	$57.67
4	75.00	$31.41	$10.35	$8.70	$9.30	$0.00	$59.76

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)							
Effective Date: 10/2/2024							
Step / Percent		**Apprentice Base Wage**					
5 / 80.00		$33.50	$10.35	$8.70	$9.30	$0.00	$61.85
6 / 85.00		$35.60	$10.35	$8.70	$9.30	$0.00	$63.95
7 / 90.00		$37.69	$10.35	$8.70	$9.30	$0.00	$66.04
8 / 95.00		$39.79	$10.35	$8.70	$9.30	$0.00	$68.14
ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
SCRAPER OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-PROPELLED POWER BROOM OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
Apprentice: SHEETMETAL WORKER							
Effective Date: 1/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 45.00		$19.00	$5.49	$4.86	$0.00	$0.85	$30.20
2 / 50.00		$21.12	$6.10	$5.40	$0.00	$0.94	$33.56
3 / 55.00		$23.23	$6.71	$9.71	$0.00	$1.15	$40.80
4 / 60.00		$25.34	$7.32	$9.71	$0.00	$1.23	$43.60
5 / 65.00		$27.45	$7.93	$9.71	$0.00	$1.31	$46.40
6 / 70.00		$29.56	$8.54	$9.71	$0.00	$1.39	$49.20
7 / 75.00		$31.67	$9.15	$9.71	$0.00	$1.47	$52.00
8 / 80.00		$33.78	$9.76	$9.71	$7.95	$1.78	$62.98
9 / 85.00		$35.90	$10.37	$9.71	$7.95	$1.86	$65.79
10 / 90.00		$38.01	$10.98	$9.71	$7.95	$1.94	$68.59
SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$40.24	$15.57	$20.17	$0.00	$0.00	$75.98
	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$40.53	$15.57	$20.17	$0.00	$0.00	$76.27
	6/1/2025	$41.53	$15.57	$20.17	$0.00	$0.00	$77.27
	12/1/2025	$41.53	$15.57	$21.78	$0.00	$0.00	$78.88
	1/1/2026	$41.53	$16.17	$21.78	$0.00	$0.00	$79.48
	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 669	4/1/2023	$47.43	$11.45	$7.20	$9.41	$0.00	$75.49

Apprentice: SPRINKLER FITTER

Effective Date: 4/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$21.34	$8.22	$0.00	$0.00	$0.00	$29.56
2	50.00	$23.72	$8.22	$0.00	$0.00	$0.00	$31.94
3	55.00	$26.09	$11.45	$7.20	$0.00	$0.00	$44.74
4	60.00	$28.46	$11.45	$7.20	$1.15	$0.00	$48.26
5	65.00	$30.83	$11.45	$7.20	$1.15	$0.00	$50.63
6	70.00	$33.20	$11.45	$7.20	$1.40	$0.00	$53.25
7	75.00	$35.57	$11.45	$7.20	$1.40	$0.00	$55.62
8	80.00	$37.94	$11.45	$7.20	$1.40	$0.00	$57.99
9	85.00	$40.32	$11.45	$7.20	$1.40	$0.00	$60.37
10	90.00	$42.69	$11.45	$7.20	$1.40	$0.00	$62.74

TELECOMMUNICATION TECHNICIAN ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS BRICKLAYERS LOCAL 3	2/1/2025	$64.74	$11.49	$15.57	$8.02	$0.00	$99.82
	8/1/2025	$66.89	$11.49	$15.57	$8.02	$0.00	$101.97
	2/10/2026	$68.24	$11.49	$15.57	$8.02	$0.00	$103.32
	8/1/2026	$70.44	$11.49	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$71.84	$11.49	$15.57	$8.02	$0.00	$106.92
TERRAZZO MECHANIC BRICKLAYERS LOCAL 3	2/1/2025	$65.82	$11.49	$15.57	$7.99	$0.00	$100.87
	8/1/2025	$67.97	$11.49	$15.57	$7.99	$0.00	$103.02
	2/1/2026	$69.32	$11.49	$15.57	$7.99	$0.00	$104.37
	8/1/2026	$71.52	$11.49	$15.57	$7.99	$0.00	$106.57
	2/1/2027	$72.92	$11.49	$15.57	$7.99	$0.00	$107.97

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.37	$11.49	$15.57	$8.02	$0.00	$67.45
2	60.00	$38.84	$11.49	$15.57	$8.02	$0.00	$73.92
3	70.00	$45.32	$11.49	$15.57	$8.02	$0.00	$80.40
4	80.00	$51.79	$11.49	$15.57	$8.02	$0.00	$86.87
5	90.00	$58.27	$11.49	$15.57	$8.02	$0.00	$93.35

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.45	$11.49	$15.57	$8.02	$0.00	$68.53
2	60.00	$40.13	$11.49	$15.57	$8.02	$0.00	$75.21
3	70.00	$46.82	$11.49	$15.57	$8.02	$0.00	$81.90
4	80.00	$53.51	$11.49	$15.57	$8.02	$0.00	$88.59
5	90.00	$60.20	$11.49	$15.57	$8.02	$0.00	$95.28

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: TERRAZZO MECHANIC							
Effective Date: 2/1/2025							
Step / Percent / Apprentice Base Wage							
1 / 50.00		$32.91	$11.49	$15.57	$7.99	$0.00	$67.96
2 / 60.00		$39.49	$11.49	$15.57	$7.99	$0.00	$74.54
3 / 70.00		$46.07	$11.49	$15.57	$7.99	$0.00	$81.12
4 / 80.00		$52.66	$11.49	$15.57	$7.99	$0.00	$87.71
5 / 90.00		$59.24	$11.49	$15.57	$7.99	$0.00	$94.29
Apprentice: TERRAZZO MECHANIC							
Effective Date: 8/1/2025							
Step / Percent / Apprentice Base Wage							
1 / 50.00		$33.99	$11.49	$15.57	$7.99	$0.00	$69.04
2 / 60.00		$40.78	$11.49	$15.57	$7.99	$0.00	$75.83
3 / 70.00		$47.58	$11.49	$15.57	$7.99	$0.00	$82.63
4 / 80.00		$54.38	$11.49	$15.57	$7.99	$0.00	$89.43
5 / 90.00		$61.17	$11.49	$15.57	$7.99	$0.00	$96.22
TEST BORING DRILLER LABORERS	12/1/2024	$50.20	$9.90	$9.25	$9.80	$0.00	$79.15
	6/1/2025	$51.70	$9.90	$9.25	$9.80	$0.00	$80.65
	12/1/2025	$53.20	$9.90	$9.25	$9.80	$0.00	$82.15
	6/1/2026	$54.75	$9.90	$9.25	$9.80	$0.00	$83.70
	12/1/2026	$56.25	$9.90	$9.25	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER LABORERS	12/1/2024	$46.32	$9.90	$9.25	$9.80	$0.00	$75.27
	6/1/2025	$47.82	$9.90	$9.25	$9.80	$0.00	$76.77
	12/1/2025	$49.32	$9.90	$9.25	$9.80	$0.00	$78.27
	6/1/2026	$50.87	$9.90	$9.25	$9.80	$0.00	$79.82
	12/1/2026	$52.37	$9.90	$9.25	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER LABORERS	12/1/2024	$46.20	$9.90	$9.25	$9.80	$0.00	$75.15
	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$40.82	$15.57	$20.17	$0.00	$0.00	$76.56
	6/1/2025	$41.82	$15.57	$20.17	$0.00	$0.00	$77.56

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2025	$41.82	$15.57	$21.78	$0.00	$0.00	$79.17
	1/1/2026	$41.82	$16.17	$21.78	$0.00	$0.00	$79.77
	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR LABORERS	12/1/2024	$58.43	$9.90	$9.25	$10.25	$0.00	$87.83
	6/1/2025	$59.93	$9.90	$9.25	$10.25	$0.00	$89.33
	12/1/2025	$61.43	$9.90	$9.25	$10.25	$0.00	$90.83
	6/1/2026	$62.98	$9.90	$9.25	$10.25	$0.00	$92.38
	12/1/2026	$64.48	$9.90	$9.25	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) LABORERS	12/1/2024	$60.43	$9.90	$9.25	$10.25	$0.00	$89.83
	6/1/2025	$61.93	$9.90	$9.25	$10.25	$0.00	$91.33
	12/1/2025	$63.43	$9.90	$9.25	$10.25	$0.00	$92.83
	6/1/2026	$64.98	$9.90	$9.25	$10.25	$0.00	$94.38
	12/1/2026	$66.48	$9.90	$9.25	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR LABORERS	12/1/2024	$50.50	$9.90	$9.25	$10.25	$0.00	$79.90
	6/1/2025	$52.00	$9.90	$9.25	$10.25	$0.00	$81.40
	12/1/2025	$53.50	$9.90	$9.25	$10.25	$0.00	$82.90
	6/1/2026	$55.05	$9.90	$9.25	$10.25	$0.00	$84.45
	12/1/2026	$56.55	$9.90	$9.25	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE) LABORERS	12/1/2024	$52.50	$9.90	$9.25	$10.25	$0.00	$81.90
	6/1/2025	$54.00	$9.90	$9.25	$10.25	$0.00	$83.40
	12/1/2025	$55.50	$9.90	$9.25	$10.25	$0.00	$84.90
	6/1/2026	$57.05	$9.90	$9.25	$10.25	$0.00	$86.45
	12/1/2026	$58.55	$9.90	$9.25	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL TEAMSTERS JOINT COUNCIL NO. 10	1/1/2025	$40.24	$15.57	$20.17	$0.00	$0.00	$75.98
	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
WAGON DRILL OPERATOR LABORERS	12/2/2024	$35.25	$9.90	$9.25	$8.32	$0.00	$62.72
	6/2/2025	$36.50	$9.90	$9.25	$8.32	$0.00	$63.97
	12/1/2025	$37.75	$9.90	$9.25	$8.32	$0.00	$65.22
	6/1/2026	$39.05	$9.90	$9.25	$8.32	$0.00	$66.52
	12/7/2026	$40.35	$9.90	$9.25	$8.32	$0.00	$67.82
	6/7/2027	$41.75	$9.90	$9.25	$8.32	$0.00	$69.22
	12/6/2027	$43.15	$9.90	$9.25	$8.32	$0.00	$70.62
	6/5/2028	$44.65	$9.90	$9.25	$8.32	$0.00	$72.12

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/4/2028	$46.15	$9.90	$9.25	$8.32	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"							
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) LABORERS	12/1/2024	$35.25	$9.90	$9.25	$6.31	$0.00	$60.71
	6/1/2025	$36.50	$9.90	$9.25	$6.31	$0.00	$61.96
	12/1/2025	$37.74	$9.90	$9.25	$6.31	$0.00	$63.20
	6/1/2026	$39.04	$9.90	$9.25	$6.31	$0.00	$64.50
	12/1/2026	$40.33	$9.90	$9.25	$6.31	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
WATER METER INSTALLER PLUMBERS & PIPEFITTERS LOCAL 104	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Marine Drilling

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BLASTER MARINE DRILLING	1/1/2018	$41.82	$7.63	$2.35	$1.25	$0.00	$53.05
BOAT CAPTAIN MARINE DRILLING	1/1/2018	$33.87	$7.63	$2.35	$0.95	$0.00	$44.80
BOAT CAPTAIN / Over 1,000 hp MARINE DRILLING	1/1/2018	$38.06	$7.63	$2.35	$1.25	$0.00	$49.29
CORE DRILLER MARINE DRILLING	1/1/2018	$31.43	$7.63	$2.25	$0.65	$0.00	$41.96
CORE DRILLER HELPER MARINE DRILLING	1/1/2018	$28.47	$7.63	$2.35	$0.65	$0.00	$39.10
DRILLER MARINE DRILLING	1/1/2018	$39.70	$7.63	$2.35	$1.25	$0.00	$50.93
ENGINEER MARINE DRILLING	1/1/2018	$39.69	$7.63	$2.25	$1.25	$0.00	$50.82
HELPER MARINE DRILLING	1/1/2018	$34.24	$7.63	$2.35	$0.65	$0.00	$44.87
MACHINIST MARINE DRILLING	1/1/2018	$38.88	$7.63	$2.35	$0.95	$0.00	$49.81
OILER - MARINE DRILLING MARINE DRILLING	1/1/2018	$34.24	$7.63	$2.35	$0.65	$0.00	$44.87
TUG DECKHAND MARINE DRILLING	1/1/2018	$27.61	$7.63	$2.35	$0.65	$0.00	$38.24
WELDER MARINE DRILLING	1/1/2018	$38.88	$7.63	$2.35	$0.95	$0.00	$49.81

Op Eng Marine (Dredging Work)

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BOAT OPERATOR OPERATING ENGINEERS LOCAL 4	10/1/2017	$29.26	$7.63	$2.35	$0.95	$0.00	$40.19
CERTIFIED WELDER OPERATING ENGINEERS LOCAL 4	10/1/2017	$31.09	$7.63	$2.35	$1.25	$0.00	$42.32
CHIEF WELDER/ CHIEF MATE OPERATING ENGINEERS LOCAL 4	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
DERRICK / SPIDER / SPILLBARGE OPERATOR OPERATING ENGINEERS LOCAL 4	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
DRAG BARGE OPERATOR / WELDER / MATE OPERATING ENGINEERS LOCAL 4	10/1/2017	$30.24	$7.63	$2.35	$0.95	$0.00	$41.17
ENGINEER / ELECTRICIAN OPERATING ENGINEERS LOCAL 4	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
LICENSED BOAT OPERATOR OPERATING ENGINEERS LOCAL 4	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
LICENSED TUG OPERATOR OVER 1000HP OPERATING ENGINEERS LOCAL 4	10/1/2017	$38.18	$7.63	$2.35	$1.25	$0.00	$49.41
MAINTENANCE ENGINEER OPERATING ENGINEERS LOCAL 4	10/1/2017	$33.03	$7.63	$2.35	$1.25	$0.00	$44.26
OILER - MARINE DIVISION OPERATING ENGINEERS LOCAL 4	10/1/2017	$24.30	$7.63	$2.35	$0.65	$0.00	$34.93
OPERATOR / LEVERMAN OPERATING ENGINEERS LOCAL 4	10/1/2017	$38.18	$7.63	$2.35	$1.25	$0.00	$49.41
RODMAN / SCOWMAN OPERATING ENGINEERS LOCAL 4	10/1/2017	$24.30	$7.63	$2.35	$0.65	$0.00	$34.93
SHOREMAN / DECKHAND OPERATING ENGINEERS LOCAL 4	10/1/2017	$24.30	$7.63	$2.35	$0.65	$0.00	$34.93

Outside Electrical

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
EQUIPMENT OPERATOR OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42 For apprentice rates see "Apprentice- LINEMAN"	9/1/2019	$44.67	$8.00	$12.55	$0.00	$0.00	$65.22
GROUNDMAN OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42 For apprentice rates see "Apprentice- LINEMAN"	9/1/2019	$30.58	$8.00	$5.48	$0.00	$0.00	$44.06
GROUNDMAN / TRUCK DRIVER OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42 For apprentice rates see "Apprentice- LINEMAN"	9/1/2019	$39.97	$8.00	$10.96	$0.00	$0.00	$58.93
HEAVY EQUIPMENT OPERATOR OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42 For apprentice rates see "Apprentice- LINEMAN"	9/1/2019	$47.01	$8.00	$13.22	$0.00	$0.00	$68.23
JOURNEYMAN LINEMAN OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	9/1/2019	$51.71	$8.00	$15.55	$0.00	$0.00	$75.26

Apprentice: JOURNEYMAN LINEMAN

Effective Date: 9/1/2019

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$31.03	$8.00	$3.43	$0.00	$0.00	$42.46
2	65.00	$33.61	$8.00	$3.51	$0.00	$0.00	$45.12
3	70.00	$36.20	$8.00	$3.59	$0.00	$0.00	$47.79
4	75.00	$38.78	$8.00	$5.16	$0.00	$0.00	$51.94
5	80.00	$41.37	$8.00	$5.24	$0.00	$0.00	$54.61
6	85.00	$43.95	$8.00	$5.32	$0.00	$0.00	$57.27
7	90.00	$46.54	$8.00	$7.40	$0.00	$0.00	$61.94

TELEDATA CABLE SPLICER OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	2/4/2019	$30.73	$4.70	$0.92	$2.25	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	2/4/2019	$28.93	$4.70	$0.89	$2.25	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	2/4/2019	$28.93	$4.70	$0.89	$2.25	$0.00	$36.77
TRACTOR-TRAILER DRIVER OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42	9/1/2019	$44.67	$8.00	$12.55	$0.00	$0.00	$65.22

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

DOCUMENT 00870

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS
(EXECUTIVE ORDER 11246)
Revised April 9, 2019

1. As used in these specifications:

   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted:

   b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority.

   c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

   d. "Minority" includes:

      (i) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);
      (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
      (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
      (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $ 10,000 the provisions of the specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in Paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

   a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

   b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

   c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

   d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

   e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

   f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

   g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

   h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11 The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as many be required by the Government and keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

APPENDIX A

The following goals and timetables for female utilization shall be included in all Federal and federally assisted construction contracts and subcontracts in excess of $ 10,000. The goals are applicable to the Contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a Federal or federally-assisted construction contract or subcontract.

Area covered: Goal for Women apply nationwide

Goals and Timetables

Timetable	Goals (percent)
From Apr. 1, 1980 until further notice	6.9

APPENDIX B-80

Until further notice, the following goals for minority utilization in each construction craft and trade shall included in all Federal or federally assisted construction contracts and subcontracts in excess of $ 10,000 to be performed in the respective geographical areas. The goals are applicable to each nonexempt contractor's total on- site construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, federally assisted or nonfederally related project, contract or subcontract.

Construction contractors participating in an approved Hometown Plan (see 41 CFR 6-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work, such contractors are required to comply with the applicable SMSA or EA goal contained in this Appendix B-80.

Economic Areas

STATE:	Goals (percent)
MASSACHUSETTS	
004 Boston MA: SMSA Counties: 1123 Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH	4.0
MA Essex, MA Middlesex, MA Norfolk, MA Plymouth, MA Suffolk, NH Rockingham.	
5403 Fall River- New Bedford MA, Bristol	1.6
9243 Worcester-Fitchburg-Leominster, MA	1.6
6323 Springfield-Chicopee-Holyoke MA-CT MA Hampden, MA Hampshire	4.8
Non-SMSA Counties: MA Barnstable, MA Dukes, MA Nantucket	3.6
Non-SMSA Counties: MA Franklin	5.9

APPENDIX C

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

3. **Solicitations for Subcontractors, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to nondiscrimination on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status.

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto, and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Massachusetts Department of Transportation (MassDOT) or FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor will so certify to MassDOT or FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Nondiscrimination provisions of this contract, MassDOT will impose such contract sanctions as it or FHWA may determine to be appropriate, including, but not limited to:

    a. withholding payments to the contractor under the contract until the contractor complies; and/or
    b. cancelling, terminating, or suspending a control, in whole or in part.

6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as MassDOT or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request MassDOT to enter into any litigation to protect the interests of MassDOT. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX D

During the performance of this contact, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor," which includes consultants) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

PERTINENT NON-DISCRIMINATION AUTHORITIES:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21

- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-Aid programs and projects)

- Federal-Aid Highway Act of 1973 (23 U.S.C. § 324 *et seq.*) (prohibits discrimination on the basis of sex)

- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability) and 49 CFR Part 27

- The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 *et seq.*) (prohibits discrimination on the basis of age)

- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex)

- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage, and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of Federal-Aid recipients, sub-recipients, and contractors, whether such programs or activities are Federally funded or not)

- Titles II and III of the Americans with Disabilities Act (42 U.S.C. §§ 12131-12189), as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38 (prohibits discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities)

- The Federal Aviation Administration's Non-Discrimination Statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex)

- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations)

- Executive Order 13166, Improving Access to Services for People with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100)

- Title IX of the Education Amendments Act of 1972, as amended (20 U.S.C. 1681 *et seq*.) (prohibits discrimination on the basis of sex in education programs or activities)

*** END OF DOCUMENT ***

DOCUMENT 00875
TRAINEE SPECIAL PROVISIONS
Revised October, 2016

THE REQUIRED NUMBER OF TRAINEES TO BE TRAINED UNDER THIS CONTRACT WILL BE **2**

The contractor shall provide on-the job training aimed at developing full journeyworkers in the type of trade of job classification involved.

In the event that a contractor subcontracts a portion of the contract work, the General Contractor shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeyworkers in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Massachusetts Department Of Transportation (MassDOT) for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyworker status is a primary objective of the Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority and women trainees (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that have been taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training.

No employee shall be trained under this Special Provision in any classification in which he or she has successfully completed a training course leading to journeyworker status or in which he or she has been employed as a journeyworker. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the finding in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration. The Massachusetts Department Of Transportation and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyworker status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather that clerk-typist or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc. where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Federal Highway Administration division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Reimbursement

Under these Training Special Provisions, reimbursement will be as follows:

The Contractor will only be reimbursed 80 cents for each hour of on the job training as specified in the approved Training Program.

The Contractor is advised and encouraged that it may train additional persons in excess of the number specified and will be reimbursed as stated above. Reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement.

If less than full training specified in the approved training programs is provided, payment to the contractor will be made at a rate of 80 cents for each hour of training completed under this contract. However, no payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyworker, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision.

Payment

Trainees will be paid:

1. Percentage (%) of the journeyworker's rate as provided in the existing programs approved by the Department of Labor or Transportation as of September 15, 1970.

2. For journeyworker programs submitted by the Contractor and approved by Massachusetts Department Of Transportation and the Federal Highway Administration at least 60 percent of the appropriate minimum journeyworker's rate specified in the contract for the first half of the training period, 75 percent for the third quarter if the training period, and 90 percent for the last quarter of the training period.

3. For skilled laborer programs, the minimum starting wage rate of unskilled laborer. At the conclusion of training, he or she will be paid the minimum wage rate of the Classification for programs submitted by the Contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration.

4. For the purposes of meeting the legal requirements of State Prevailing Wage Law, please be advised that no person may be paid the Apprentice wage rate as listed on a MA Prevailing Wage Rates schedule, unless that person and program is registered with the Department of Labor Standards/Division of Apprentice Standards (DLS/DAS). Any person or program not registered with DLS/DAS, regardless of whether or not they are registered with any other federal, state, local, or private entity must be paid the journeyworker’s rate for the trade.

The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

Form FHWA-1409, Federal-aid Highway Construction Contracting Semi Annual Training Report, shall be submitted as per instructions on the Form.

*** END OF DOCUMENT ***

DOCUMENT 00880

Revised January 12, 2022

DEPARTMENT OF LABOR

Employment Standards Administration

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS

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"General Decision Number: MA20250020 08/15/2025

Superseded General Decision Number: MA20240020

State: Massachusetts

Construction Type: Highway

County: Hampshire County in Massachusetts.

HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	04/11/2025
2	05/16/2025
3	07/11/2025
4	07/18/2025
5	08/15/2025

ENGI0004-019 06/01/2025

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 57.83	33.70
Group 2	$ 57.18	33.70

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:
A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Labor Day, Memorial Day, Independence Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS
Group 1: Broom/Sweeper; Crane; Gradall; Post Driver (Guardrail/Fences)
Group 2: Bulldozer; Grader/Blade

ENGI0098-010 12/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 42.88	31.04+A
Group 2	$ 42.57	31.04+A
Group 4	$ 39.12	31.04+A

Footnote:
A. Paid Holidays: New year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS
Group 1: Backhoe/Excavator/Trackhoe; Bobcat/Skid Steer/Skid Loader; Loader
Group 2: Milling Machine; Paver (Asphalt, Aggregate, and Concrete)
Group 4: Roller

IRON0007-027 03/16/2025

	Rates	Fringes
IRONWORKER (ORNAMENTAL AND STRUCTURAL)	$ 41.15	33.25

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* LABO0596-008 06/01/2025

	Rates	Fringes
LABORER (Traffic Control: Flagger)	$ 35.00	26.91

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* LABO0999-003 06/01/2025

	Rates	Fringes
LABORER		
Common or General	$ 35.00	26.91
Landscape	$ 35.00	26.91

PAIN0035-023 07/01/2024

	Rates	Fringes
PAINTER (Steel)	$ 56.76	36.00

SUMA2014-010 01/11/2017

	Rates	Fringes
CARPENTER, Includes Form Work	$ 40.64	20.80
CEMENT MASON/CONCRETE FINISHER	$ 52.13	20.89

ELECTRICIAN	$ 47.13	13.41
IRONWORKER, REINFORCING	$ 46.21	21.27
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 33.10	18.09
LABORER: Concrete Saw (Hand Held/Walk Behind)	$ 44.43	14.18
OPERATOR: Forklift	$ 51.63	0.00
OPERATOR: Mechanic	$ 48.14	17.02
OPERATOR: Piledriver	$ 43.87	18.04
PAINTER: Spray (Linestriping)	$ 37.50	18.83
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper	$ 43.73	15.06
TRUCK DRIVER: Concrete Truck	$ 33.69	15.79
TRUCK DRIVER: Dump Truck	$ 30.00	18.18
TRUCK DRIVER: Flatbed Truck	$ 48.53	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at
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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

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A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

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WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
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U.S. Department of Labor
200 Constitution Avenue, N.W.
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2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

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END OF GENERAL DECISION"

"General Decision Number: MA20250010 08/15/2025

Superseded General Decision Number: MA20240010

State: Massachusetts

Construction Types: Heavy (Heavy and Marine)

Counties: Berkshire, Franklin, Hampden and Hampshire Counties in Massachusetts.

HEAVY CONSTRUCTION PROJECTS; AND MARINE CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	03/07/2025
2	03/14/2025
3	03/21/2025
4	03/28/2025
5	05/16/2025
6	07/11/2025
7	07/18/2025
8	08/15/2025

BOIL0029-001 01/01/2025

	Rates	Fringes
BOILERMAKER	$ 50.62	28.82

BRMA0001-005 08/01/2023

SPRINGFIELD CHAPTER

	Rates	Fringes
BRICKLAYER BRICKLAYERS; CEMENT MASONS; PLASTERERS; STONE MASONS; MARBLE, TILE & TERRAZZO WORKERS	$ 50.81	32.27

BRMA0001-007 08/01/2023

SPRINGFIELD/PITTSFIELD CHAPTER
BERKSHIRE COUNTY

	Rates	Fringes

BRICKLAYER
BRICKLAYERS; CEMENT
MASONS; PLASTERERS; STONE
MASONS; MARBLE, TILE &
TERRAZZO WORKERS.....$ 50.81 32.27

CARP0056-004 08/01/2024

	Rates	Fringes
DIVER TENDER	$ 61.70	35.47
DIVER	$ 78.11	35.47

CARP0056-009 08/01/2024

	Rates	Fringes
PILEDRIVERMAN	$ 51.97	35.47

CARP0336-005 03/01/2025

FRANKLIN COUNTY (Erving, Orange, North Orange, and Warwick)

	Rates	Fringes
CARPENTER	$ 42.59	27.61

CARP0336-010 03/01/2025

BERKSHIRE

	Rates	Fringes
CARPENTER	$ 42.59	27.61

CARP0336-012 03/01/2025

HAMPDEN; HAMPSHIRE; AND FRANKLIN (Remainder of County)

	Rates	Fringes
CARPENTER	$ 42.59	27.61

CARP1121-004 01/06/2025

	Rates	Fringes
MILLWRIGHT	$ 43.42	33.00

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* ELEC0007-002 06/29/2025

HAMPDEN (Except Chester & Holyoke); HAMPSHIRE (Belchertown, Ware)

	Rates	Fringes
ELECTRICIAN	$ 52.16	29.56

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* ELEC0007-003 06/29/2025

BERKSHIRE; FRANKLIN; HAMPDEN (Chester, Holyoke); HAMPSHIRE (Except Belchertown, Ware)

	Rates	Fringes
ELECTRICIAN	$ 52.16	29.56

ENGI0098-007 12/01/2024

	Rates	Fringes
Power equipment operators:		
Group 1	$ 42.88	31.04+A
Group 2	$ 42.57	31.04+A
Group 3	$ 42.35	31.04+A
Group 4	$ 39.12	31.04+A
Group 5	$ 38.00	31.04+A
Group 6	$ 36.06	31.04+A
Group 7	$ 54.38	31.04+A
Group 8	$ 44.06	31.04+A
Group 9	$ 44.37	31.04+A
Group 10	$ 46.38	31.04+A
Group 11	$ 47.38	31.04+A
Group 12	$ 48.88	31.04+A
Group 13	$ 49.88	31.04+A
Group 14	$ 50.88	31.04+A
Group 15	$ 52.38	31.04+A

HAZARDOUS WASTE PREMIUM $2.00

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:
Group 8 and Group 9 are per day wages.
A. Paid Holidays: New year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Shovels; crawlers and truck cranes including all tower; self-propelled hydraulic cranes 10 tons and over; draglines; clam shells; cableways; shaft hoists; mucking machines derricks; backhoes; bulldozers; gradalls; elevating graders; pile drivers; concrete pavers; trenching machines; front end loaders- 5 1/2 cu yds and over; dual drum paver; automatic grader-excavator(C.M.I. or equal); scrapers towing pan or wagon; tandem dozers or push cats(2 units in tandem); shotcrete machine; tunnel boring machine; combination backhoe/loader 3/4 cu yd hoe or over; jet engine dryer; tree shredder; post hole digger; post hole hammer; post extractor; truck mounted concrete pump with boom; roto-mill; Grader; Horizontal Drilling Machine; John Henry Rock Drill and similar equipment.

Group 2: Rotary drill with mounted compressor; compressor house (3 to 6 compressors); rock and earth boring machines (excluding McCarthy and similar drills); front end loaders 4 cu yds to 5 1/2 cu yds); forklifts-7 ft lift and over 3 ton capacity; scraper 21 yds and over (struck load); sonic hammer console; reclaimers road planer/milling machine; cal tracks; ballast regulators; rail anchor machines; switch tampers, asphalt pavers; mechanic; welder and transfer machine.

Group 3: Combination backhoe/loader up to 3/4 cu yd; scrapers up to 21 cu yd (struck load, self propelled or tractor drawn); tireman; front end loaders up to 4 yds; well drillers; engineer or fireman on high pressure boiler; self-loading batch plant; well point operators electric pumps used in well point system; pumps, 16 inches and over (total discharge); compressor, one or two 900 cu ft and over; powered grease truck; tunnel locomotives and dingys; grout pumps; hydraulic jacks; boom truck; hydraulic cranes-up to 10 ton.

Group 4: Asphalt rollers; self-powered rollers and compactors; tractor without blade drawing sheepsfoot roller; rubber tire roller; vibratory roller or other type of compactors including machines for pulverizing and aerating soil; york rake.

Group 5: Hoists; conveyors; power pavement breakers; self-powered concrete pavement finishing machines; two bag mixers with skip; McCarthy and similar drills; batch plants (not self loading); bulk cement plants; self-propelled material spreaders; three or more 10 KW light plants; 30 KW or more generators; power broom.

Group 6: Compressor (one or two) 315 cu ft to 900 cu ft; pumps 4 inches to 16 inches (total discharge).

Group 7: Compressors up to 315 cu ft; small mixers with skip; pumps up to 4 inches; power heaters; oiler; A-frame trucks; forklifts-up to 7 ft. lift and up to 3 ton capacity; hydro broom; stud welder.
Group 8: Truck crane crews
Group 9: Oiler
Group 10: Master Mechanic
Group 11: Boom lengths over 150 feet including jib
Group 12: Boom lengths over 200 feet including jib
Group 13: Boom lengths over 250 feet including jib
Group 14: Boom lengths over 300 feet including jib
Group 15: Boom lengths over 350 feet including jib

IRON0007-014 03/16/2025

BERKSHIRE (Becket, East Otis, Hinsdale, Monterey, New Marlboro, North Otis, Otis, Peru, Sandisfield, Savoy, Sheffield, Washington, Windsor); FRANKLIN; HAMPDEN; HAMPSHIRE

	Rates	Fringes
IRONWORKER	$ 41.15	33.25

IRON0012-003 07/01/2025

BERKSHIRE (Lee)

	Rates	Fringes
IRONWORKER	$ 40.75	31.91

IRON0012-004 07/01/2025

BERKSHIRE (Remainder of County)

	Rates	Fringes
Ironworkers:		
Sheeter	$ 41.00	31.91
Structural, Ornamental, Reinforcing, Fence Erector, Machinery Mover, Rigger, Rodman, Stone Derrickman	$ 40.75	31.91

LABO0022-002 12/01/2024

FRANKLIN (Orange, Warwick)

	Rates	Fringes
Laborers:		
GROUP 1	$ 38.95	29.70
GROUP 2	$ 39.20	29.70
GROUP 3	$ 39.70	29.70
GROUP 4	$ 39.95	29.70
GROUP 5	$ 39.70	29.70
GROUP 6	$ 40.95	29.70

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders, plasterer tenders

GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tenmder; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drill operatorm jackhammer operator, pavement breaker, carbide core drilling machine, chain saw operator, barco type jumping tampers, concrete pump, motorized mortar miner, ride-on motorized buggy

GROUP 3: Air track operator; block paver; rammer; curb setter, hydraulic and similar self-powered drills

GROUP 4: Blaster; powderman

GROUP 5: Precast floor and roof, plank erector

GROUP 6: Asbestos Abatement, Toxic and Hazardous waste laborers

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LABO0473-005 12/01/2024

FRANKLIN (Except Orange and Warrick); HAMPDEN and HAMPSHIRE COUNTIES (with the exception of Chesterfield, Cummington, Goshen, Middlefield, Plainfield, and Worthington)

	Rates	Fringes
Laborers:		
Group 1	$ 35.00	29.70
Group 2	$ 35.00	29.70
Group 3	$ 35.00	29.70
Group 4	$ 35.00	29.70
Group 5	$ 27.01	29.70
Group 6	$ 35.00	29.70

LABORERS CLASSIFICATIONS

Group 1: Carpenter tenders, cement finisher tenders, laborers, wrecking laborers

Group 2: Asphalt rakers, fence and guard rail erectors, laser beam operator, mason tender, pipelayer, pneumatic drill operator, pneumatic tool operator, wagon drill operator

Group 3: Air track operator, block pavers, rammers, curb setters

Group 4: Blasters, powdermen

Group 5: Flaggers

Group 6: Asbestos abatement, toxic and Hazardous waste laborers

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LABO0473-006 12/01/2024

BERKSHIRE; HAMPSHIRE COUNTIES (the towns of Chesterfield, Cummington, Goshen, Middlefield, Plainfield, and Worthington only)

	Rates	Fringes
Laborers:		
Group 1	$ 33.99	26.65
Group 2	$ 33.99	26.65
Group 3	$ 33.99	26.65
Group 4	$ 33.99	26.65
Group 5	$ 27.01	26.65
Group 6	$ 33.99	26.65

LABORERS CLASSIFICATIONS

Group 1: Carpenter tenders, cement finisher tenders, laborers, wrecking laborers

Group 2: Asphalt rakers, fence and guard rail erectors, laser beam operator, mason tender, pipelayer, pneumatic drill operator, pneumatic tool operator, wagon drill operator

Group 3: Air track operator, block pavers, rammers, curb setters

Group 4: Blasters, powdermen

Group 5: Flaggers

Group 6: Asbestos abatement, toxic and Hazardous waste laborers

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LABO1421-002 12/02/2024

	Rates	Fringes
Laborers:		
Group 1	$ 46.25	29.70
Group 2	$ 47.00	29.70
Group 3	$ 47.25	29.70
Group 4	$ 42.25	29.70
Group 5	$ 45.35	29.70
Group 6	$ 46.25	29.70

Group 1: Adzeman, Wrecking Laborer.
Group 2: Burners, Jackhammers.
Group 3: Small Backhoes, Loaders on tracks, Bobcat Type Loaders, Hydraulic ""Brock"" Type Hammer Operators, Concrete Cutting Saws.
Group 4: Yardman (Salvage Yard Only).
Group 5: Yardman, Burners, Sawyers.
Group 6: Asbestos, Lead Paint, Toxic and Hazardous Waste.

PAIN0035-010 07/01/2024

	Rates	Fringes
PAINTER		
NEW CONSTRUCTION:		
Brush, Taper	$ 38.78	31.85
Spray, Sandblast	$ 39.48	31.85
REPAINT:		
Bridge	$ 56.76	31.85
Brush, Taper	$ 35.40	31.85
Spray, Sandblast	$ 36.80	31.85

PLUM0004-003 03/01/2025

FRANKLIN (Orange)

	Rates	Fringes
Plumber and Steamfitter	$ 55.00	30.17

PLUM0104-004 03/17/2025

BERKSHIRE (Becket, Otis, Sandisfield); FRANKLIN (Except Monroe, Rowe, and the Western part of Charlemont); HAMPDEN; HAMPSHIRE

	Rates	Fringes
Plumbers and Pipefitters	$ 51.26	29.85

FOOTNOTE:
A. Two paid holidays, Independence Day and Labor Day, provided the employee has been employed seven days prior to the holiday by the same employer

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PLUM0104-009 03/17/2025

BERKSHIRE (Except Otis, Becket, Sandisfield); FRANKLIN (Monroe, Rowe and the Western part of Charlemont)

	Rates	Fringes
Plumber and Steamfitter	$ 51.26	29.85

FOOTNOTE FOR PLUMBERS & STEAMFITTERS:
A. Paid holidays: Independence Day and Labor Day, provided the employee has been employed seven days prior to the holiday by the same employer.

TEAM0379-001 06/01/2025

	Rates	Fringes
Truck drivers:		
Group 1	$ 40.78	37.35+a+b
Group 2	$ 40.95	37.35+a+b
Group 3	$ 41.02	37.35+a+b
Group 4	$ 41.14	37.35+a+b
Group 5	$ 41.24	37.35+a+b
Group 6	$ 41.53	37.35+a+b
Group 7	$ 41.82	37.35+a+b

POWER TRUCKS $.25 DIFFERENTIAL BY AXLE
TUNNEL WORK (UNDERGROUND ONLY) $.40 DIFFERENTIAL BY AXLE
HAZARDOUS MATERIALS (IN HOT ZONE ONLY) $2.00 PREMIUM

TRUCK DRIVERS CLASSIFICATIONS

Group 1: Station wagons; panel trucks; and pickup trucks

Group 2: Two axle equipment; & forklift operator

Group 3: Three axle equipment and tireman

Group 4: Four and Five Axle equipment

Group 5: Specialized earth moving equipment under 35 tons other than conventional type trucks; low bed; vachual; mechanics, paving restoration equipment

Group 6: Specialized earth moving equipment over 35 tons

Group 7: Trailers for earth moving equipment (double hookup)

FOOTNOTES:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day and Christmas Day

B. PAID VACATION: Employees with 4 months to 1 year of service receive 1/2 day's pay per month; 1 week vacation for 1 - 5 years of service; 2 weeks vacation for 5 - 10 years of service; and 3 weeks vacation for more than 10 years of service

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

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A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates
in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

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The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

"General Decision Number: MA20250006 02/21/2025

Superseded General Decision Number: MA20240006

State: Massachusetts

Construction Type: Heavy Dredging

Counties: Massachusetts Statewide.
STATEWIDE

Massacusetts All Dredging, except self-propelled hopper dredges, on the Atlantic Coast & tributary waters emptying into the Atlantic Ocean.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	02/21/2025

* ENGI0025-001 10/01/2024

STATEWIDE

	Rates	Fringes
Dredging:		
CLASS A1	$ 47.07	15.34+a+b
CLASS A2	$ 41.94	14.99+a+b
CLASS B1	$ 40.71	14.90+a+b
CLASS B2	$ 38.31	14.73+a+b
CLASS C1	$ 37.26	14.66+a+b
CLASS C2	$ 36.07	14.57+a+b
CLASS D	$ 29.96	14.15+a+b

CLASSIFICATIONS:
CLASS A1: Deck Captain; Mechanical Dredge Operator, Leverman, Licensed Tug Operator over 1000 HP.
CLASS A2: Crane Operator (360 swing).
CLASS B1: Derrick Operator (180 swing), Spider/Spill Barge Operator, Engineer, Electrician, Chief Welder, Chief Mate, Fill Placer, Operator II, Maintenance Engineer, Licensed Boat Operator, Licensed Crew Boat Operator.
CLASS B2: Certified Welder.
CLASS C1: Mate, Drag Barge Operator, Assistant Fill Placer, Welder, Steward.
CLASS C2: Boat Operator.
CLASS D: Oiler, Deckhand, Shoreman, Rodman, Scowman, Cook, Messman, Porter/Janitor.

INCENTIVE PAY: (Add to Hourly Rate)
Operator (NCCCO License/Certification) $1.80 Licensed Tug Operator over 1000 HP (Assigned as Master) (USCG licensed Master of Towing Vessels (MOTV) $1.80; Licensed Boat Operator (Assigned as lead boat captain) USCG licensed boat operator $1.30; Engineer (QMED and Tankerman endorsement or licensed engineer (USCG) $1.80
Oiler (QMED and Tankerman endorsement (USCG) $1.80; All classifications (Tankerman endorsement only) USCG $1.55; Deckhand or Mate (AB with Lifeboatman endorsement (USCG) $1.80; All classifications (lifeboatman endorsement only (USCG) $1.55; Welder (ABS certification) $1.55

FOOTNOTES APPLICABLE TO ABOVE CRAFTS:
a. PAID HOLIDAYS: New Year's Day, Martin Luther King, Jr.'s Birthday, Memorial Day, Good Friday, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day and Christmas Day
b. VACATION: Eight percent (8%) of the straight time rate, multiplied by the total hours worked.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates
in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

DOCUMENT A00801

SPECIAL PROVISIONS

HADLEY
Federal Aid Project Number NHP(BRR-ON)-003S(813)X

Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

Labor participation goals for this Project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both Contractor's and Subcontractor's on-site construction workforce. Refer to Document 00820 for details.

SCOPE OF WORK

All work under this Contract shall be done in conformance with the *2025 Standard Specifications for Highways and Bridges*, the *Supplemental Specifications* contained in this book, the *Construction Standard Details* in effect as of March 12, 2025, the *1990 Standard Drawings for Signs and Supports*, the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD) with Revisions 1, 2, and 3 and the November 2022 Massachusetts Amendments to the MUTCD, the 1968 Standard Drawings for Traffic Signals and Highway Lighting*, the latest edition of The *American Standard for Nursery Stock*, the Plans and these Special Provisions.

The work to be done under this contract consists of furnishing all necessary labor, materials and equipment required for the complete replacement of Bridge No. H-01-005, which carries Bay Road (Rte. 47) over the Fort River and as shown on the plans.

Also included as part of the work is furnishing and installing a temporary pedestrian bridge, temporary traffic signals, guardrail, water main replacement, loam and seed; maintaining construction safety controls, and other incidentals required to complete the work as shown on the drawings, as listed in the proposal, as specified herein, and as directed by the Engineer.

SUBSECTION 7.05 INSURANCE REQUIREMENTS
B. Public Liability Insurance

The insurance requirements set forth in this subsection are in addition to the requirements of the Standard Specifications and supersede all other requirements.

Paragraphs 1 and 2

The Massachusetts Department of Transportation and applicable railroads shall be named as additional insureds.

Paragraph 4

Asbestos Liability Insurance shall be obtained for this project. The Contractor and the Massachusetts Department of Transportation shall be named as additional insureds.

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 3:00 P.M. on the Tuesday of the previous week before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address massdotspecifications@dot.state.ma.us The MassDOT proposal number and municipality is to be placed in the subject line.

CONTRACT AWARD AND NOTICE TO PROCEED PROCEDURES

(Amending and Supplementing Subsections 3.03 and 3.05)

The prepared Contract Package is to be completed in duplicate by the successful Bidder who shall execute and deliver the Contract Package and furnish the required surety to the Department on the third day after the date of bid opening by 2:00 pm. The date of the Contract shall be the date of the Bidder's signature and shall be typed on all forms by the successful Bidder. The Contract Package consists of the contract forms for execution all of which must be returned. These documents are available on www.bidx.com. as a separate file.

The company's corporate seal should be affixed to both the Contract and bonds.

The Board of Director's Vote will indicate who is authorized to sign and execute the Contract and bonds and affix the corporate seal. The vote shall show that said vote is in full force and effect and has not been amended or rescinded. The vote of the board of directors should be dated the same date as indicated on the contract form and should bear the imprint of the company's corporate seal.

HOLIDAY WORK RESTRICTIONS

(Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public. DHD may allow work in those areas on a case by case basis and where work is behind barrier and will not impact traffic

Below are the holiday work restrictions:

New Years Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Martin Luther King's Birthday (Federal Holiday)
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Evacuation Day (Suffolk County State Holiday)
No work restrictions due to traffic concerns.

Patriot's Day (State Holiday)
Work restrictions will be in place for Districts 3 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

Mother’s Day
No work on Western Turnpike and Metropolitan Highway System from 5:00 AM on the Friday before, until the normal start of business on the following day.

HOLIDAY WORK RESTRICTIONS (Continued)

Memorial Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Bunker Hill Day (Suffolk County State Holiday)
No work restrictions due to traffic concerns.

Juneteenth
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Independence Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Labor Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Columbus Day (Federal Holiday)
No work on major arterials from 5:00 AM on the Friday before, until the normal start of business on the following day

Veterans' Day (Federal Holiday)
No work restrictions due to traffic concerns.

Thanksgiving Day (Federal Holiday)
No work on major arterials from 5:00 AM two days before until the normal start of business on the following Monday.

Christmas Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

SOIL STOCKPILING DIRECTIVE P-22-001

Any stockpiling of soil must be performed in compliance with Policy Directive P-22-001, Off-Site Stockpiling of Soil from MassDOT Construction Projects. This directive limits the allowable locations for off-site stockpiling of soil generated during MassDOT projects and includes various requirements that must be satisfied by the contractor prior to off-site stockpiling. The Contractor is responsible for identifying a suitable stockpile location.

SUBSECTION 8.02 SCHEDULE OF OPERATIONS

Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

TRUCK SAFETY DEVICES

(Supplementing Subsection 7.04: Motor Vehicles)

All motor vehicles subject to Section 7 of Chapter 90 to be operated under this Contract shall be equipped with safety devices as provided therein and in 540 CMR 4.00.

By December 31, 2025, the Contractor shall certify to the Registry of Motor Vehicles, in a manner prescribed by the Registrar, that all applicable vehicles are equipped with Lateral Protective Devices, Convex Mirrors, Cross Over Mirror(s) and Back Up Cameras in accordance with the requirements of 540 CMR 4.00.

The Contractor shall provide evidence satisfactory to the Department to demonstrate compliance with the above certification requirement for all applicable vehicles operated under this Contract by the Contractor and its subcontractors and vendors in a manner set forth by the Department. Thereafter, the Contractor shall have an affirmative obligation to continue to provide such evidence of compliance on an ongoing basis and no later than 7 days after certification with the Registry of Motor Vehicles of any additional vehicles operated under this Contract by the Contractor and its subcontractors and vendors.

Non-compliance with respect to a vehicle that is subject to 540 CMR 4.00 may subject the Contractor to statutory fines as established in M.G.L. c. 90, § 7 and/or contractual remedies up to and including termination of the Contract.

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

B. PROJECT UTILITY COORDINATION (PUC) FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Contractor shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

C. INITIATION OF UTILITY WORK

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

1) Contractor's accepted Baseline Schedule
2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
3) An approved Proposal Schedule

SUBSECTION 8.14 (Continued)

C.1 - BASELINE SCHEDULE – UTILITY BASIS
The Contractor shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE
All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Contractor shall present all known information at the pre-construction conference in the form of a 'sub-net' schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Contractor shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Contractor shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM
If the Contractor intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contactor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Contractor shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Contractor shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

D. UTILITY DELAYS
The Contractor shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor shall continue to diligently seek the Utility Owner's cooperation in performing their scope of Work.

SUBSECTION 8.14 (Continued)

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Contractor must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Contractor.

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

E. LOCATION OF UTILITIES

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Contractor shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

F. POST UTILITY SURVEY – NOTIFICATION

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

SUBSECTION 8.14 (Continued)

I. ACCESS AND INSPECTION

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT

(Supplementing Subsection 7.01)

On all projects, the "Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment" Regulation (2 CFR 200.216) prohibits the Contractor from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Contractor certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Contractor shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

Payment for the item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Contractor.

BIDDERS LIST

Pursuant to the provisions of 49 CFR Part 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

BUILD AMERICA BUY AMERICA PREFERENCE

On Federally-aid projects the Buy America (23.CFR § 635.410) and Build America, Buy America Act. requires the following,

(1) all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, must occur in the United States. Foreign steel and iron can be used if the cost of the materials does not exceed 0.1% of the total Contract cost or $2,500, whichever is greater. The action of applying a coating to a covered material (i.e., steel and iron) is deemed a manufacturing process subject to Buy America. Coating includes epoxy coating, galvanizing, painting and any other coating that protects or enhances the value of a material subject to requirements of Build America, Buy America. Steel used for temporary support of excavation, including H piles, soldier piles, and sheeting when the steel is required to be left in place is subject to requirements of Build America, Buy America. Temporary steel, shall remain in place when it falls within the influence zone of the soil supporting any structure or railroad tracks.

(2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States and

(3) all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States. “Construction materials” includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of:

- non-ferrous metals,
- plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables),
- glass (including optic glass),
- lumber; or
- drywall.

BUILD AMERICA BUY AMERICA PREFERENCE (Continued)

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

All articles, materials, and supplies should be classified as an iron or steel product, a manufactured product, or another product as specified by law or in 2 CFR part 184 (such other products specified by law or in 2 CFR part 184 include "excluded materials" and "construction materials"); an article, material, or supply must not be considered to fall into multiple categories.

NOTE: The requirements for manufactured products indicated in paragraph (2) above are not in effect for this contract.

NOTICE TO OWNERS OF UTILITIES (Supplementing Subsection 7.13)

The Contractor shall perform work concurrently and in conjunction with the utility companies involved with project so as to provide for all possible cooperation towards the satisfactory completion of the work with minimum delay and inconvenience. Certain utility companies may incur considerable work; schemes involving such work will be coordinated with the Contractor by the utility companies prior to start of construction.

The Contractor shall be responsible for maintenance of flow in all water courses, sewers, drains and other pipes in the way of the proposed work, or for any conveyance of the flow to a suitable point of discharge in such a manner that there will be no flow upon or hindrance to other work, or cause nuisance of any kind.

It is the Contractor's responsibility to protect existing buildings, structures and utilities from damage during the construction period.

The Contractor shall provide written notice to all utilities at least one week in advance of beginning any work within the project limits. This notice shall include a work schedule identifying the sequence of construction. The Contractor shall, at the same time, file a copy of such notice with the Engineer.

NOTICE TO OWNERS OF UTILITIES (Continued)

Following are the names and owners and representatives of the principal utilities, as well as City Department contacts:

Hadley

Christopher Okafor, Director
Hadley DPW
230 Middle Street
Hadley, MA 01035
(413) 586-2390

Michael Spanknebel, Fire Chief
Hadley Fire Department
15 East Street
Hadley, MA 01035
(413) 584-0874

Nicholas Langone
Eversource Electric West
300 Cadwell Drive
Springfield, MA 01104
(413) 787-9022

Wesley Scalise
Berkshire Gas Co.
115 Cheshire Road
Pittsfield, MA 01201
(413) 445-0383

Karen Mealey
Verizon
385 Myles Standish Blvd.
Taunton, MA 02780
(774) 409-3160

Jason Wing
Local Linx
30 Elmview Circle
Dover, NH 03820
(403) 538-4545

Mark Bonanno
Crown Castle
80 Central Street
Boxborough, MA 01719
(508) 616-7818

Pat O'Malley
Charter Communications
301 Barber Avenue
Worcester, MA 01606
(774) 243-9787

Tom Brennan
Five Colleges Inc
97 Spring Street
Amherst, MA 01002
tebrennan@fivecolleges.edu

Elizabeth Glidden
Verizon Wireless Small Cell
20 Alexander Drive
Wallingford, CT 06492
elizabeth.glidden@vzw.com

Sandra Sheehan
PVTA
2808 Main St
Springfield, MA 01036
(413) 732 6248 Ex. 216
ssheehan@pvta.com

Paul Burns-Johnson
PVTA
2808 Main St
Springfield, MA 01036
(413) 732 6248 Ex. 2230
pburns@pvta.com

NOTICE TO OWNERS OF UTILITIES (Continued)

See following link for latest contact information:

https://www.mass.gov/orgs/highway-division

Under Featured topics/Highway Construction Resources:
Select "Highway Utility Relocation" link, then select "Utility contacts by district and municipality" then select District 2, then select the Town of Hadley, and then
Select Utility Contacts

MassDOT District Utility and Constructability Engineer (District 2)

Paul Kelly Paul.Kelly@state.ma.us Telephone No. (413) 582-0587

EVERSOURCE EMERGENCY TELEPHONE NUMBERS

ELECTRIC:
Outage/ Emergency: 800-592-2000 or 844-726-7562
New Service: 1-888-633-3797 (1-888-need pwr)
Customer Support: 1-800-340-9822

BERKSHIRE GAS EMERGENCY TELEPHONE NUMBERS

GAS:
Outage/Emergency: 1-800-292-5012 or 413-499-1680
New Service: 1- 800-297-7144
Customer Support: 1-800-292-5012

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL

(02/06/2020)

Demolition and work involving painted steel shall conform to the requirements of Subsection 961 of the Standard Specifications.

Work Involving Painted Steel

Hazardous materials shall be removed in the immediate area of any intended welding, heating, saw cutting or burning of steel. Hazardous material removal is required to allow the demolition of structural steel, railings, drainage systems, utility supports, steel lamp posts, etc.

The contractor shall assume that the coatings on the steel contain lead (Pb), unless otherwise determined by testing. The contractor shall certify in writing to the Engineer the results of all testing, and shall also certify that any lead (Pb) coated steel removed from the project was not reused or buried, but was sent to a scrap metal recycling facility.

Implement and maintain programs and procedures, which comply with the requirements of this specification and all applicable standards and regulations. Comply with all applicable regulations even if the regulation is not specifically referenced herein. If a state or local regulation is more restrictive than the regulation of this specification, follow the more restrictive requirements.

This requirement is intended only for the demolition and preparation prior to repair and does not include provisions for recoating of steel.

Environmental

All applicable portions of Subsections 961.65 “Worker Protection” and 961.66 “Environmental Protection and Monitoring” shall be followed when performing this work.

During chemical stripping a hand washing facility may be used in lieu of a decontamination/changing facility.

Hazardous material shall be collected during the disassembly and disposed of as outlined in Subsection 961.68 “Handling of Hazardous Waste and Reporting Release Programs”.

The applicable submittals shall be according to Subsection 961.69 “Submittals”.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL (Continued)

Cleaning/Removal

Cutting Or Burning Of Steel

All surfaces to be welded, heated, saw cut or burned shall be cleaned so as to remove all contaminants and/or hazardous materials, which could be discharged to the environment as a function of the subsequent operations.

Lead paint shall be removed in its entirety in an area prescribed by a 6 inch (15 cm) minimum offset from the required work. The paint removal operation may be dry abrasive blasting, wet abrasive blasting or chemical stripping.

Proper level of containment shall be used when performing this work in accordance with Subsection 961.67 "Containment". Full containment is not required during chemical stripping operation however; the Contractor shall install proper shielding and/or tarpaulins under the chemical stripping operations in order to catch all debris generated during this procedure. A cleaned area must be inspected and approved before the demolition operations are started.

During cleaning operations the Contractor shall be required to furnish and erect temporary floodlights illuminating the steel surface at a minimum of 30-foot candles. This lighting shall be used in areas where there is insufficient lighting for proper cleaning operations and inspection. The Contractor shall supply electrical power.

The Contractor shall provide support for interim and final inspection of the bridge during cleaning operations. This support shall include the necessary traffic controls and safe access to the work.

Mechanical Disassembly Of Steel

All surfaces to be mechanically disassembled by shear cutting or removing bolts or rivets shall not require deleading. When shear cutting or removing bolts or rivets, the Contractor shall not use any method that will cause dust and/or particles to be emitted and/or dispersed into the environment to an extent that would expose the workers above the Action Levels of 30µg/m3.

For purposes of limiting the lead (Pb) dust, the Contractor will be required to dampen the lead paint work areas.

The contractor shall install a proper shielding and/or tarpaulins under all lead-paint-coated surfaces to be shear cut or bolts or rivets ordered removed in order to catch any loose lead paint chips, dust or particles.

PIGEON WASTE

The Contractor shall remove and dispose of the pigeon waste and any other debris accumulated on the steel members and bridge seats in areas where work is being performed. Pigeon waste and debris material contaminants will require special handling and disposal in accordance with all Federal, state, and local requirements. No separate payment will be made for removal and disposal of pigeon waste. Cost shall be incidental to the contract pay items.

EMERALD ASH BORER ADVISORY

To the extent possible, all trees and brush shall be disposed on site, typically chipped and spread in place. When trees or brush must be removed, such as in urban, or otherwise populated areas, Contractor shall identify proposed location for disposal, and provide written notification to the Engineer for approval. Disposal shall be in city or town of project, or at minimum, within county, of construction operations.

WORK SCHEDULE

All proposed work hours shall conform to Subsection 7.09 of the Standard Specifications and be subject to the written approval of the Engineer.

The work on this project is allowed to be done between 7:00 am to 3:30 pm, Monday through Friday, with the Prime Contractor and all Subcontractors working on the same shift. Set-up and removal of all equipment and materials for construction and / or traffic maintenance shall be done only during working hours for the particular work being done. The roadway shall be free of the Contractor's personnel and operations during non-work hours. Work at night will be allowed with the prior written permission and approval of the Engineer and RE, and shall be done between 7:00 pm and 5:30 am, Monday night through Friday morning.

The Contractor shall give notice to the Engineer at least 48 hours in advance of beginning any work affecting maintenance to traffic, where work affects any street in use by the public. The Contractor shall not proceed with surfacing operations without specific notice to and approval of the Engineer.

The Contractor is advised that for certain specific activities, their work hours will be restricted to low-volume time periods. These specific activities may include but not be limited to: prestressed beam delivery and installation; crane picks; certain demolition operations such as deck slab removals; and beam erection. The Contractor shall provide to the Engineer at least 1 week in advance a written request specifying the specific construction activity and specific low-volume time periods for the restricted activity. The time periods may take place during weekends or overnight, and shall be reflected in the Contractor's Schedule of Operations.

The duration of work for this contract was developed with the inclusion of various items of work continuing through the winter months.

PROVISIONS FOR TRAVEL AND PROSECUTION OF WORK

The Contractor shall furnish and install proper shielding under the bridge structure to prevent any debris from falling to the river below.

The Contractor shall close off the bridge construction area completely by using temporary chain-link fence. The fence shall have gates to permit the Contractor's personnel and equipment access to the site. Should the Contractor provide openings for access/egress to the work area through sections of temporary concrete barrier runs, the Contractor shall be responsible to ensure that no barrier or fence blunt ends are exposed to vehicular traffic unless temporary impact attenuation, approved by the Engineer, has been provided to protect the traveling public from said blunt ends.

At the end of each work day, the Contractor shall verify that no openings in the fence are present, and that all gates are chained and padlocked. In the event that the fence is vandalized or damaged by any means, the Contractor shall be responsible for replacing such by end of same workday, to the Engineer's satisfaction.

Roadways not affected by the bridge construction shall remain open to traffic at all times during the period of time required for the completion of work, unless otherwise shown on the Plans or required by the Engineer.

SUBSECTION 8.06 - LIMITATIONS OF OPERATIONS

1. For landscaping/planting, Work allowed from April 1 to June 1 and August 15th to October 15.
2. Winter weather sensitive work: concrete work, soil compaction, etc. Work allowed from March 16 to November 30.
3. Winter Work of Hot Mix Asphalt (HMA) Base Paving. Work allowed from April 1 to November 15.
4. Weekend work calendar, with hours from Saturday night at 1AM to Monday Morning at 5AM, with prior approval.
5. Contractor to provide access to various utility companies for performance of their work based on the scope and duration identified in the Project Utilities Coordination (PUC) form.

HANDLING OF HAZARDOUS MATERIALS

Disposal of Treated Wood Products

Wood is present on the bridge to be demolished as a remaining form, and as an enclosure for the existing utility conduit. This wood is likely to have been treated with hazardous chemicals. All potentially-treated wood will be handled as described in Item 184.1, Disposal of Treated Wood Products found later in these provisions.

Asbestos-Containing Materials

The Contractor is advised of the potential for asbestos-containing materials (ACM) in the existing coatings or wrappings around the water main on the bridge to be demolished. Item 182.1, Inspection and Testing For Asbestos, as well as removal of asbestos items, are included in this Contract, as described later in these provisions. It is also the Contractor's responsibility to evaluate all underground utility conduit that will be impacted (cut, crushed, disposed of, etc.) for the potential for ACM as part of the project.

Oil and Hazardous Materials DEP Listed Sites

The Contractor is advised that it is the Contractor's responsibility to properly implement this project's Environmental Health and Safety Program (EHASP) described in Item 180.01, Environmental Health and Safety Program, when working in the areas where OHM contamination may be encountered.

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION

The northern long-eared bat (*Myotis septentrionalis*; NLEB) and tricolored bat (*Perimyotis subflavus*; TCB) are listed as federally endangered or proposed endangered, respectfully, under the Endangered Species Act (ESA). The U.S. Fish and Wildlife Service (USFWS) developed this guidance to address ESA compliance and promote conservation of NLEB and TCB. This project has been consulted with the USFWS through the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and Federal Transit Administration (FTA) Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and Northern Long-Eared Bat revised February 5, 2018 and amended March 31, 2023.

On June 16, 2023, Tetra Tech, on behalf of MassDOT Highway Division Environmental Services, conducted a northern long-eared bat summer presence/absence survey using acoustic detection methods, in accordance with the 2022 survey guidelines. The survey confirmed the presence of NLEB and/or TCB, and as stated within the survey guidelines, the survey is valid for five years. If additional stressor producing work is proposed by the Contractor past this date, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.

The project is eligible for a May Affect, Not Likely to Adversely Affect (NLAA) determination, with Avoidance and Minimizations Measures (AMMs), in accordance with the FHWA, FRA and FTA Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat. On behalf of FHWA, the lead federal agency for Section 7 consultation, MassDOT submitted a Programmatic Consultation for Transportation Projects affecting NLEB or Indiana Bat to the USFWS through the Information for Planning and Consultation (IPaC) webpage and generated a NLAA documentation letter (see Document A00844). Therefore, the project has completed Section 7 consultation through the ESA.

In advance of the uplisting of the TCB to endangered under the ESA, the following Avoidance and Minimization Measures (AMMs) must be strictly adhered to in order to protect NLEB and TCB and to be in compliance with the ESA. Contact MassDOT Environmental Services - Wildlife Unit Supervisor for questions about project limits, restrictions, or conservation measures.

General AMM

- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and TCB, including all applicable AMMs. NLEB and TCB information (https://www.fws.gov/midwest/endangered/mammals/nleb/ and https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus) shall be made available to all personnel.

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION (Continued)

Lighting AMMs

- Direct temporary lighting away from suitable habitat during the active season: **April 1 to October 31.**
- When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable.

Bridge AMM

- On June 16, 2023, Tetra Tech on behalf of MassDOT Highway Division Environmental Services, conducted a northern long-eared bat bridge/structure bat assessment, in accordance with the USFWS guidelines. The assessment did not find presence of, or evidence of use by bats, and as stated within the guidelines, the assessment is valid for two years. If bridge work is not complete before June 16, 2025, assessment of the bridge for the presence of, or evidence of use by, bats shall be completed by contractor/consultant/DOT prior to continuing bridge work. The Contractor shall notify the MassDOT Wildlife Unit no later than fourteen (14) days prior to to June 16, 2025 to provide adequate time for inspection. If bats are found to be present, or, if there is evidence of bat usage, work at the bridge shall not commence until after the MassDOT Wildlife Unit has completed coordination with the US Fish and Wildlife Service to determine the appropriate follow up or mitigation actions.

Tree Removal AMMs

- *If additional cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.*
- Ensure tree removal is limited to that specified in project plans and ensure that contractors understand clearing limits and how they are marked in the field (e.g., install bright colored flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits).
- No tree cutting shall be conducted during the active season: **April 1 to October 31.**
- No tree cutting shall be conducted during the active season: **April 1 to October 31**, or if cutting inside of this timeframe is required, tree removal is limited to 10 or fewer trees per project at any time of year within 100 feet of existing road/rail surface and outside of documented roosting/foraging habitat or travel corridors; and a visual emergence survey must be conducted by *MassDOT Highway Division's Environmental Services Section or appointed representative* with no bats observed.
- Do not remove **documented** or NLEB and/or TCB roosts that are still suitable for roosting, or trees within 0.25 miles of roosts, or **documented** foraging habitat any time of year.
- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and/or TCB, including the **TOY** restriction. If this restriction needs to be waived at any location(s) the Resident Engineer shall send a locus map of the proposed work to MassDOT Highway Division's Environmental Services Section for review and a determination if the restriction can be waived.

DEP - WATER QUALITY CERTIFICATE

This project is subject to the Massachusetts Clean Water Act, M.G.L.e.21, §§ 26 through 53 and has been issued a Water Quality Certificate ("WQC") by the Department of Environmental Protection. The WQC and Application are to be considered part of this Contract and a copy of the WQC and all plans/attachments shall be on-site while activities regulated by the WQC are being performed. The Contractor's attention is directed to the fact that special conditions and other requirements are associated with this WQC and Application. It is the Contractor's responsibility to be aware of and comply with these conditions and requirements and plan his or her work and schedule accordingly. **The Contractor is hereby notified that he or she will be responsible and held accountable for performing any and all work necessary to satisfy and comply with the entire WQC and Application.** If the Contractor initiates any changes or modifications to the WQC, he or she shall be responsible for obtaining any amended or additional environmental permits. MassDOT will not be responsible for any time delays or monetary claims associated with permit modifications initiated by the Contractor. The Contractor is advised that no additional compensation will be allowed for work required to establish, achieve, and maintain compliance with the WQC and Application, as payment for the work shall be included in the various bid items. This work may include, but is not limited to, the following: the hiring and paying for the services of a Professional Biologist, Botanist, Wetland Scientist, Engineer, Landscape Architect, etc.; preparation and submission of as-built plans; wetland flagging; wetland replication monitoring reports, etc.

ARMY CORPS OF ENGINEERS PERMIT

This project is subject to Section 401 of the federal Clean Water Act, 33 U.S.C. 1251 *et seq* and has been issued a General Permit (GP) by the Army Corps of Engineers. The GP and the respective Application are to be considered part of this contract and a copy of the GP and all plans/attachments shall be on-site while activities regulated by the GP are being performed. The Contractor’s attention is directed to the fact that specific time restrictions for work in water and other conditions/requirements may be associated with the GP and Application. It is the Contractor’s responsibility to be aware of and comply with these restrictions and requirements and plan his/her work and schedule accordingly. **The Contractor is hereby notified that he/she will be responsible and held accountable for performing any/all work necessary to satisfy and comply with the entire GP and respective Application**. Arrangements to view the GP and/or Application can be made by calling the District #2 Environmental Section at (413) 582-0542. If the Contractor wishes to obtain copies, s/he shall do so at his own expense. For a Self Verification (SV) Projects, Appendix C must be completed and submitted as required. For Pre-Construction Notification (PCN) Projects, The Work-Start Notification Form and the Compliance Certification Form (both provided with the PCN authorization Letter) shall be completed and returned to the Corps. The Contractor is advised that no additional compensation will be allowed for work required to establish, achieve, and maintain compliance with the GP and Application, as payment for the work shall be included in the various bid items, unless specified elsewhere. This work may include, but is not limited to, the following: preparation and submission of as-built plans; wetland replication monitoring reports, etc.; preparation and submission of as-built plans; wetland flagging; wetland replication monitoring reports, etc.

ENVIRONMENTAL PERMITTING

If Contractor erection, demolition, storage, or other procedures not originally allowed by existing environmental permits require work to occur in or otherwise impact water or wetland resource areas, the Contractor is advised that no associated work can occur until all required environmental permits have been either amended or obtained allowing such work. The Contractor must notify the District #2 Highway Director and Resident Engineer in writing at least 60 days prior to desired commencement of the proposed activity. All environmental submittals, including any contact with Local, State, or Federal environmental agencies, must be coordinated through the District #2 Environmental Engineer. The Contractor is expected to fully cooperate with requests for information and provide same in a timely manner. The Contractor is further advised that the Department will not entertain a delay claim due to the time required to modify or obtain the environmental permits.

EQUIVALENT SINGLE AXLE LOADS (ESALS)

The estimated traffic level to be used for SUPERPAVE HMA mixture designs for this contract, expressed in Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is 1.7 Million 18-kip (80-kn) ESALs.

VALUE ENGINEERING CHANGE PROPOSAL

This Subsection defines the conditions and requirements which apply to Value Engineering Change Proposals ("VECPs"). The purpose of this provision is to encourage the Contractor to propose changes in certain project requirements that will maintain the project's functional requirements at a savings in contract time, contract price, or both. The net savings obtained by using a VECP that meets the conditions and requirements set forth here will be shared by the Contractor and MassDOT.

VECP's under this provison are to be initiated, developed and submitted to MassDOT by the Contractor. The VECP must show the contemplated changes to the Drawings, Specifications and other requirements in the Contract. When a VECP submitted pursuant to this section is fully accepted by MassDOT, the VECP will be implemented by the Contractor and paid using the current cost and resource loaded schedule. Contractor shall demonstrate that the VECP is equal to, or better than, the original design or material; that there is an interest in public safety within the VECP; that there is a life-cycle cost benefit; and/or that end users will benefit from the shortened schedule. VECPs shall be consistent with the MassHighway/MassDOT Standard Specifications for Highways and Bridges and other applicable reference documents and directives. Any proposed deviation from these documents will need to be clearly identified in the VECP Proposal Documents, and must be approved by MassDOT's Chief Engineer before accepting this VECP.

A. In order to be considered for MassDOT review each VECP shall:
   1. Be clearly labeled pursuant to this Subsection;

   2. Yield a net savings at least two hundred and fifty thousand (250,000.00) Dollars and/or a net saving of contract completion duration of at least three (3) months;

   3. The proposed changes to contract items must:

      a. maintain the specified items' required functions (service life, reliability);

      b. meet applicable safety regulations and codes;

      c. material substitutions must be in accordance with DOT prequalified/preapproved products and must be tested in accordance with standard material specs/testing methods (and considering all relevant environmental, load, and other relevant factors);

      d. show economy of operation, ease of maintenance, ease of construction, and necessary standardized features and appearance; and

   4. Shall not require an extension of Contract Time or Contract Milestones, with the exception of cases when there are anticipated significant cost saving.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

The thresholds above are considered to be a general guideline. MassDOT will consider VECPs outside of these thresholds if a significant benefit is demonstrated. Additionally, notwithstanding this VECP process, MassDOT will consider minor revisions in the form of a Contract Modification.

Further, any VECP submitted shall be in sufficient detail to clearly define the proposed change. The Contractor's failure to provide information of the type, detail and in a format to facilitate the MassDOT's review, may be grounds for rejection of the VECP. Additionally, the Contractor will not be entitled to any equitable adjustment or increased Time, due to any aspect of any of the proposed VECP including permitting, right of way, utility coordination or delayed responses by MassDOT. If, after the progression of the work associated with the executed Contract Modification for the VECP, any additional costs are realized by the Contractor or any of the sub- consultants, sub-contractors, or suppliers, the Contractor shall be obligated to pay for any and all costs.

B. The following initial items shall be provided by the Contractor for MassDOT's review. *Items 1-6 need to be submitted prior to the start of MassDOT's review of the VECP and item 7 is an important consideration for the pricing of the VECP and the timeline of the proposed VECP schedule.*

1. ***VECP Description***: A description of the difference between the existing and the proposed Contract requirements, and the comparative advantages and disadvantages of each;

2. ***VECP Change Listing***: A listing of the Contract requirements that will need to be changed, modified, or reviewed as well as the proposed Contract document changes in the Instructions to Bidders, Contract, Standard Specifications, General Requirements and Special Provisions required by the VECP.

3. ***Construction Schedule Update*****:** Any changes in the Contract Time(s) or Contract Milestone(s), that will result from acceptance of the VECP, shall be accompanied by a contemporaneous schedule analysis *(i.e, the Contractor's baseline schedule submission, all past/required monthly schedule updates, a detailed assessment of all past delays, and a resource loaded Crticial Path Method schedule as specified in Section 8.0 / Subsection 8.02 of this Contract)* of the projected Work that remains including the proposed VECP related schedule changes *(inclusive of the timeline to review accept the VECP and the timeline for implementing the design changes)* in the remaining work. This shall be submitted in the form of a Proposal Schedule until the VECP has been formally accepted. Note: All of this information is to be updated, recertified, and formally accepted by MassDOT before final acceptance of this this VECP is issued.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

4. ***Date for MassDOT's Acceptance***: A statement that clearly justifies the date by which the VECP must be accepted to obtain the maximum price reduction, noting any effect upon the Contract Time(s) and/or Contract Milestone(s). This statement must include a narrative that demonstrates the most recent construction schedule has been utilized to justify that proposed acceptance date *(e.g. "in order to start to fabricate critical materials, authorization must be provided to work on the shop drawings by no later than [date]").* The Contractor should allow for at least sixty (60) to ninety (90) days for acceptance by MassDOT once all of the VECP documentation has been provided. Acceptance shall mean that MassDOT has received a finalized and executed contract modification. However, this is a proposed Contract change.

   The Contractor is fully obligated to progress the Work of the original Contract and MassDOT is not liable for any delays or costs that may occur in the review phase of any VECP proposal.

5. ***Cost and Savings Estimates***: A detailed estimate of the anticipated net savings, calculated as follows:

   a. ***Original Scope:*** Isolate the cost of performing the original contract construction activities, in accordance with the original Contract Documents, as originally bid by the Contractor, that are anticipated to be superseded by the VECP. *This cost is to include any original contract scope that is anticipated to be altered or eliminated by the VECP such as, shop drawing preparation, inspection work, testing, maintenance of traffic, or any other original contract costs, that have yet to have been performed at the time of this VECP submission.*

   b. ***New VECP Scope:*** Calculate the cost of performing the comparable construction activities associated with the VECP.

   c. ***Contractor's Engineer & Inspection***: Calculate the cost of engineering, inspection, and design work by the Contractor's Engineer/Designer. This should be a realistic estimate of the costs of any required engineering, design and review work by the Contractor's Engineer.

   d. ***MassDOT's Costs:*** MassDOT's estimate of costs to perform engineering/design reviews, cost estimate reviews, schedule reviews, and any other administrative costs to review and recommend implementation of the proposed VECP. *(including all anticipated increased costs to MassDOT on other Contracts and all anticipated follow-on increased costs to MassDOT, if any)* as provided by MassDOT. MassDOT's estimated costs must be included the VECP calculation and will be provided by MassDOT in support of the VECP evaluation process.

   e. ***Other Costs:*** Estimated costs associated with any revisions to other project related costs, such as Environmental Permits or Right of Way acquisitions, including other agency or municipality costs, as provided by MassDOT.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

Net Savings:
The net savings to be split between MassDOT and the Contractor shall be calculated using the items above as follows: a - (b+c+d+e) = net savings

6. *The Contractor shall also provide:*

   a. A proposed Change Order, which explains and justifies any required Equitable Adjustment in the Contract Price.

   b. The Contractor's actual costs expended for developing the VECP as of the date of the VECP submission;

***7. Design Changes and Drawings*:** The costs that are outlined above should be inclusive of the following design and engineering responsibilities.

   a. Design changes shall be prepared and stamped by the Contractor's professional designer and/or engineer. In addition, in the development of the VECP; the Contractor is responsible for anticipating and managing all aspects associated with any VECP design work that must be performed by a licensed Engineer.

   b. The Contractor's engineer must analyze and stamp all components of any aspect of the project that has been redesigned, changed, or altered as a result of this VECP.

   c. The Contractor's engineer shall provide all calculations and supporting design/engineering documentation that was utilized to develop the changes and stamped drawings. These will be used by MassDOT's Designer-of-Record to review the VECP changes. The Contractor is limited to selecting only those engineer's that have been pre-qualified by MassDOT's A&E Board.

   d. MassDOT's Designer-of-Record will review and respond to all completed design submissions related to this VECP within thirty (30) calendar days, unless determined to be a non-critical path item.

   e. MassDOT will be responsible for estimating and managing MassDOT's Designer-of-Record during the VECP review and implementation. Should any significant conflicts arise, between the Contractor's Engineer and MassDOT's Designer-of-Record, the DOT and the Contractor will work expeditiously to resolve the conflict. Should this type of conflict continue for greater than five (5) days, the Contractor is to bear all financial and time related impacts of such delay and must seek to resolve the design conflict, in an acceptable manner to MassDOT. The resolution of this conflict will be funded at the Contractor's expense – exclusive of the net saving that was agreed to at the execution of the contract modification for this VECP.

   f. The Contractor's Engineer may also be required to inspect the construction work. The Contractor is to include such anticipated inspection costs in the initial VECP.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

g. MassDOT's Designer of Record will remain the Designer-of-Record for the entire Project. Any costs incurred in the use of MassDOT's Designer-of-Record by MassDOT or Contractor associated with the review of a VECP are to be included in the calculated net savings.

C. Approval of the VECP shall not occur until a Contract Modification, incorporating the VECP, is issued by MassDOT and properly executed by the Contractor. MassDOT may accept or reject part or all of any VECP at any time prior to an executed Contract Modification for the applicable VECP. The decision of MassDOT, concerning acceptance or rejection of any VECP, shall be final and shall not be subject to dispute resolution.

It is expected that several weeks may go by before the final VECP documentation has been executed with a Contract Modification. Therefore, MassDOT intends to make certain that the initial cost estimate information has not changed before entering into a Contract Modification. As the VECP evaluation process is finalized, and prior to the signed Contract Modification for the VECP, the Contractor and MassDOT must re-certify the current status of the originally proposed cost and/or schedule savings.

Until a contract modification is issued and schedule and cost/savings re-certification is complete and accepted by MassDOT, the Contractor shall remain obligated to perform the Work in accordance with the terms and conditions of the original Contract Documents.

Upon completion of the work associated with the VECP, MassDOT may require verification that the VECP savings has been achieved.

D. VECPs will be processed (distributed, reviewed, commented upon, accepted or rejected) expeditiously (pursuant to M.G.L. c. 30, § 39R); however, as this is an elective modification to the contract, MassDOT shall not be liable for any delay or cost in the review and acceptance of the VECP. During the review of the VECP, the Contractor remains obligated to progress the original Contract scope, and schedule, as planned; until a Contract Modification, accepting the Contractor re-certified VECP, has been executed by MassDOT.

The Contractor has the right to withdraw part, or all of any VECP, prior to acceptance by MassDOT. Such withdrawal shall be made in writing to the Engineer. The Contractor shall state the period of time, from the date of the initial VECP submittal, that the VECP shall remain valid and feasible. Revision of this validity and feasibility period shall be allowed only by mutual agreement of the Contractor and the Engineer in writing.

If the Contractor desires to withdraw the proposal prior to the expiration of this period for non-technical reason, MassDOT reserves the right to recover all actual costs that have been incurred to MassDOT.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

If the Contractor withdraws the VEC Proposal, MassDOT reserves the right to proceed with the VECP or any portion of the VECP as a normal change and the Contractor waives any right it may have had to share in net savings thereunder.

For purposes of this provision, expiration of the time established by the Contractor for approval shall be considered as withdrawal by the Contractor if MassDOT requests an extension of that time and the Contractor does not provide a written extension.

E. With regard to unknown conditions or sub-surface work, in general, the expectation is that the Contractor and MassDOT will strive to gain enough knowledge about the risks in order to provide a forward-priced Change Proposal. Therefore, any costs to fully evaluate the proposal, such as additional borings and/or test pits, must be considered in the cost evaluation of whether the VECP is worth pursuing. However, if it is impractical to gather conclusive exploratory information, before the VECP is executed, MassDOT may consider provisions in the VECP that clearly identifies the risk sharing (cost and time) related specifically to the unknown/sub-surface conditions. If these VECP provisions are acceptable to MassDOT they are to include supplemental language to provide a determination of the final savings/cost, and time impacts, no later than 45 days after the sub-surface work is completed. All other aspects of the VECP, unrelated to these Provisions, will be binding upon execution of the VECP.

SECTION 722
CONSTRUCTION SCHEDULING
DESCRIPTION

722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded Construction Schedule as defined by the schedule type set forth below. These requirements are in addition to any requirements imposed in other sections.

This section establishes the requirement for scheduling submissions. There are four schedule types identified as types A, B, C and D.

All schedules shall be prepared and submitted in accordance with this specification and the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit.

Type A –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded & Resource Loaded CPM
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

Type B –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded & Resource Loaded CPM
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

Type C –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

SECTION 722 (Continued)

Type D -

- Bar chart schedule updated monthly or at the request of the Engineer
- Short-term Construction Schedule
- Monthly Projected Spending Report (PSR)

EQUIPMENT, PERSONNEL

722.40 General

A. **Software Requirements**

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Section 740 – Engineer's Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer's Field Office. The computer and software shall be maintained and serviced at no additional cost to the Department.

B. Scheduler Requirements

The Scheduler shall be approved by the Engineer.

For Type A, B and C Schedules the name of the Contractor's Project Scheduler together with his/her qualifications shall be submitted to the Department for approval by the Engineer within seven (7) Calendar Days after NTP. The Project Scheduler shall have a minimum of five (5) years of project CPM scheduling experience, three (3) years of which shall be on projects of similar scope and value as the project for which the Project Scheduler is being proposed. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

SCHEDULING METHODS

722.60 General

A. **Schedule Planning Session**

The Contractor shall conduct a schedule planning session prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

1. the Work to be performed by the Contractor and its subcontractors;
2. the planned construction sequence and phasing; planned crew sizes;
3. summary of equipment types, sizes, and numbers to be used for each work activity;
4. all early work related to third party utilities;
5. identification of the most critical submittals and projected submission timelines;
6. estimated durations of major work activities;
7. the anticipated Critical Path of the project and a summary of the activities on that Critical Path;
8. a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;

SECTION 722 (Continued)

9. a summary of the anticipated quarterly cash flow over the life of the project.

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

B. **Schedule Reviews by the Department**

1. Baseline Schedule Reviews
   The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Rejected Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.
2. Contract Progress Schedule / Monthly Update Reviews / Recovery Schedules
   The Engineer will respond to each submittal within twenty-one (21) Calendar Days. Rejected schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

The Engineer's review comments shall not be construed as direction to change the Contractor's means and methods. The review and acceptance of the CPM schedule does not relieve the Contractor of the responsibility for accomplishing the work within the contract required completion dates. Omissions and errors in the accepted CPM schedule shall not excuse performance less than that required by the Contract.

722.61 Schedule Content and Preparation Requirements

All schedules shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:
https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit
and the following:

A. **LOGIC**

The schedules shall divide the Work into activities with appropriate logic ties to show:

1. conformance with the requirements of this Section and Division I, Subsection 8.02 - Schedule of Operations
2. the Contractor's overall approach to the planning, scheduling, and execution of the Work
3. conformance with any additional sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

SECTION 722 (Continued)

B. **ACTIVITIES**

The schedule shall clearly define the progression of the Work from the Notice to Proceed (NTP) to Contractor Field Completion (CFC) by using separate activities, or including attributes within appropriate activities, to address each of the following:

1. Notice to Proceed
2. Work Breakdown Structure
3. The Critical Path is clearly defined and organized.
4. Float shall be clearly identified.
5. Detailed activities to satisfy permit requirements.
6. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
7. The preparation and submission of shop drawings, procedures, and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable.
8. The review and return of shop drawings, procedures, and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer.
9. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
10. Each component of the Work defined by specific activities.
11. Right-of-Way (ROW) takings that have been identified in the Contract.
12. Early Utility Relocation (by others) that has been identified in the Contract.
13. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
14. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Section 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
15. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
16. Limitations of Work – time of year restrictions and any other limitations identified in the contract
17. Traffic work zone set-up and removal, night work and phasing
18. Material Certifications
19. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
20. For Type A and B Contracts only: All items to be paid for, including all Unit Price and Lump Sum pay items, shall be identified by activity. This shall include all non-construction activities such as engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

SECTION 722 (Continued)

21. Contractor's request for validation of FBU (ready to open to traffic)
22. Full Beneficial Use (FBU) Contract Milestone per the following requirements: The majority of contract Work has been completed and the asset(s) has been opened for full multi-modal transportation use, except for limited contract work items that do not materially impair or hinder the intended public use of the transportation facility. All anticipated lane takings have been completed, except for minor, short term work items and as defined in Subsection 8.03 - Prosecution of Work
23. The Department's confirmation of completed work to allow for FBU.
24. Contractor's request for validation of Substantial Completion
25. Department generated punch list of twenty-one (21) Calendar Days
26. Substantial Completion Contract Milestone as defined in the standard specifications.
27. Punch list Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes
28. Contractor confirmation that all punchlist work and documentation has been completed.
29. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
30. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
31. Contractor Field Completion Contract Milestone (which can also be considered the completion date) per the following requirements: All physical contract Work is complete including punchlist. The Contractor has fully de-mobilized from field operations and as defined in Subsection 5.11

C. **EARLY AND LATE DATES**

Early Dates shall be based on proceeding with the Work or a designated part of the Work exactly on the date when the corresponding Contract Time commences. Late Dates shall be based on completing the Work or a designated part of the Work exactly on the corresponding Contract Time, even if the Contractor anticipates early completion.

D. **DURATIONS**

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration of resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

SECTION 722 (Continued)

Should there be an activity with a duration that is determined by the Engineer to be unreasonable, the Contractor will be asked to provide a basis of the duration using bid documents, historic production rates for similar work, or other form of validation that is acceptable to the Engineer. Should the Contractor and the Engineer be unable to agree on reasonable activity durations, the Engineer will, at a minimum, note the disagreement in the Baseline Schedule Review along with a duration the Engineer considers reasonable and the basis for that duration. A schedule that contains a substantial number of activities with durations that are deemed unreasonable by the Engineer will not be accepted.

E. MATERIALS ON HAND

The Contractor shall identify in the Baseline Schedule all items of permanent materials (Materials On Hand) for which the Contractor intends to request payment prior to the incorporation of such items into the Work.

F. ACTIVITY DESCRIPTIONS

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label.

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

I. CALENDARS

Different calendars may be created and assigned to all activities or to individual activities. Calendars define the available hours of work in each Calendar Day, holidays and general or project-specific non-Work Days such as Fish Migration Periods, time-of-year (TOY) restrictions and/or area roadway restrictions. All calendars shall extend two years beyond the current project completion date.

Project Special Provisions identify specific calendar restrictions some examples of special calendars include, but are not limited to:

- Winter Shutdown Period, specific work is required by separate special provision to be performed during the winter. See Special Provision 8.03 (if applicable)
- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Planting seasons for trees, shrubs and grasses and wetlands mitigation work.

SECTION 722 (Continued)

- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods.
- Night-time paving and striping operations, traffic, and temperature restrictions.
- Utility Restrictions shall be as specified within the Contract.

J. **FLOAT**

For the calculation of float in the CPM schedule, the setting for *Retained Logic* is required for all schedule submissions, starting with the Baseline Schedule Submission. Should the Contractor have a reason to propose that an alternative calculation setting such as *Progress Override* be used, the Contractor shall obtain the Engineer's approval prior to modifying to this setting.

K. **COST AND RESOURCE LOADING (Types A and B only)**

For all Type A and B Schedules, the Contractor shall provide a cost and resource-loaded schedule with an accurate allocation of the costs and resources necessary to complete the Work. The costs and resources shall be assigned to all schedule activities in order to enable the Contractor to efficiently execute the Contract requirements and the Engineer to validate the original plan, monitor progress, provide cash flow projections, and analyze delays.

1. Each schedule activity shall have an assigned cost that accurately represents the value of the Work. Each schedule activity shall have its resources assigned to it by craft and the anticipated hours to accomplish the work. Each schedule activity's equipment resources shall be assigned to it by equipment type and hours operated. Front-loading or other unbalancing of the cost distribution will not be permitted.
2. The sum of the cost of all schedule activities shall be equal to the Contractor's Bid Price.
3. Indicating the labor hours per individual, per day, by craft and equipment hours/day will be acceptable.
4. The Engineer reserves the right to use the cost-loading as a means to resolve changes, disputes, time entitlement evaluations, increases or decreases in the scope of Work, unit price renegotiations and/or claims.
5. For all Type A and B Schedules, all subnets, fragnets, Proposal Schedules, and Recovery Schedules shall be cost and resource- loaded to help to quickly validate and monitor the duration of the Work to be performed.
6. For Type A Schedules, cost-loading of the schedule will also be used for cash flow projection purposes.
7. The cost-loading of each activity shall indicate the portion of the cost for that activity that is applicable to a specific bid item (cost account.) The total cost for each cost account must equal the bid item price.

SECTION 722 (Continued)

L. **NOT TO BE USED IN THE CONTRACTOR'S CPM SCHEDULE**

1. Milestones or constraint dates not specified in the Contract.
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer.
4. Delayed starts of follow-on trades.
5. Float suppression techniques.
6. Leads such as leads, lags, SS, SF, & FF relationships without the expressed permission of the Department.

722.62 Submittal Requirements

All schedules shall be prepared and submitted in accordance with the requirements listed below.

Each monthly Contract Progress Schedule submittal shall be uniquely identified.

Each Submission shall, at a minimum, include the following:

a. Narrative
b. Schedule submittals shall be signed by the Scheduler
c. Schedule Printout - All Activities
d. Schedule Printout - Critical Path Layout
e. Schedule Printout - Remaining Work
f. Schedule Printout - Top 3 Float Path
g. Work Breakdown Structure (WBS) Summary
h. Project Spending Report (PSR) in Portable Document Format (.PDF)
i. Project Spending Report (PSR) in Microsoft Excel spreadsheet (.XLS)
j. Oracle Primavera P6 Schedule File (.XER)

All digital file submittals will be labeled with the following information.

- Contract Number
- Project Number
- Project locations (i.e., town(s))
- Brief description
- Submittal description (i.e., UP07)
- Data Date (MM-DD-YY)
- File Description (i.e., Critical Path)

Example: C110464 (P606309) - Orange Route 2 over 202 – UP23 (07-15-22) - Critical Path

A. **Narratives**

A written narrative shall be submitted with every schedule submittal. The narrative shall:

1. itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress Schedule / Monthly Update or the Baseline Schedule, whichever is most recent.
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements.

SECTION 722 (Continued)

3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A – Notice of Delay.
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record.
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path.
6. provide a description of any possible considerations to improve the probability of completing the project early or on time.
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths.
8. describe the Contractor's plan, approach, methodologies, and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required.
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule.
10. describe any out-of-sequence logic and provide an explanation of why each out-of-sequence activity does not require a correction, if one has not been provided, and an adequate demonstration that these changes represent the basis of how these activities will be built, including considerations for resources, dependencies, and previously approved production rates.
11. identify any possible duration increases resulting from actual or anticipated unit price item quantity overruns as compared to the baseline duration, with a corresponding suggestion to mitigate any possible delays to the Critical Path. If the delay is anticipated to impact the Critical Path, refer to Subsections 4.06 – Increased or Decreased Contract Quantities and 8.10 – Determination and Extension of Contract Time for Completion and submit a letter to the Engineer notifying of a potential delay.
12. include a schedule log consisting of the name of the schedule, the data date and the date submitted.
13. include and describe any notifications, communications and coordination meetings with third-parties such as utility companies that occurred from the last update including personnel names, job titles and contact information, date of meeting(s)/correspondence(s), topics discussed, and reasons the third party provided for deviations from the PUC form.

SECTION 722 (Continued)

B. **CPM Bar Charts**

One (1) timescaled bar chart containing all activities shall be prepared and submitted using a scale that yields readable plots and that meets the requirements of Subsection 722.61 – Schedule Content and Preparation Requirements Activities shall be linked by logic ties and shown on their Early Dates. Critical Paths shall be highlighted, and Total Float shall be shown for all activities.

A second timescaled bar chart shall also be prepared containing only the Critical Path or, if the Critical Path is not the longest path, the Longest Path using a scale that yields readable plots and that meets the requirements of Subsection 722.61 – Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Total Float shall be shown for all activities.

C. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily read comparison of progress during the present and previous reporting periods.

D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)

With each Contractor Quantity Estimate (CQE), the Contractor shall submit an Activity Cost Report and Cash Flow Projection that includes all activities grouped by Contract Bid Item.

The Activity Cost Report shall be generated from the Schedule of Record and shall be the basis of the Monthly Cash Flow Projection. Within each contract Bid Item, activities shall be sequenced by ascending activity identification number and shall show:

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start, and finish dates for each completed activity.
4. any variance to the estimated contract quantity shall be shown.

E. Resource Graphs (Type A only)

Monthly and cumulative resource graphs for the remaining Contract period using the Early Dates and Late Dates in the Contract Progress Schedule shall be included as part of each schedule submittal.

SECTION 722 (Continued)

F. Projected Spending Reports

A Projected Spending Report (PSR) shall be prepared and submitted monthly. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF.

722.63. Progress Schedule Requirements

A. Baseline Schedule

The Baseline Schedule shall be due thirty (30) Calendar Days after Notice to Proceed (NTP). The Baseline Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving Extra Work Orders or any other type of alleged delay. The Baseline Schedule shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements. Once the Baseline Schedule has been accepted by the Engineer, with or without comments, it shall represent the as-planned schedule for the Work and become the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 722.63.C - Contract Progress Schedules / Monthly Updates, 722.64.C - Recovery Schedules and 722.64.D - Proposal Schedules.

The Cost and Resource-Loading information (Types A and B only) shall be provided by the Contractor within forty-five (45) Calendar Days after NTP.

The Engineer's review comments on the Baseline Schedule and the Contractor's responses to them will be maintained for the duration of the Contract and will be used by the Engineer to monitor the Contractor's work progress by comparing it to the Contract Progress Schedule / Monthly Update.

B. Interim Progress-Only Schedule Submissions

The first monthly update of the Contract Progress Schedule/Monthly Update is due within seventy (70) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule review period ends at sixty (60) Calendar Days after NTP, see Subsection 722.60.B - Schedule Reviews by the Department. If the Baseline Schedule has not been accepted within sixty (60) Calendar Days after NTP, an Interim Progress-Only Schedule shall be due within seventy (70) Calendar Days after NTP. The purpose of the Interim Progress-Only Schedule is to document the actual progress of all activities, including non-construction activities, from NTP until the Baseline Schedule is accepted.

SECTION 722 (Continued)

C. Contract Progress Schedules / Monthly Updates

The first Contract Progress Schedule shall be submitted by the Contractor no later than seventy (70) Calendar Days after NTP. The data date for this first Progress Schedule shall be two months (approximately sixty (60) Calendar Days) after NTP. Subsequent Progress Schedules shall be submitted monthly.

Each Contract Progress Schedule shall reflect progress up to the data date. Updated progress shall be limited to asbuilt sequencing and asbuilt dates for completed and inprogress activities. Asbuilt data shall include actual start dates, remaining Work Days and actual finish dates for each activity, but shall not change any activity descriptions, the Original Durations, or the Original Resources (as planned at the time of bid), without the acceptance of the Engineer. If any activities have been completed out-of-sequence, the Contractor shall propose new logic ties for affected in-progress and future activities that accurately reflect the previously approved sequencing. Alternatively, the Contractor may submit to the Engineer for approval an explanation of why an out-of-sequence activity does not require a correction and an adequate demonstration that the changes accurately represent how the activities will be built, including considerations for resources, dependencies, and previously approved production rates. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

No revisions to logic ties, sequence, description, or duration of future activities; or planned resource costs shall be made without prior approval by the Engineer.

Any proposed logic changes for in-progress or future activities shall be submitted to the Engineer for approval before being incorporated into a Contract Progress Schedule. The logic changes must be submitted using a Proposal Schedule or a schedule fragnet submission. Once approved by the Engineer, the Contractor may incorporate the logic in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

For any proposed changes to the original sequence, description or duration of future activities, the Contractor shall submit to the Engineer for approval an explanation of how the proposed description or duration change reflects how the activity will be progressed, including considerations for resources and previously approved production rates. Any description or duration change that does not accurately reflect how the activity will be progressed will not be approved by the Engineer. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

Contract Progress Schedules that extend performance beyond the Contract Time or beyond any Contract Milestone shall not be approved by the Engineer. The Contractor shall submit a Recovery Schedule, or a Time Entitlement Analysis, if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

SECTION 722 (Continued)

D. Short-Term Construction Schedule

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a spreadsheet format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule and may be at a greater level of detail. The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities. Short-Term Construction Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements.

722.64 Impacted Schedule Requirements

A. Notice of Delay

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within fifteen (15) of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor. Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such a delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

B. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) shall consist of a descriptive narrative, prepared in accordance with Subsection 722.62.A - Narratives, and an as-built CPM schedule, which may be in the form of a schedule fragnet that has been developed from the project's Contract Progress Schedule of Record, and illustrates the impact of a delay to the Critical Path, Contract Milestones and/or Contract Completion Date as required in Subsection 8.10 - Determination and Extension of Contract Time for Completion. TEAs shall also be used to determine the schedule impact of proposed Extra Work Orders (EWO) as also required in Subsection 8.10.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements and shall be based on the Contract Progress Schedule of Record applicable at the start of the delay or impact from an EWO. A TEA fragnet must start with a specific new activity describing the work contained in either a Notice of Delay previously submitted to the Department per Subsection 722.64.A - Notice of Delay or an EWO.

SECTION 722 (Continued)

TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fifteen (15) Calendar Days after a request for a TEA by the Engineer for any other reason.

A TEA shall be submitted to the Engineer before any Time Extension is granted to the Contractor. Time Extensions will not be granted unless the TEA accurately reflects an evaluation of all past delays and the actual events that occurred that impacted the Critical Path. The TEA must also demonstrate a plan for the efficient completion of all of the remaining work through an optimized CPM Schedule. The analysis shall include all delays, including Contractor-caused delays, and shall be subdivided into timeframes and causes of delays.

TEAs shall incorporate any proposed activities, logic ties, resource considerations, and activity costs required to demonstrate the schedule impacts most efficiently in addition to detailing all impacts to existing activities, logic ties, the Critical Path, Contract Milestones, and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, restraints, and activity costs, necessitated by an Extra Work Order or other schedule impact, for the completion of the remaining work. The Contractor shall provide TEAs that demonstrate that all delays have been mitigated to the fullest extent possible without requiring an Equitable Adjustment to the original bid basis.

All TEAs shall clearly indicate any overtime hours, additional shifts and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. The Engineer shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions if it is determined to be in the best interest of the Department to do so.

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates. During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

The Engineer may request that the Contractor prepare a Proposal Schedule or a Recovery Schedule to further mitigate any delays that are shown in the accepted TEA or Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Contract Progress Schedules that predict performance extended beyond the Contract Time or beyond any Contract Milestone shall not be approved as the schedule of record. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

The Contractor shall submit a Recovery Schedule within fifteen (15) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates unless a recovery schedule is waived by the Department. Waiving the recovery schedule does not relieve the contractor of the responsibility for the delay. The Department may revoke the waiver of a Recovery Schedule, at which time a Recovery Schedule shall be submitted within fifteen (15) Calendar Days of the Contractor being notified.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

SECTION 722 (Continued)

D. Proposal Schedules

A Proposal Schedule is an alternative schedule used to evaluate proposed changes to the Contract scope or significant alternatives to previously approved approaches to complete the Work, which may include changes to activity durations, logic, and sequence. For Types A and B Schedules, the Proposal Schedule shall be cost and resource loaded.

A Proposal Schedule may be requested by the Department at any time or may be offered by the Contractor. The Engineer may request that the Contractor prepare a Proposal Schedule to further mitigate any delays that are shown in an accepted TEA or Contract Progress Schedule.

The Contractor shall submit the Proposal Schedule within thirty (30) Calendar Days of a request from the Department.

The Proposal Schedule shall not be considered a Schedule of Record until the logic, durations, narrative, and basis of the Proposal Schedule have been accepted by the Engineer. If the Proposal Schedule took the form of a fragnet, it must be incorporated into the Contract Progress Schedule of Record showing the current progress of all other activities and the impacts/results of the changes made by the Proposal Schedule before the Proposal Schedule is accepted by the Department.

Proposal Schedules shall clearly indicate any proposed acceleration including overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. Proposal Schedules that contain a cost element shall be submitted with a separate Cost Proposal.

Changes represented in the accepted Proposal Schedules shall be incorporated into the next Contract Progress Schedule. During the review of any Proposal Schedule, all Contract Progress Schedules shall continue to be required every month.

E. Disputes

All schedules shall be submitted, reviewed, dispositioned, and accepted in the timely manner specified herein so as to provide the greatest possible benefit to the execution of this Contract.

The Contractor may dispute a decision by the Engineer by filing a claim notice within seven (7) days after the Contractor's request for additional time has been denied or if the Contractor does not accept the number of days granted in a time extension. The Contractor's claim notice shall include a revised time entitlement analysis that sufficiently explains the basis of the time-related claim. Failure to submit the required time entitlement analysis with the claim notice shall result in denial of the Contractor's claim. A determination on the Contractor’s claim shall be in accordance with Subsection 7.16 Claims of Contractor for Compensation. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

SECTION 722 (Continued)

722.65 Schedule Type D Requirements

This section is to detail the requirements for Type D Schedules and is separate from the requirements listed above. These schedules are intended for a project in which a more formal schedule would not be practical.

Schedules for Type D projects shall be submitted for each work assignment. The Schedule Type D shall be submitted electronically in .XLS and .PDF format and meet the following requirements.

The schedule requirements for work assignments that are anticipated to last three weeks or less shall conform to the requirements for Short-term Construction Schedules below.

Work assignments that are anticipated to last longer than three weeks shall submit a bar chart baseline and provided update schedules upon request of the engineer as required under Bar Chart Schedule below in addition to meeting the Short-term Construction schedule requirements.

A. **Bar Chart Schedule**

A Bar Chart that shall include the following:

- Work Assignment start date.
- Activities to identify.
  - Major work operations broken down to be no longer than 14 days.
  - Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
  - The preparation and submission of shop drawings, procedures, and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable.
  - The review and return of shop drawings, procedures, and other required submittals, approved or with comments, the duration of which shall be shown as thirty (30) Calendar Days,
  - Detailed activities to satisfy permit requirements.
  - Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
  - Project Close out activities including a 21-calendar day creation of a punchlist activity and 30 calendar day minimum completion of punchlist activity.
- Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
- Access Restraints – restrictions on access to areas of the Work
- Traffic work zone set-up and removal, night work and phasing
- Contract Milestones including Full beneficial Use, Substantial Completion and Contractor Field Completion

The Bar Char Schedule shall be provided at the beginning of the project and updated with each work order created for the project.

SECTION 722 (Continued)

B. **Short-Term Construction Schedule**

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a spreadsheet format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule and may be at a greater level of detail. See schedule toolkit for suggested format.

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work on the assignment for the two week period prior and all planned work for the following three week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities.

C. **Project Spending Report (PSR)**

A Projected Spending Report (PSR) shall be prepared and submitted monthly. The PSR shall be for all active work assignments, broken down by work assignment. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF

SECTION 722 (Continued)

COMPENSATION

722.80 Method of Measurement

Schedule of Operations (Type A, B and C)

The project bid documents specify the fixed-price amounts to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this fixed price bid item amounts in their bid. Failure to do so may be grounds for the rejection of the bid.

This fixed price amount is for payment purposes only and is separate from what the Department considers to be the Contractor's General Condition costs. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's overall bid price.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals will be paid for under the fixed price amount.

Twenty percent (20%) of this pay item will be paid upon the Engineer's acceptance of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 722.63.A.

The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the Contract Duration from Notice to Proceed (NTP) to Contractor Field Completion (CFC), less the 2 months required for the submittal and review of the Baseline Schedule in accordance with the following formula:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of the Item Cost.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

Should there be a Time Extension granted to the Contractor, the Engineer may provide an Equitable Adjustment for additional Contract Progress Schedule Updates at intervals directed by the Engineer. The monthly payment will be the basis for this Equitable Adjustment.

Schedule of Operations (Type D)

For projects assigned with Type D schedule requirements, all scheduling work shall be considered incidental to the project with no separate payment under this section.

SECTION 722 (Continued)

722.81 Basis of Payment

The timely and accurate submission of the Baseline Schedule is critical to the Contract and the Department's ability to make informed decisions. Only payments under Item 740 - Engineer's Field Office and Item 748 – Mobilization will be made until the Baseline Schedule is accepted by the Engineer.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals (including monthly progress schedules, short-term schedules, project spending reports, TEAs, recovery schedules or impacted schedules) shall be included in this work.

No payment for any other pay item will be processed beyond seventy-five (75) Calendar Days from Notice to Proceed (NTP) until the Baseline Schedule is accepted by the Engineer. Until the Engineer's acceptance of the Baseline Schedule, the combined total of all payments made to the Contractor will be limited to an amount no greater than the total price for Item 748 - Mobilization or 3% of the contract price, whichever is less.

All Contract Progress Schedule Updates submitted later than ten (10) Calendar Days after the CQE (Contract Quantity Estimate) completion date, or greater than forty (40) Calendar Days from the Data Date of the previous submission, will be deemed to be no longer useful and will not qualify for payment. The late submission of Impacted schedules, including TEAs, recovery schedules and proposal schedules will result in the forfeiture of the monthly payment for the month in which they were due and subsequent months until the submission is made. Late submission of missed submittals will not result in recovery of the previously forfeited portion of the Schedule of Operations Fixed Price Payment Item.

Failure to submit schedules as and when required may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

Failure to submit schedules that are acceptable to the Engineer may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

The Contractor's failure or refusal to comply with the requirements of this Section shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence and may result in the Engineer withholding of full or partial payments of all work performed.

722.82 Payment Items

722.1	SCHEDULE OF OPERATIONS (TYPE A) - FIXED PRICE $_____	LUMP SUM
722.2	SCHEDULE OF OPERATIONS (TYPE B) - FIXED PRICE $_____	LUMP SUM
722.3	SCHEDULE OF OPERATIONS (TYPE C) - FIXED PRICE $_____	LUMP SUM

ITEM 102.3 HERBICIDE TREATMENT OF INVASIVE PLANTS HOUR

This work must be performed by persons who meet the qualifications below and are approved by the Landscape Design Section.

Work under this item consists of herbicide treatment of invasive plants currently existing within the project limits and as directed. An Invasive Plant Management Strategy (IPMS) shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on-site. The IPMS shall be written and submitted per Item 102.33 Invasive Plant Management Strategy and shall be measured and paid for under that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Payment is per hour on-site and shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work. If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

Date and time stamped photos indicating start and stop time of work must be submitted if requested.

This item is not intended for manual removal of plants.

Management of plants determined to have been introduced to the site via imported loam, compost, mulch, plants, equipment, or other construction activities will be the Contractor's responsibility and at the Contractor's expense.

Herbicide shall be applied during daytime hours only.

Measures to prevent the introduction of invasive plant species to the site and to address introduction due to construction-related activities shall be covered under the Standard Specifications, Division I - Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): "non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."

ITEM 102.3 (Continued)

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section may be contacted at: Tara.Mitchell@dot.state.ma.us .

QUALIFICATIONS

The applicators shall submit and meet the qualifications outlined below. A list of contractors specializing in invasive management and approved by MassDOT Landscape Design Section is available on the following website: https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

Requirements

1. Company must provide proof of qualifications by providing the following:
    a. Narrative describing company, its expertise and experience with invasive plant control.
    b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas.
    c. Describe company's technical qualifications and past performance.

2. Company must meet licensing requirements:
    a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
    b. At least one or more applicator must have a ROW certification, if required for work.
    c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
    d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.

3. Company must provide proof of experience with invasive plant control and include following:
    a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
    b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
    c. Photo documentation of these projects.
    d. GPS coordinates of project locations, if available.

ITEM 102.3 (Continued)

4. Crew leader must have expertise with invasive plant control and provide the following:
   a. Have held Core license for at least five (5) years.
   b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

SUBMITTALS

No work shall begin without approval of the submittals.

Submittals include the following items:

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work done under this item shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer and the MassDOT Landscape Architect a completed and signed MassDOT Herbicide Use Report.

Photo Documentation

Digital photos with date and time of herbicide application work, showing start time and completion time, are required and must be submitted for measurement of payment upon request.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

METHODS

All methods used shall be as approved in the IPMS which shall be determined during the Initial Site Walk as described under Item 102.33 Invasive Plant Management Strategy.

The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

The Contractor shall notify the Engineer a minimum of 3 days prior to date of expected herbicide application. Applicators shall notify the Engineer upon arriving on-site and upon leaving the site.

ITEM 102.3 (Continued)

Herbicide Applications

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material must be approved by the Engineer and included in the IMPS.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

ITEM 102.3 (Continued)

Where feasible, it is preferable to dispose of plants on-site or to bury them on-site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

The Contractor shall be responsible for treating or otherwise managing areas of re-growth due to improper disposal. Treatment shall be at the Contractor's expense.

Follow-Up Treatment

Plants and areas shall be re-treated as necessary and as appropriate to the time of year. Treatment shall be for the duration of the contract and per the IPMS.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of verified crew time spent on the project doing herbicide application as and where specified herein and in the IPMS. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment will be based upon verified time spent on the project doing herbicide application as and where specified in the IPMS and upon receipt and approval of submittals. Payment will not include travel time to and from the Contractor's place of business and nor time for investigative field trips.

If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33 INVASIVE PLANT MANAGEMENT STRATEGY HOUR

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants currently existing on the project site and/or as directed and shall be coordinated with Item 102.3 Herbicide Treatment of Invasive Plants. Unless otherwise approved, the IPMS shall be submitted in the form of the MassDOT Invasive Plant Management Strategy Report Form.

The IPMS shall be submitted for review and approval by the MassDOT Landscape Design Section or their representative, and the IPMS shall be implemented on-site.

The Invasive Plant Management Strategy Report Form is available online at https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

Herbicide treatment for invasive plants shall be as described under Item 102.3 Herbicide Treatment of Invasive Plants and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation as relevant to the project.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control and submit qualifications as described below.

QUALIFICATIONS

Individual shall be from the same company as that providing services for Item 102.3 Herbicide Treatment of Invasive Plants and shall submit the following, if not submitted under Item 102.3:

- Submit copy of current Core license.
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.
- References shall be submitted if requested.

SUBMITTALS

Task Summary & Reports

For measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the tasks performed. At a minimum, the tasks shall include the Initial Site Walk, submittal of an approved IPMS, and if requested to accommodate project or site changes, a Follow-up Site Inspection and accompanying IPMS Amendment.

Interim Site Monitoring Reports and/or a Final Report shall be submitted if requested by the MassDOT Landscape Design contact. The MassDOT Landscape Design contact must be notified to attend the site inspection walk when an Interim or Final Report has been requested.

ITEM 102.33 (Continued)

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to construction activities and/or any proposed treatment, the contractor shall submit the IPMS for approval by the Engineer and MassDOT Landscape Architect. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall be completed in coordination with the Prime Contractor and the Engineer and shall include the following as appropriate and applicable to the project and to the IPMS Report Form questions and Guidance:

I. Project Information

a. Company writing the IPMS and performing the herbicide application.
b. Date of site walk
c. Attendees at site walk
d. Expected end date of contract and expected last treatment (month/season)

II. Brief Description of Conditions

a. Provide a free-hand sketch on construction plans or aerial image showing species, location, and as relevant, show or note extent of population as relevant to Strategy (i.e., population extends off ROW preventing eradication, small population and eradication deemed feasible within contract schedule, etc.).

III. Coordination with Roadway Contractor regarding other work

a. Tree Work: Note coordination to be implemented with tree removal, clearing, and clearing and grubbing as applicable to the project.
b. Wetland Mitigation - Include management proposed for wetland mitigation areas in the IPMS, if and as required.
c. Planting: If there will be planting in areas proposed for treatment, propose treatment and schedule to avoid herbicide damage to plants.
d. Mowing: If coordination is required with state mowers, note need in IPMS.

IV. Soil Management

a. Provide specifics on how soil with invasive plant roots (in particular) or seeds will be handled (i.e., separate stockpiles, plant material will be buried on-site, re-used on-site, disposed off-site and if so, where?).
b. Show stockpile locations on plan and include treatment schedule.
c. Note measures that will be implemented to avoid spread through equipment, including how and where equipment will be cleaned.

ITEM 102.33 (Continued)

V. Invasive Plant Treatment & Management

a. Proposed chemical and methods of treatment for each species or area.
b. Time of treatment based on target plant species.
c. Submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
d. Proposed performance metrics or measure of treatment success if different from that specified under Item 102.3.
e. Method for disposing invasive plant material. This includes material that may result in spread (i.e., seeds, roots) and material that has been treated and/or is not viable (foliage, dead wood, etc.). Methods may include grinding in place, stockpiling and treating, and incinerating offsite.
f. Expected follow-up treatment for duration of contract.

VI. Monitoring Schedule if requested by MassDOT.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide an approved IPMS may jeopardize this item, in which case, the contractor will be responsible for management of invasive plants found on-site at no cost to the contract.

Photo Documentation

Digital photos of site conditions, typical species, and extent of infestation must be provided with the IPMS and with any follow-up monitoring or reporting. Photos of follow-up monitoring and reporting must be date and time stamped for acceptance.

METHODS

Initial Site Walk

Prior to any construction activities and soil disturbance, the Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect to determine the IPMS. During the site walk the Contractor shall identify limits of work and, as necessary, mark locations of areas designated for treatment and individual plants targeted for treatment or removal. The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

IPMS Follow-up Amendment

The IPMS may be amended to address additional concerns or adjust to conditions if required by the MassDOT Landscape Architect. The amended IPMS shall be submitted to the Engineer and MassDOT Landscape Architect for approval at least fourteen (14) days prior to any proposed treatment.

ITEM 102.33 (Continued)

Interim Site Monitoring Inspection Reports

If required by the MassDOT Landscape Architect and Engineer, Interim Site Monitoring and an accompanying report shall be conducted. Interim Reports must include time and date stamped photos showing treated locations and species.

Final Inspection

A final inspection and report documenting the status of the invasive control may be required for regulatory purposes or for instances where control will be continued by others. The report shall include photo documentation of pre-construction (existing) and post-treatment conditions, notations on a plan or aerial image of area treated, summary of treatment performed, and control achieved. Final reports submittal must include time and date stamped photos.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal and acceptance of submittals and photos described above.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work. Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511 TREE PROTECTION – ARMORING AND PRUNING EACH

The work under this item shall conform to the relevant provisions of Subsection 771 of the Standard Specifications and the following:

Tree protection – armoring and pruning shall be used for instances where construction activity (the use of heavy equipment), comes within proximity to potentially damage tree trunk(s) or limbs.

The work shall include the furnishing and installing of temporary tree trunk protection, minor limb pruning, or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities; as shown on the Drawings; and/or as required by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Material used for trunk armoring or mounting shall be such that installation and removal shall not damage the trunk.

Acceptable trunk armoring materials shall include two by four (2x4) wood cladding, mounted with wire or metal strapping, or when duration of construction activities is less than three months, slotted corrugated plastic pipe, mounted with duct tape. Eight (8) once untreated burlap shall be used to wrap the tree trunk prior to installation of cladding.

Alternative armoring methods or materials may be acceptable if approved by the Engineer.

The height of tree trunk cladding shall be measured from the base of the tree (including root flare) to the bottom of the first branch, or to a height of eight (8) feet, or as may be required by the Engineer.

METHODS OF WORK

Prior to construction activities, the Engineer, Contractor, and the Arborist (if item is included in the contract), shall review trees noted on the Drawings to be protected. Final decision and selection of trees to be armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be maintained such that it is effective for as long as required or replaced when materials are found to be damaged or ineffective, as determined by the Engineer. Replacement, if required, shall be incidental to the work. Armoring shall be removed immediately upon completion of work activities adjacent to the protected tree(s).

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

ITEM 102.511 (Continued)

DAMAGES OR LOSS

If trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described in Item 102.55. The Arborist shall be approved by MassDOT.

If, based on the recommendation of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury; soil compaction remediation; pruning; soil injection fertilization; and/or watering; the damage shall be repaired as soon as possible, within the appropriate season for such work and according to industry standards.

If, based on the recommendation of the Arborist, the Engineer determines that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and topsoil filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate tree protection shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per EACH tree to be armored and pruned. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract or as required by the Engineer.

Payment for work under this item will be scheduled as follows:

- 40% of the value shall be paid upon installation of trunk armoring and completion of pruning work, if required.

- 60% of the value shall be paid at the end of construction operations that would potentially damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

No separate payment will be made for costs of remedial actions, including Arborist services, tree removal, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 102.521 TREE AND PLANT PROTECTION FENCE FOOT

The work under this Item shall conform to the relevant provisions of Subsections 644 and 771 of the Standard Specifications and the following:

Work under this item shall consist of furnishing, installing, and maintaining tree and plant protection fence(s) in a vertical and taut position; removing and resetting fencing as may be required; and final removal of protection fence(s) at the completion of construction activities, or as otherwise required by the Engineer.

The purpose of the fencing is to signify a construction work-free zone and physical barrier, thereby preventing damage to tree roots, tree trunks, soil, and all other vegetation within this delineated Tree and Plant Protection Zone (TPPZ), as shown on the Drawings, as required by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise required by the Engineer.

MATERIALS

Tree and plant protection fence(s) shall provide a minimum forty-eight (48) inch tall barrier, that remains vertical and taut. The Fence shall be orange plastic safety fence (recommended where high visibility is necessary), or wooden snow fencing, or other approved material. Posts and anchoring materials shall be incidental to the work.

Per requirements of the Engineer, additional posts, deeper post depths, and/or additional attachments shall be used if the fabric or fence sags, leans or otherwise is not providing visible or physical protection to the TPPZ.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

Establishment of THE TPPZ

Fencing shall be used to delineate and establish the TPPZ, adjacent to construction areas, staging areas, stockpile areas, as shown on the Drawings, and/or as required by the Engineer.

Fencing shall be located as close to the work zone limit and as far from tree trunk(s) and plants as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

ITEM 102.521 (Continued)

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the drip line of each tree or as close as possible to the drip line, and/or as shown on the Drawings. The drip line is defined as the outermost limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer. Activities may including operating, moving, or storing equipment, supplies, or materials; and locating temporary facilities, including trailers or portable toilets, Accessing or traversing the TPPZ shall not be permitted.

METHOD OF WORK

TPPZ fencing shall be installed prior to any construction work or staging activities. Fence(s) shall be repositioned where and as necessary for optimum tree and plant protection. Repositioning shall be incidental to this item. TPPZ fencing shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance.

After construction activities are completed, or when required by the Engineer, fencing, stakes, and other anchoring materials, if any, shall be removed and disposed off-site by the Contractor.

REQUIRED WORK WITHIN THE TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading; the use of six (6) inch depth of wood chips or approved matting for root protection; pruning of branches; and/or trunk protection. These protection measures shall be paid under applicable contract items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where handwork is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

TREE AND PLANT INJURY OR LOSS

If the TPPZ is encroached by construction activity without approval, at the discretion of the Engineer, the Contractor may be required to provide a more durable barrier (e.g., Jersey Barriers, chain link fence (if not already in use) to secure the area. Costs of furnishing and installing additional or more durable barrier(s) shall be borne by the Contractor.

In such cases of encroachment, soils shall be considered compacted and tree root injury will be assumed. Action shall be taken as specified below.

ITEM 102.521 (Continued)

In the event that trees designated for protection under this item are injured, including root injury from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described under Item 102.55. The Arborist shall be approved by MassDOT.

In the event of spills, compaction or injury, the Contractor shall take corrective action immediately using methods approved by the Engineer, in coordination with the Arborist.

If, based on the recommendations of the Arborist, the Engineer determines that injuries can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering; the injury shall be repaired as soon as possible, within the appropriate season for such work, and according to industry standards.

If, based on the recommendations of the Arborist, the Engineer determines that injuries are irreparable, or that the injuries are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate protection of the TPPZ shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

Shrubs removals from improper or inadequate protection of the TPPZ shall be replaced with plants of similar species and equal size or the largest size plants reasonably available. The Engineer shall approve the size, quality, and quantity of the replacement plant(s). Each replacement shall include a minimum of one year of watering and establishment care, specified under Section 771.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Tree and Plant Protection Fence will be measured by the FOOT, complete in place, by the length along the top of the fence.

Tree and plant protection fence will be paid for under the contract unit price per FOOT, complete in place and shall include all materials, labor, and equipment required to furnish, install, anchor, maintain, and remove the fence upon completion, as described herein. Posts, temporary footings, anchoring and removal upon completion, shall be incidental to this item.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, Arborist services, tree or plant removal, shrub replacement and establishment, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 102.521 (Continued)

Payment for work under this item will be scheduled as follows:

- Forty (40) percent of the value payment will be made upon installation of fencing.

- Sixty (60) percent of the value payment will be made when fencing materials have been maintained to function as specified, for the intended duration, and removed and disposed off-site at the completion of protection measure requirement.

ITEM 114.1 DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. H-01-005 LUMP SUM

The work under this Item shall conform to the relevant provisions of Subsection 112 of the Standard Specifications and the following:

Work under this Item shall include the complete demolition, removal, and satisfactory disposal of the entire bridge superstructure and integral pier caps of the existing Bridge No. H-01-005 to the limits shown on the Bridge Plans and as directed by the Engineer.

MassDOT does not guarantee or represent that the bridge materials will coincide with any descriptions contained herein or represented on the Plans. The Contractor must visit the bridge site prior to submitting bids to get familiar with the scope of work and bridge condition.

No additional compensation, other than the Lump Sum Bid Price for this Item, shall be made if the materials or work provided is different than that inferred or described herein or shown on the Plans.

The Contractor will make their own investigation of the superstructure to be demolished including the materials that are part of, or may be stored in the superstructure.

The existing bridge may have lead paint. Prior to demolition, the Contractor shall obtain samples from the existing bridge and have them tested. The handling, removing, disposing and/or recycling of all lead-based painted materials shall conform to the "General Requirements for Work Involving Painted Steel" that is included elsewhere in these Special Provisions.

The Contractor shall take all measures necessary to protect pedestrian and vehicular traffic from their construction operations. Materials shall be removed carefully so as to avoid damage to adjacent buildings and utilities. During the prosecution of this work, the Engineer may reject the use of any method or equipment, which causes undue vibration or possible damage to the remaining superstructure or any part thereof. No explosives shall be used.

The Contractor shall locate and protect from damage all existing utilities. The Contractor shall contact utility companies to verify existing utilities and locations and coordinate proposed utility locations prior to demolition and construction.

The Contractor shall obtain all necessary permits, coordinate with the utility owners the relocation of all utilities from the existing bridge onto the new bridge, and make all required submittals under this Item prior to beginning any demolition work.

The proposed highway and bridge plans indicate how much construction must be completed and where traffic shall be shifted before demolition of the bridge superstructure can begin.

The Contractor shall be responsible for reviewing the latest bridge inspection report and verifying that the existing bridge has the capacity necessary for any construction equipment that will be used on the existing bridge during construction.

ITEM 114.1 (Continued)

Whenever any demolition or removal work is to be performed, a suitable protective cover and/or shielding shall be provided by the Contractor to prevent any materials, equipment, tools, debris (liquid or solid) or other materials from falling during demolition.

The Contractor shall design, furnish, install, and remove a temporary protective shielding / debris containment systems under this item. All debris, including used water if applicable, shall be collected and legally disposed of.

No debris, tools or incidental equipment of any kind will be permitted to fall into the river. Any material that accidentally falls into the river shall be removed immediately.

The shielding shall be designed by a Professional Structural Engineer registered in Massachusetts and shall be submitted to the Engineer for approval.

The contractor shall protect and support all utilities on the bridge during demolition and reconstruction operations. The Contractor shall submit his method of temporary utility protection and support for approval to the Engineer prior to the start of operations.

During the prosecution of this work, the Engineer may reject use of any method or equipment which causes undue vibration or possible damage to portions of the remaining structure.

The Contractor shall use extreme care not to damage portions of the existing structure to remain or that will continue to carry live load. Any damage done to portions to remain or that continue to carry live load on the bridge shall be replaced or repaired by the Contractor at his own expense, to the acceptance by the Engineer.

Submittals

The Contractor shall submit their proposed method of demolition, including crane capacity and location, demolition sequence, lift loads, equipment, tools, procedures, etc., to the Engineer for review and approval. The submittal shall specify that the requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61 of the Standard Specifications.

The demolition procedure, traffic management plan, and any necessary calculations (loads, selection of crane equipment, and lifting hardware) and drawings shall all be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts certifying that all existing structural members are suitably braced and supported throughout the demolition process. Work under this Item may not commence until the Engineer has given written approval of the method of demolition.

ITEM 114.1 (Continued)

BASIS OF PAYMENT

Item 114.1 will be paid for at the Contract unit Lump Sum price, which price shall include all labor, materials, equipment, submittals, engineering services, testing, loading, transportation, approvals, permits, protective shielding, removal and disposal of abandoned utilities on the bridge structure, and all incidental costs required to complete the work.

Payment of 50% of the lump sum bid price of this item will be made upon complete demolition for the first stage.

Payment of 50% of the lump sum bid price of this item will be made upon complete demolition for the second stage.

ITEM 127.1 REINFORCED CONCRETE EXCAVATION CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsections 112, 120, and 140 of the Standard Specifications and the following:

The work under this Item shall include the complete demolition, removal, and satisfactory disposal of the abutments and of the existing Bridge No. H-01-005, to the limits shown on the Bridge Plans and as directed by the Engineer.

MassDOT does not guarantee or represent that the bridge materials will actually coincide with any descriptions contained herein or represented on the Plans. The Contractor must visit the bridge site prior to submitting bids to get familiar with the scope of work and bridge condition. No additional compensation, other than the Unit Bid Price for this Item, shall be made if the materials or work provided is different than that inferred or described herein or shown on the Plans.

The Contractor will make their own investigation of the substructure to be demolished. No increase will be made to the bid price due to the nature of the materials involved in the demolition. All costs for permits, dump fees, special handling of hazardous materials, etcetera, shall be included in the bid price of the demolition item.

The Contractor shall take all measures necessary to protect pedestrian and vehicular traffic from their construction operations. Materials shall be removed carefully so as to avoid damage to adjacent buildings and utilities. During the prosecution of this work, the Engineer may reject the use of any method or equipment, which causes undue vibration or possible damage to the remaining superstructure or any part thereof. No explosives shall be used.

The Contractor shall locate and protect from damage all existing utilities. The Contractor shall contact utility companies to verify existing utilities and locations and coordinate proposed utility locations prior to demolition and construction. The Contractor shall obtain all necessary permits, coordinate with the utility owners the relocation of all utilities from the existing bridge onto the new bridge, and make all required submittals under this Item prior to beginning any demolition work.

The proposed highway and bridge plans indicate how much construction must be completed and where traffic shall be shifted before demolition of the bridge substructure can begin. The Contractor shall be responsible for reviewing the latest bridge inspection report and verifying that the existing bridge has the capacity necessary for any construction equipment that will be used on the existing bridge during construction.

ITEM 127.1 (Continued)

SUBMITTALS

The Contractor shall submit their proposed method of demolition, including demolition sequence, equipment, tools, procedures, etc., to the Engineer for review and approval. The demolition procedure, traffic management plan, and any necessary calculations (loads, selection of crane equipment, and lifting hardware) and drawings shall all be stamped by a Professional Structural Engineer registered in the Commonwealth of Massachusetts certifying that all existing structural members are suitably braced and supported throughout the demolition process. Work under this Item may not commence until the Engineer has given written approval of the method of demolition.

METHOD OF MEASUREMENT

Item 127.1 will be measured for payment by the Cubic Yard.

BASIS OF PAYMENT

Item 127.1 will be paid for at the Contract unit price per Cubic Yard, which price will include all labor, tools, equipment, materials, submittal, engineering services, sawcutting if needed, testing, loading, transportation, approvals, permits, and all incidental costs required to complete the work.

ITEM 127.51 TIMBER PILE – REMOVED AND DISCARDED EACH

The work under this item shall conform to the relevant provisions of Subsection 112 and the following:

This item is for the removal of existing timber piles that are located at the existing piers and abutments of Bridge No. H-01-005. All timber piles at existing piers shall be cut-off and removed at an elevation located 5' below the existing river bed elevation. Many of the timber piles at piers have been reinforced by 18" diameter concrete jackets and steel sleeves, the removal of which shall be considered incidental to this item.

All existing timber piles at each abutment shall be cut-off 12" below the proposed trench and filled with crushed stone. Existing timber piles at each abutment in conflict with the proposed pile locations shall be extracted by the contractor. Any void left in the ground after extracting the pile shall be filled with 3/8" crushed stone (M2.01.6).

The Contractor may elect to extract some or all timber piles entirely rather than locally excavating around them, cutting them off at the required elevation and then backfilling around the pile. If the Contractor elects to do this, the hole created by the extracted pile shall be backfilled with suitable material as approved by the Engineer.

The Contractor shall legally dispose of the removed piles from the site.

METHOD OF MEASUREMENT

Item 127.51 will be measured for payment by the Each timber pile removed and discarded.

BASIS OF PAYMENT

Item 127.51 will be paid for at the Contract unit price per Each pile cut off, removed and legally disposed and shall include all labor, material and equipment to complete the work. The work shall include local excavation of soil around the pile, cutting, removing and disposing of the pile and backfilling.

If the Contractor chooses to entirely extract the pile and backfill the void created by the extracted pile instead of cutting it off, then this method of removal will be considered to be at the Contractor's convenience and no additional compensation will be provided.

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work shall consist of ensuring the health and safety of the Contractor's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water and sediment.

The Contractor shall prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP shall include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety shall be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the MassDOT, Contractor, and Subcontractors involved with on-site activities. The employee's signature on the EHASP shall be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets shall be submitted to the Engineer.

The EHASP shall specify a Contractor Site Safety and Health Officer responsible for implementation of the EHASP and to oversee all construction activities, including handling, storage, sampling and transport, which require contact with or exposure to potentially hazardous materials.

The level of protection, required to ensure the health and safety of on-site personnel will be stipulated in the EHASP. The Site Safety and Health Officer shall implement the EHASP based on changing site and weather conditions, type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, air monitoring data, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and type of equipment to be utilized.

ITEM 180.01 (Continued)

During implementation of the EHASP, a daily log shall be kept by the Site Safety and Health Officer and a copy shall be provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personal protection being employed, screening data and any other information relevant to on-site environmental safety conditions. The Site Safety and Health Officer shall sign and date the daily log.

Method of Measurement and Basis of Payment

Preparation and implementation of the Environmental Health and Safety Program, including the monitoring, protection and storage of all contaminated materials, as well as subsequent modifications to the EHASP, will be measured and paid for at the Lump Sum Bid Price.

Payment of 50% of the Environmental Health and Safety Program contract price will be made upon the initial acceptance of the EHASP by the Engineer. Payment of the remaining 50% of the Environmental Health and Safety Program contract price will be made upon completion of the work. The bid price shall include preparation and implementation of the EHASP as well as the cost for its enforcement by the Site Safety and Health Officer along with any necessary revisions and updates. The work of implementing the Environmental Health and Safety Program includes work involving, but not limited to, the monitoring, protection, and storage of all contaminated materials.

ITEM 180.02 PERSONAL PROTECTION LEVEL C UPGRADE HOUR

The work shall consist of providing appropriate personal protective equipment (PPE) for all personnel in an area either containing or suspected of containing a hazardous environment.

Contingencies for upgrading the level of protection for on-site workers will be identified in the EHASP and the Contractor shall have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use shall be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the contract unit price, per hour, per worker, required in Level C personal protection. No payment will be made to the Contractor to provide Level D PPE.

ITEM 180.03 LICENSED SITE PROFESSIONAL SERVICES HOUR

Within limited areas of the project site, media (i.e. soils, sediments, surface water and/or groundwater) requiring evaluation and/or management under the Massachusetts Contingency Plan (MCP) may be encountered. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include a site walk, field screening, sampling, analysis and characterization of potentially contaminated media, preparation and implementation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the MCP. LSP services shall also be necessary to temporarily move material generated on the project to an off-site storage location.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the Massachusetts Department of Environmental Protection (DEP) shall be submitted for all work assignments listed for the LSP and environmental technicians. Upon approval of the LSP Qualifications, the LSP will be designated as the LSP of Record unless MassDOT designates in writing otherwise. The LSP of Record will serve as the primary point of contact for all hazardous material matters on the project.

The LSP shall evaluate soil and/or sediment with discoloration, odor, elevated field screening results, presence of petroleum liquid or sheen on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on-site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect media. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall evaluate the need for confirmatory sampling prior to backfill in areas where contaminated material has been excavated and disposed off-site for compliance with applicable regulatory requirements. The Engineer shall approve the locations of the testing sites prior to the sampling.

ITEM 180.03 (Continued)

Contaminated media shall be handled in accordance with all applicable state and federal statutes, regulations, and policies. The LSP shall adequately evaluate contaminated media for compliance with the requirements of the MCP and Department Policies.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and both shall be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise tabular format which tracks the excavation, stockpiling, analysis and reuse/disposal of all known/suspect contaminated media. These records shall be up-to-date and submitted to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media in a tabular format and compare the results to applicable reporting thresholds. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results, evaluation of applicable regulatory exemptions, reporting obligations, and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, damages, and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, damages, and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Engineer before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

ITEM 180.03 (Continued)

LABORATORY TESTING IN SUPPORT OF LSP SERVICES

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included and are incidental to Items 181.11-181.14.

In order to maintain compliance with the MCP and Department Policies or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. No sampling shall be conducted without prior approval from the Engineer. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The Contractor will be reimbursed upon satisfactory written evidence of payment. The Contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

ITEM 180.03 (Continued)

Laboratory testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

This item is for LSP work for compliance with the MCP and Department Policies. LSP hours and any laboratory testing related to off-site disposal of excess soil and sediment is incidental to Items 181.11-181.14 (including, but not limited to, disposal characterization, disposal package preparation, landfill acceptance, shipment paperwork preparation, field screening, and tracking). LSP hours for groundwater management (including characterization, obtaining off-site discharge permits, compliance testing, etc.) is incidental to Item 183.1.

ITEM 181.11	**DISPOSAL OF UNREGULATED SOIL**	**TON**
ITEM 181.12	**DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY**	**TON**
ITEM 181.13	**DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY**	**TON**
ITEM 181.14	**DISPOSAL OF HAZARDOUS WASTE**	**TON**

The work under these Items shall include the transportation and disposal of contaminated material excavated, or excavated and stockpiled. It shall also include the cost of any additional laboratory analyses required by a particular disposal facility beyond the standard disposal test set.

Excavation of existing subsurface materials may include the excavation of contaminated soils. The Contractor shall be responsible for the proper coordination of characterization, transport and disposal, recycling or reuse of contaminated soils. Disposal, recycling or reuse will be referred to as "disposal" for the purposes of this specification. However, regardless of the use of the term herein, there will be no compensation under these items for reuse within the project limits. The Contractor will be responsible for coordinating the activities necessary for characterization, transport and disposal of contaminated soils. Such coordination will include the Engineer and his/her designee overseeing management of contaminated materials. Contaminated soils must be disposed of in a manner appropriate for the soil classification as described below and in accordance with the applicable laws of local, state and federal authorities. The Contractor shall be responsible for identifying disposal facility (ies) licensed to accept the class of contaminated soils to be managed and assure that the facility can accept the anticipated volume of soil contemplated by the project. The Contractor shall be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Contractor will be responsible for obtaining all permits, approvals, manifests, waste profiles, Bills of Lading, etc. subject to the approval of the Engineer prior to the removal of the contaminated soil from the site. The Contractor and LSP shall prepare and submit to the Engineer for approval all documents required under the Massachusetts Contingency Plan (MCP) and related laws and environmental regulations to conduct characterization, transport, and disposal of contaminated materials.

CLASSES OF CONTAMINATED SOILS

The Contractor and its LSP shall determine if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials shall be given a designation for purposes of reuse or disposal based on the criteria of the MCP. Soils and sediments which are not suitable for reuse will be given a designation for purposes of off-site disposal based on the characterization data and disposal facility license requirements. The Classes of Contaminated Soils are defined as follows:

ITEMS 181.11 through 181.14 (Continued)

UNREGULATED SOIL consists of soil, fill and dredged material with measured levels of oil and hazardous material (OHM) contamination at concentrations below the applicable Reportable Concentrations (RCs) presented in the MCP. Unregulated soil consists of material which may be reused (or otherwise disposed) as fill within the Commonwealth of Massachusetts subject to the non-degradation criteria of the MCP (310 CMR 40.0032(3), in a restricted manner, such that they are sent to a location with equal or higher concentrations of similar contaminants. Disposal areas include licensed disposal facilities, approved industrial settings in areas which will be capped or covered with pavement or loamed and seeded, and for purposes of this project should be reused as fill within the project site construction corridor whenever possible. The material cannot be placed in residential and/or environmentally sensitive (e.g. wetlands) areas. Under no circumstances shall contaminated soils be placed in an uncontaminated or less contaminated area (including the area above the groundwater table if this area shows no sign of contamination).

The Contractor shall submit to MassDOT the proposed disposal location for unregulated soils for approval. If such a disposal location is not a licensed disposal facility, the Contractor shall submit to the Engineer analytical data to characterize the disposal area sufficiently to verify that the unregulated material generated within the MassDOT construction project limits is equal to or less than the contaminant levels at the disposal site and meets the non-degradation requirements of the MCP. In addition, the Contractor shall provide written confirmation from the owner of the proposed disposal location that they have been provided with the analytical data for both the materials to be disposed as well as the disposal site characterization and that s/he agrees to accept this material. A Material Shipping Record or Bill of Lading, as appropriate, shall be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, shall be provided to the Engineer in order to document legal disposal of the unregulated material.

The cost of on-site disposal of unregulated soil within the project area will be considered incidental to the item of work to which it pertains.

ITEMS 181.11 through 181.14 (Continued)

REGULATED SOIL consists of materials containing measurable levels of OHM that are equal to or exceed the applicable Reportable Concentrations for the site as defined by the MCP, 310 CMR 40.0000. Regulated soil which meets the MCP reuse criteria of the applicable soil/groundwater category for this project area may be reused on site provided that it meets the appropriate geotechnical criteria established by the Engineer. Regulated Soil may be reused (as daily or intermediate cover or pre-cap contouring material) or disposed (as buried waste) at lined landfills within the Commonwealth of Massachusetts or at an unlined landfill that is approved by the Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. Regulated Soil removed from the site for disposal or treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form. This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

HAZARDOUS WASTE consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e. polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

MONITORING/SAMPLING/TESTING REQUIREMENTS

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

ITEMS 181.11 through 181.14 (Continued)

No excavated material will be permanently placed on-site or removed for off-site disposal until the results of chemical analyses have been received and the materials have been properly classified. The Contractor shall submit to the Engineer results of field and laboratory chemical analyses tests within seven days after their completion, accompanied by the classification of the material determined by the Contractor, and the intended disposition of the material. The Contractor shall submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

WASTE TRACKING:

Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three days of receipt by the Contractor. The Contractor is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

DECONTAMINATION OF EQUIPMENT

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item.

ITEMS 181.11 through 181.14 (Continued)

REGULATORY REQUIREMENTS

The Contractor shall be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts DEP, the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing the disposal of contaminated soils.

All labor, materials, equipment and services necessary to make the work comply with such regulations shall be provided by the Contractor without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions shall apply. The Contractor shall reimburse MassDOT for all costs it incurs, including damages and/or fines, as a result of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

SUBMITTALS

I. Summary of Sampling Results, Classification of Material and Proposed Disposal Option.

The following information, presented in tabular format, must be submitted to the Engineer for review and approval prior to any reuse on-site or disposal off-site. This requirement is on-going throughout the project duration. At least two weeks prior to the start of any excavation activity, the Contractor shall submit a tracking template to be used to present the information as stipulated below. Excavation will not begin until the format is acceptable to MassDOT.

Characterization Reports will be submitted for all soil, sediment, debris and groundwater characterized through the sampling and analysis program. Each report will include a site plan which identifies the sampling locations represented in the Report. The Construction Plan sheets may be used as a baseplan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g. grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and, all analytical results.

ITEMS 181.11 through 181.14 (Continued)

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

II. Stockpiling, Transport, and Disposal.

At least two weeks prior to the start of any excavation activity, the Contractor shall submit, in writing, the following for review and shall not begin excavation activity until the entire submittal is acceptable to MassDOT.

Excavation and Stockpiling Protocol:
Provide a written description of the management protocols for performing excavation and stockpiling and/or direct loading for transport, referencing the locations and methods of excavating and stockpiling excavated material.

Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.

2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

Transportation:
The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. Material Tracking and Analytical Documentation for Reuse/Disposal.

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

ITEMS 181.11 through 181.14 (Continued)

All soils, sediments and demolition debris must be tracked from the point of excavation to stockpiling to onsite treatment/processing operations to off-site disposal or onsite reuse as applicable.

Demolition Debris:
Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.

Soil/Sediment:
Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

Method Of Measurement And Basis Of Payment

Disposal of contaminated soil shall be measured for payment by the Ton of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used. The work of the LSP for disposal under all of these items shall be incidental to the work with no additional compensation.

ITEM 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in tons, of contaminated materials removed from the site and transported to and disposed of at an approved location or licensed facility, and includes any and all costs for approvals, permits, fees and taxes, additional testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.12 Measurement for Disposal of Regulated Soil – In-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved in-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEMS 181.11 through 181.14 (Continued)

ITEM 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight in tons of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS LUMP SUM

The work shall include the inspecting and testing of all materials suspected of containing asbestos. When any demolition is required to enable the inspection and testing of the suspected material it will be considered incidental to this Item and the Contractor must perform all asbestos handling and testing in accordance with the regulations stated below.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during any disturbance of asbestos suspected material. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health and Safety Plan (HASP) may pose a safety hazard to the workers.

The Contractor shall employ the services of a Massachusetts licensed "Asbestos Inspector" to inspect the material to determine whether or not "ITEM 182.2 REMOVAL OF ASBESTOS" is required. Should the asbestos inspector determine laboratory testing is required, a state certified laboratory shall be used to perform all necessary tests.

REGULATIONS

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

ITEM 182.1 (Continued)

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards Regulations, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

BASIS OF PAYMENT

Item 182.1 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work as described and as required by the Engineer.

No separate payment will be made for the protection of general public, private property, the proper inspecting and testing of the material, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 182.2 REMOVAL OF ASBESTOS FOOT

This item is intended, but not limited to, the removal of the 8-inch water main which contains asbestos.

The work shall include the removal and satisfactory disposal of existing asbestos. The Contractor's attention is directed to the fact that existing asbestos shall be inspected and tested prior to removal, to determine if special removal and disposal is required. The Contractor shall follow all the rules and regulations stated in "ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS". If asbestos is present, the Contractor shall follow all the rules and regulations stated in the section "REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS", under this item. The Contractor should notify and coordinate his/her efforts with the proper utility accordingly.

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS
This section specifies the requirements for the handling and removal of asbestos containing material. The Contractor must perform all asbestos handling and removal work in accordance with these specifications and the following additional requirements.

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58
Occupational exposure to Asbestos, Tremolite,Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

ITEM 182.2 (Continued)

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise,
Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

All asbestos material shall be removed and properly disposed of by a contractor or subcontractor with a current Massachusetts Abatement Contractors License issued by the Department of Labor Standards. Work shall be supervised by a competent person as required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have completed a course at an EPA Training Center or equivalent course in asbestos abatement procedures, have had a minimum of four years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be certified by the Commonwealth as an Asbestos Supervisor and Asbestos Project Designer as required by 454 CMR 28.00.

Asbestos removal work shall be coordinated with all other work under the contract and shall be completed prior to performing any activities which could disturb the asbestos material or produce airborne asbestos fibers.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during trenching and excavation. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health and Safety Plan (HASP) may pose a safety hazard to the workers.

ITEM 182.2 (Continued)

NOTIFICATION AND PERMITS

The Contractor shall prepare a formal pre-notification form at least ten (10) days prior to the start of asbestos removal work. This form must be submitted to the appropriate Regional Office of the Massachusetts Department of Environmental Protection and to the U.S. Environmental Protection Agency Region I Air and Hazardous Material Division. A copy of the submitted forms must be provided to the Engineer and kept at the work site.

Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the city/town. A copy of the permit(s) must be provided to the Engineer and posted at the work site.

The Contractor shall also obtain and pay all other applicable asbestos waste transportation and disposal permits, licenses and fees.

STANDARD OPERATING PROCEDURES

The standard operating procedure shall ensure the following:

1. Proper site security including posting of warning signs and restricting access to prevent unauthorized entry into the work spaces.

2. Proper protective clothing and respiratory protection prior to entering the work spaces.

3. Safe work practices including provisions for communications; exclusion of eating, drinking, smoking, or use of procedures or equipment that would in any way reduce the effectiveness of respiratory protection or other engineering controls.

4. Proper exit practices from the work space though the showering and decontamination facilities.

5. Removing asbestos containing material in ways that minimize release of fibers.

6. Packing, labeling, loading, transporting and disposing of contaminated material in a way that minimizes or prevents exposure and contamination.

7. Emergency evacuation of personnel, for medical or safety (fire and smoke) so that exposure will be minimized.

8. Safety from accidents in the work space, especially from electrical shocks, slippery surfaces and entanglements in loose hoses and equipment.

9. Provisions for effective supervision and OSHA - specified personnel air monitoring for exposure during work.

ITEM 182.2 (Continued)

REQUIRED SUBMITTALS

The Contractor shall submit to the Engineer the following listed items at least ten (10) calendar days prior to the start of asbestos work. No asbestos removal work activities shall commence until these items are reviewed by the Engineer, unless otherwise waived. Submittals shall be clearly labeled and in sufficient detail to enable the Engineer to form an opinion as to its conformity to the specifications.

1. Name, experience and DLS certification of proposed Supervisors and Foreman responsible for asbestos work.
2. Summary of workforce by disciplines and a notarized statement documenting that all proposed workers, by name, have received all required medical exams and have been properly trained and certified for asbestos removal work, respirator use and appropriate Massachusetts DLS, EPA and OSHA standards.
3. Notarized statement that workers are physically fit and able to wear and use the type of respiratory protection proposed for the project. Notarized certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance and worker training records are being kept in conformance with 29 CFR 1926.
4. Written plan of action and standard operating procedures (HASP) to include: location and layout of decontamination areas; sequencing of asbestos work; detailed schedule of work activities by date and interface with other project activities which affect work performance; methods used to assure safety and security; worker protection and exposure monitoring; contingency and emergency evacuation procedures; detailed description of methods to be employed to control pollution; waste handling procedures.
5. Written respiratory protection program specifying level of protection intended for each operation required by the project and details of daily inspection and maintenance elements.
6. Copies of the U.S. EPA, State and local asbestos removal pre-notification forms. If applicable, lists and copies of all permits, licenses, or manifests which will be applied for and used.
7. Name, location and applicable approval certificates for primary and secondary landfill for disposal of asbestos-containing or asbestos contaminated waste. Name, address and licenses number(s) of hauler permitted to transport waste. (Submit copies of completed manifests upon disposal).

The Contractor must provide copies of daily inspection and record logs upon request of the Engineer, at any time during project. This information will include but is not limited to work area entry data, respirator inspections and maintenance, HEPA-exhaust inspections and maintenance and other work applicable activities or reports of accidents or unusual events.

ITEM 182.2 (Continued)

METHOD OF MEASUREMENT

ITEM 182.2 will be measured for payment by the FOOT for the complete removal and disposal of the asbestos containing material.

BASIS OF PAYMENT

Item 182.2 will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work specified above and as required by the Engineer.
No separate payment will be made for the protection of general public, private property, the proper inspecting and testing of the material, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 183.1 TREATMENT OF CONTAMINATED GROUNDWATER GALLON

This Item addresses the treatment and disposal of contaminated groundwater encountered during excavation operations. The work generally consists of furnishing the materials, equipment, labor, services, testing/sampling, waste characterization, transportation, disposal, permits and agreements necessary to perform the work required for the collection, treatment and disposal of contaminated groundwater.

The Contractor is advised that contaminated groundwater may be encountered during dewatering activities. The levels and nature of contamination may vary depending on location and/or depth. Soil contamination data for the dredging work, within the Land Under Water (LUW) resource, required at the bridge site has been provided in the Contract Documents indicating the types of contaminants that may be found in groundwater encountered during this work. For all other project locations that may require excavation in areas of possible groundwater contaminated areas, no data has been provided in indicating the types of contaminants that may be found in groundwater encountered during the work. It will be the responsibility of the Contractor to ensure that water removed during dewatering operations is treated and disposed of in accordance with all applicable laws and regulations and in accordance with this specification.

The Contractor shall monitor the quantity of groundwater collected for treatment using an in-line totalizer flowmeter or an alternate method approved by MassDOT. The Contractor shall, at all times, minimize the quantity of groundwater removed from the excavations. All groundwater determined to be contaminated will be managed in accordance with all applicable local, state and federal regulations.

It is not the intent herein for the Department to design for or specify to the Contractor which particular treatment is to be used, if necessary. Rather, it is the Department's intent to provide guidance to the Contractor for informational and bidding purposes only. It is, therefore, the Contractor's responsibility to use a treatment method to allow him/her to meet any and all laws, regulations, policies, guidelines and permit requirements. Treatment of contaminated groundwater for dewatering operations is generally performed using a mobile treatment trailer equipped with one or more granular-activated carbon (GAC) canisters, although other techniques are also used.

It is likely that treatment of the contaminated groundwater using granular-activated carbon will be required to complete the work under this Contract. The Methods described under Item 183.1 provides for the identification, testing, management and treatment or disposal of contaminated groundwater and shall be implemented, at a minimum and as necessary by the Contractor via Methods under Item 183.1.

The overall handling and management of contaminated groundwater is regulated under the provisions of 310 CMR 40.0000, 314 CMR 3.00 and 5.00, NPDES and other applicable laws. The unpermitted discharge of contaminated dewatering effluent into the environment (storm drain, surface water body, onto the ground) is a violation of federal and state laws and regulations. Should dewatering of contaminated groundwater be necessary, approvals must be sought from the appropriate federal, state, or local regulatory jurisdiction. The USEPA will not specify a treatment system or method, but normally requires that the treated discharge meet Massachusetts Drinking Water Standards.

ITEM 183.1 (Continued)

The discharge standards are normally met by treating the dewatered groundwater through granular-activated carbon canisters, or similar techniques. Longer term discharges to surface waters or storm drains, and any discharges to the ground, require approval and/or issuance of a permit from the DEP Division of Water Pollution Control. The Contractor shall be responsible for applying for, paying all fees for and obtaining all permits required for treatment and/or disposal of contaminated groundwater. Additional requirements may be mandated by local/regional sewer authorities for discharge to sanitary sewer or Publicly Owner Treatment Works (POTW). Copies of permit applications and correspondence from federal and state agencies and sewer authorities shall be supplied to the Engineer prior to dewatering activities.

EPA regulations published in the Federal Register on September 9, 2005 (70 FR 53663) require a National Pollutant Discharge Elimination System (NPDES) Remediation & Miscellaneous Contaminated Sites General Permit (RGP) for all contaminated construction site dewatering activities in Massachusetts (MAG910000) that will involve the discharge of water to classes of receiving waters designated in the Massachusetts Water Quality Standards (314 CMR 4.00). The application requires that operators of proposed new discharges seeking coverage under this general permit submit a Notice of Intent (NOI) to EPA New England post-marked at least 14 days prior to commencement of discharge. The Contractor is solely responsible for applying for and obtaining coverage under the NPDES Remediation General Permit from EPA and, if applicable, DEP, including the costs associated with sampling and analysis of groundwater and any application fees. The Contractor is required to submit a completed copy of the NOI to the Engineer and the Director of Environmental Programs, Construction Division, 10 Park Plaza, Boston, prior to commencement of discharge.

Upon permanent cessation of the discharges authorized by the RGP, the Contractor shall be responsible for submitting a Notice of Termination (NOT) to EPA New England within 30 days of the permanent cessation. The Contractor is required to submit to MassDOT a completed copy of the NOT within 14 days of the permanent cessation of the discharges authorized by the RGP. All costs and fees associated with the submission of the NOT will be the responsibility of the Contractor.

The Contractor shall be responsible for adhering to regulations, specifications, and recognized standard practices related to contaminated groundwater handling during dewatering activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent local, state or federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing this work.

ITEM 183.1 (Continued)

The Contractor shall be responsible for determining compliance with the requirements of any permit and for any sampling, testing, and disposal required in connection with said permits. MassDOT and the City/Town reserve the right to collect additional samples of dewatered groundwater to determine the Contractor's compliance with the Permit's requirements. All laboratory testing is to be performed by a DEP certified laboratory for all parameters being tested. Copies of all field and laboratory testing results, reports, etc. required by the permits must be supplied to the Engineer. MassDOT, DEP, and the permit-granting agency, where applicable, reserve the right to collect additional samples of discharged groundwater to verify compliance with permit requirements.

For the purpose of these specifications and to establish a basis for the bid, it is anticipated that granular-activated carbon will be the treatment medium for dewatered contaminated groundwater. The bidder shall factor into the payment item all costs associated with the testing and analyses that may be required by the permitting agency. In addition, any laboratory testing of groundwater is to be performed by a DEP certified laboratory for the parameters being tested. Copies of all field and laboratory testing results will be supplied to the Engineer. Bid price shall also include full compensation for labor, materials, maintenance, mobilization, rental and other related costs. Item 183.2 will be used for disposal of used granular-activated carbon canisters.

SUBMITTALS

Prior to initiating work, the Contractor shall submit an excavation dewatering plan to the MassDOT that includes a detailed description of the approach to dewatering, a description of methodology for sealing the excavation to minimize infiltration of groundwater, if deemed applicable to the work, anticipated treatment, discharge points, sampling frequency, required permits, transporters and waste facilities complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor plans to utilize for waste disposal. The plan shall be submitted for the record.

The Contractor shall submit to MassDOT for review, the proposed methods for dewatering and groundwater treatment and disposal for the various portions of the work to be done. The review shall be for methods only. The Contractor shall remain responsible for the maintenance, performance, structural integrity and safety of the systems installed for this work as well as regulatory compliance of the applicable local, state and federal discharge standards. The contractor shall provide all groundwater sampling and analyses, results and reports required by all applicable local, state and federal agencies. The Contractor shall submit to MassDOT for review all plans and documents that must be submitted to the EPA and DEP, including NOI, NOT, treatment system analytical reports and correspondence. Copies of all permits and approvals and lab analyses and test results associated with groundwater treatment and disposal must be submitted to MassDOT within 3 days of receipt by the Contractor.

ITEM 183.1 (Continued)

ESTABLISHMENT OF TREATMENT PROCEDURE

Since concentrations of contaminants in groundwater cannot be easily assessed in the field, all groundwater extracted from the ground will be considered contaminated and will be initially pumped and stored into open settling tank(s) or a fractionation tank until it can be sampled and analyzed, unless otherwise directed by MassDOT. The Contractor will perform initial sampling and analyses of the groundwater to determine the need for a permit to dispose of contaminated groundwater. Based on the results of the initial sample analysis, which must be provided to the Engineer within twenty-four (24) hours of the time the samples are received by the laboratory, the Contractor will determine the necessity for treatment(s) and disposal procedures. Sampling must also be performed to meet applicable discharge criteria as set by the appropriate regulatory agencies for the permit obtained for disposal. All discharges must meet regulatory standards set forth in the permits required for discharge. For the purposes of the bidding process, it is anticipated that the treatment system will consist of sedimentation tanks, an oil water separator and liquid-phase granular activated carbon as the primary on-site treatment medium for dewatered contaminated groundwater. MassDOT may require additional treatment processes if such is determined necessary during the groundwater testing procedure. The Contractor shall integrate the additional treatment process into the treatment system, if necessary.

The Contractor shall provide all labor, equipment and appurtenances required to treat the groundwater, subject to the approval of MassDOT. Groundwater stored and tested but not requiring treatment or off-site disposal shall be discharged to a location subject to the approval of MassDOT without payment to the Contractor.

TREATMENT UNITS

The Contractor shall furnish all labor and materials, and shall install and operate temporary groundwater treatment and disposal system(s) as necessary to treat contaminated groundwater pumped from excavations during construction activities under the Contract. Such systems shall be capable of treating groundwater to meet applicable discharge criteria as set by the appropriate regulatory agencies.

The Contractor or their Environmental Consultant shall operate, maintain and modify the selected treatment system, and conduct the necessary monitoring and reporting of influent, midpoint and effluent results, as required by the discharge permit for the disposal option selected.

ITEM 183.1 (Continued)

METHOD OF MEASUREMENT:

Provide a treatment system that meets permit discharge requirements, mobilize it to the site, provide copies of laboratory analytical data indicating that the system is performing appropriately to meet permit requirements, and demobilize it from the site. This includes management and disposal of wastes generated during treatment prior to discharging such as activated carbon, etc. Work under Item 183.1 is based upon the number of gallons disposed or contaminated groundwater pumped through the granular-activated carbon (Item 183.2) as the medium for the treatment of contaminated groundwater that is found in pipe trenches, manhole excavations, catch basin excavations, that need to be dewatered.

BASIS OF PAYMENT

Payment shall be made at the unit price bid per gallon of groundwater pumped, stored, treated as needed and tested as required by discharge permits and regulatory requirements, which price shall be full compensation for all necessary labor and materials, mobilization, maintenance, demobilization of the appropriate unit(s), freight, rental costs, field and laboratory testing costs and permits. Costs associated with the disposal of granular-activated carbon shall be covered under Item 183.2.

ITEM 183.2 DISPOSAL OF GRANULAR ACTIVATED CARBON POUND

GENERAL

Work under Item 183.2 is based upon the disposal of used granular-activated carbon as the treatment medium for contaminated groundwater (Item 183.1) that is found during excavations in which contaminated groundwater is encountered.

BASIS OF PAYMENT

Payment shall be made at the unit price bid per pound of carbon that is properly disposed and replaced, as necessary, to meet treated water discharge requirements during dewatering operations at the site. Payment for Disposal of Granular Activated Carbon shall include compensation for all labor, equipment, materials, permits, characterization, sampling and on-site or laboratory analysis as needed or required by permits, for replacement and disposal of liquid-phase activated carbon for the on-site contaminated groundwater pumping, collection, treatment and treated water discharge system during the time period required to complete the work. No payments shall be made for replacing carbon which is spent due to the Contractor's failure to remove floating petroleum product or excess sediments prior to the groundwater entering the carbon treatment units. All other costs associated with treatment of contaminated groundwater will be covered under Item 183.1- Treatment of Contaminated Groundwater.

ITEM 184.1 DISPOSAL OF TREATED WOOD PRODUCTS TON

Work under this item shall include the removal and disposal of all treated existing wood product as directed by the Engineer.

The timber components of the existing structure are suspected to be treated with creosote, pentachlorophenol and/or CCA. This item shall include all costs for sampling, laboratory testing, loading, transportation and disposal of the treated wood. The Contractor is required to submit disposal manifests to the Engineer prior to the completion of the project. All aspects of this Item are to be completed in accordance with state and federal regulations.

COMPENSATION

Measurement and payment shall be by the weight, in tons, of treated timber removed from the structure and subsequently accepted at a licensed facility. The work shall be considered full compensation for all labor, tools, equipment, materials, testing, loading, transportation, approvals, and permits necessary for the completion of the work.

ITEM 223.1 FRAME AND GRATE (OR COVER) REMOVED AND STACKED EACH

The work under this Item shall conform to the relevant provisions of Subsection 220 of the Standard Specifications and the following:

DESCRIPTION

This work shall consist of removing and stacking frames and grates or covers that will not be reused within the project limits.

The frames and grates or covers shall be removed, transported and neatly stacked by the Contractor at a location coordinated with the Town of Hadley DPW Director.

METHOD OF MEASUREMENT

Item 223.1, Frame and Grate (or Cover) Removed and Stacked, will be measured for payment by the Each frame and grate or cover, each combination counted as one unit together, actually removed and stacked.

BASIS OF PAYMENT

Item 223.1, Frame and Grate (or Cover) Removed and Stacked, will be paid at the Contract unit price per Each, which payment shall be considered as full compensation for all labor, tools, equipment, materials, transportation, stacking and incidentals required to complete the work as described above, as required by the Engineer.

All castings deemed non-salvageable by MassDOT shall become the property of the Contractor, and shall be disposed of legally off the site, which associated costs shall be considered incidental to applicable project item requiring the frame and grate or cover removal, and no additional compensation made to the Contractor.

ITEM 241.121 12 INCH REINFORCED CONCRETE PIPE CHECK VALVE EACH

The work to be done under this item shall conform to the relevant provisions of Subsection 230 of the Standard Specifications and the following:

The work shall include furnishing, installing and testing of all materials required to install appropriate check valves at the termination of the drain pipes where shown on the plans.

Approval of Materials

The Contractor shall submit the names of the material suppliers to the Town, and receive approval from the Engineer and Town of Hadley Engineering Department prior to ordering any materials.

The Contractor shall submit shop drawings showing the layout of the proposed check valves, including all fittings, anchoring, epoxy materials and materials necessary to furnish a complete operating check valve.

The Hadley Engineering Department. and the Engineer shall be forwarded a copy of this submittal for review and acceptance.

Supplier shall have at least twelve (12) years of experience in the design and manufacture of in line style check valves on storm mains.

Manufacturer shall have designed, fabricated and have at least five (5) current installations of an inline check valves in the sizes called for on the Contract Drawings. Manufacturer must provide documentation, including project name, location and references.

Manufacturer shall have conducted independent hydraulic testing to determine headloss and jet velocity characteristics on a minimum of eight sizes of check valves ranging from 10" – 18". The testing must include multiple constructions (stiffness) within each size and must have been conducted for free discharge (discharge to atmosphere) and submerged conditions.

Manufacturer shall have conducted an independent hydraulic test where multiple valve (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability of the manufacturing process to produce the same hydraulics characteristics.

Materials

Check Valves are to be flow operated check type with an integral flanged end connection. The flange and check valve shall be once piece construction.

The flange drilling shall conform to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards. The valve shall be furnished with galvanized or stainless steel back up rings for installation.

ITEM 241.121 (Continued)

The valve shall be furnished with a stainless steel saddle support for installation. The flange of the saddle support shall have a drilling conforming to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards.

The flange will be constructed of either carbon steel, ductile iron, type 304 stainless steel or type 316 stainless steel. The valve component can either be the same material of the flange or rubber with nylon reinforcement.

The flange will be fastened to the cement concrete headwall with type 304 Stainless Steel or type 316 stainless steel fasteners.

Installation

The flange type check valve shall be installed utilizing the fasteners described above and in-line with the pipe end at the cement concrete headwall. Installation shall be performed by an installer who has installed four (4) valves of similar type and size.

Method of Measurement

Item 241.121 will be measured for payment by the Each 12 inch reinforced concrete pipe check valve installed, complete in place.

Basis Of Payment

Item 241.121 will be paid at the Contract unit price per Each, which price will include all labor, materials, testing, lab fees, equipment and all incidental costs required to complete the work to the satisfaction of the Engineer and the Town of Hadley.

ITEM 315.08 8 INCH WATER MAIN REMOVED AND STACKED FOOT

The work under this item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

The work shall consist of removing, transporting, and stacking existing water pipe, as detailed on the Plans or as required by the Engineer. Work also includes capping of existing 8" water pipe as shown on the plans. The pipe shall be neatly stacked by the Contractor at a location coordinated with the Town of Hadley DPW Director.

METHOD OF MEASUREMENT

Item 315.08 will be measured for payment by the Foot of 8 inch water main removed and stacked.

BASIS OF PAYMENT

Item 315.08 will be paid at the Contract unit price per Foot of pipe removed and stacked, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

If the pipe is determined to not be suitable for reuse, it shall be disposed of by the Contractor in accordance with local and State regulations at no additional cost. Capping of the existing 8" water pipe shall be paid for under Item 309.

ITEM 371.12 12 INCH COUPLING EACH

ITEM 379.075 ¾ INCH AIR RELEASE VALVE EACH

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

The work shall include furnishing, installing and testing of all materials required to modify or remove existing water systems, and install new water systems where shown on the plans, consisting of, but not be limited to, the following:

A. Removal and capping of a section of 8-inch (abandoned) water main
B. Furnishing pipe and insulation for water main replacement
C. Furnishing fittings and miscellaneous appurtenances
D. Installation
E. Tests and Disinfection

General

The Contractor shall give at least a 48-hour notice to the Engineer and to the Town of Hadley Water Works Department before any work is undertaken. The Contractor shall cooperate with the Engineer and the Town of Hadley Water Department, and shall coordinate all water supply alteration work with them. The Town of Hadley Water Department will furnish necessary personnel to close or open valves on the water main.

The existing 8-inch water main shall be severed at each end of the bridge, as shown on the plans or as directed by the Engineer, at a point so that the remaining pipe will not interfere with, or be damaged by, the demolition of the existing bridge structure and construction of the new bridge.

The Contractor shall perform his or her work so as to minimize shutdowns.

Data relative to existing water mains, services, etc., shown on the plans, has been compiled from existing plans, field surveys and information furnished by the Town of Hadley, but such data is not guaranteed as to the exact location or elevation. The Contractor shall verify the location, size and type of existing pipes at each location involved in the project with test pits if needed.

Approval of Materials

The Contractor shall submit the names of the material suppliers to the Town, and receive approval from the Engineer and Town of Hadley Water Department prior to ordering any materials.

The Contractor shall submit shop drawings showing the layout of the proposed water mains, including all fittings, pipe supports, pipe and materials necessary to furnish a complete operating water main.

The Hadley Water Dept. and the Engineer shall be forwarded a copy of this submittal for review and acceptance.

ITEMS 371.12 & 379.075 (Continued)

No work shall be performed on the water mains without prior written approval by the Hadley Water Department at least 14 days in advance regarding all water main related activities. The Contractor shall coordinate with the Town to establish the duration for advance notice required.

All construction work on the water main shall be witnessed by representatives from the Hadley Water Department.

Materials

Pipe and Fittings

12-Inch Ductile Iron Water Pipe

12-inch ductile iron water pipe shall be Class 52 - Cement Lined push-on restrained joint pipe manufactured in accordance A21.50 & A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA, C111/A21.11. The 12-inch ductile iron water pipe shall be insulated on the bridge and below grade at either end of the bridge where the pipe has less than 5' of cover.

Fittings for ductile iron water pipe shall be ductile iron, Class 250 minimum, conforming to applicable ANSI, NEWWA, and AWWA specifications. Fittings shall utilize restrained joints recommended by the manufacturer as suitable for use on bridge crossings.

Pipe and fittings shall have a cement mortar lining and seal coat on the inside and a coal tar enamel coat on the outside in accordance with ANSI A21.4 (AWWA C104) and ANSI A21.6 (AWWA C106), as amended, except that the cement mortar lining shall be 1/8" in thickness for pipe 2" to 12" in diameter. It shall be free of any casing or cracks in the cement lining.

Pipe shall be rubber-ring type push-on joint. Rubber gaskets shall conform to ANSI A21.11. Pipe shall be supplied in lengths not exceeding 20'. Each pipe and fitting shall have the initials of the manufacturer's name and the year cast stamped or cast into the metal.

Valves

Gate valves shall conform to AWWA C500 and shall be rated for 200-psi minimum working pressure and a minimum of 350-psi test pressure. Stuffing boxes shall be of the O-ring type. The operating nut shall be standard AWWA 2" square. Valves shall have mechanical joint only, used with "Megalug" or approved equal retainers. All valves shall open left or counter-clockwise.

All valves shall be ductile iron, bronze mounted, resilient seat seal, non-rising stem type. All ferrous parts of the valves, except finished or bearing surfaces, shall be given two coats of asphalt varnish.

After the valves are assembled and tested, a third coat shall be applied on the exterior.

All valves shall be of a mechanical joint design.

ITEMS 371.12 & 379.075 (Continued)

Valves shall be as manufactured by The Mueller Company, The Kennedy Companies, Darling Valve Co., or approved equal.

¾ " Air Release Valve

Air release valves shall be constructed of cast iron body and cover with shock proof seats for 150 psi pressure. The air release valve shall have a ¾-inch inlet.

Couplings

Couplings shall be capable of withstanding 150 psi water pressure, and shall be sized suitably to mate with the adjoining pipe. Couplings shall be as manufactured by Dresser, Smith Blair, Romac or approved equal.

Water Pipe Insulation

Insulation shall be urethane, 2 inch thickness, and aluminum jacket and shall meet the requirements specified in subsections M9.11.4 and M9.11.5 of Division III, Materials of the Standard Specifications.

Valve and Service Boxes

Valve and curb boxes shall be two-section, cast iron, heavy pattern adjustable type, with cast iron cover. The upper sections shall not have a bottom. The bottom section shall enclose the valve stuffing box and operating nut. Boxes shall be of lengths adapted to 5' pipe cover or more and have a minimum of 6" of overlap in the most extended position. Valve box covers shall have the word "WATER" cast in the top.

Installation

Pipe and Fittings Installation

Laying of pipe and fittings shall be in accordance with the requirements of AWWA Standard Specifications for Installation of Ductile-Iron Water Mains, C600, and as follows:

The Contractor shall make all necessary arrangements with the Town of Hadley Water and Fire Departments for the necessary shutdowns of service.

Upon testing and acceptance of the new water main, the Town of Hadley Water Department will establish the time of shutdown for the connection of the new main to the existing mains, including associated services.

ITEMS 371.12 & 379.075 (Continued)

Care shall be taken in loading, transporting, and unloading to prevent injury to the pipes or coatings. Pipe and fittings shall not be dropped. All pipe or fittings shall be examined for cracks, defects in coating or lining, and any other evidences of unsuitability before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer. Any pipe found to be defective, before or after laying, shall be satisfactorily removed and replaced with sound pipe at no additional cost to the Owner.

The Contractor shall excavate a minimum amount of trench and shall backfill trench to within 2 lengths of pipe laying. All trenches shall be completely backfilled at night unless otherwise approved by the Engineer.

All pipe and fittings shall be sound and clean before laying and shall be laid on a shaped bedding providing uniform, firm support over the entire length of each section barrel. BLOCKING WILL NOT BE PERMITTED. The select bedding material shall be placed and tamped along the sides of the pipe to complete the bedding.

Acceptable alignment shall be preserved in laying. The deflection at joints shall not exceed 3 degrees, or 12 inches for an 18-foot length of pipe, and shall not exceed that recommended by the manufacturer. Additional fittings shall be provided, as required, in crossing utilities that may be encountered upon opening the trench. Solid sleeves shall be used only where approved by the Engineer.

New pipe shall be laid at a uniform 5’ depth to top of pipe below proposed grade except where extra depth is required to clear other utilities and to connect to existing pipes, valves or fittings.

Pipe shall be laid in the dry and at no time shall water in the trench be permitted to flow into the pipe. The Contractor is responsible for the control of all groundwater flow at all times using a suitable method for control approved by the Engineer. When pipe laying is stopped for any length of time, including short periods, the open ends of the pipe and fittings shall be closed with a watertight plug or cap.

The Contractor shall provide a compressible, mechanical, hand tightened temporary plug to be inserted into the open end of each pipe bell during pipe laying operations. The temporary plug shall be left inserted into the open end of the last piece of pipe laid at the end of each work day and on weekends.

Necessary pipe cutting shall be accomplished by power saw and shall leave a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a push-on bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.

Push-on joints shall be made in strict accordance with the manufacturer's instructions. The rubber gasket shall be inserted in the groove of the bell end of the pipe, the joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be joined and pushed home with a jack or by other means. After jointing the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

ITEMS 371.12 & 379.075 (Continued)

Mechanical joints shall be installed in accordance with the "Notes of Method of Installation" of ANSI A2 1.1 l and the instructions of the manufacturer. The Contractor shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tight to the specified torque. Under no condition shall extension wrenches or pipe over handle or ordinary ratchet wrench be used to secure greater leverage.

If ledge, reinforced concrete, Portland cement concrete or boulders are encountered during the course of pipe installation, it shall be the Contractor's responsibility to remove and dispose of all ledge concrete, cement or boulders by blasting or other suitable method approved by the Engineer. Extreme care shall be exercised to insure that no damage occurs to any other underground utility or above-ground facility and all adjacent paved surfaces during all removal and backfill operations.

Should any such damage occur, it shall be completely repaired or restored to original condition at the Contractor's expense.

The pipe shall then be laid on the trench bedding, and the pipe pushed into place. Assembly of restrained joint pipe shall be in accordance with the manufacturer's instructions and appropriate ASTM Standards. The Contractor shall have on hand for each pipe laying crew, the necessary tools, gauges, pipe cutters, tamping bars, etc., necessary to install the pipe in a workmanlike manner. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow.

If inspection of the pipe indicates that the pipe has been properly installed as determined by the Town’s Water Superintendent, the Contractor may then refill or backfill the remainder of the trench in accordance with the Standard Specifications and these Special Provisions.

Concrete Thrust Blocks

Concrete thrust blocks shall be installed at all tees, bends, plugs, caps, tapping sleeves and other locations as shown on the plans and as directed by the Engineer in accordance with approved AWWA Standards and the dimensions and details shown on the plans.

The back of thrust blocks shall be placed against undisturbed earth and the sides shall be formed. Felt roofing paper shall be placed to protect pipe joints. Concrete shall not be placed over bolts or nuts, or in a manner that prevents the removal of joints. Concrete shall be 4000 PSI, 1 ½ inch, 565 cement concrete, and payment shall be made under Item 901.

Valve Installation

Valves shall be installed as nearly as possible in the positions indicated on the drawings consistent with conveniences of operating the hand wheel or wrench. All valves shall be carefully erected and support in their respective positions free from all distortion and strain or appurtenances during handling and installation. All material shall be carefully inspected for defects in workmanship and material, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves and other equipment, which do not operate easily or are otherwise defective, shall be replaced at the Contractor's expense.

ITEMS 371.12 & 379.075 (Continued)

Valves shall not be installed with stems below the horizontal.

Valves shall be set plumb and supported adequately in conformance with the instructions of the manufacturer. Valves shall be installed so as to be easily accessible.

Valves shall be provided with extension stems where required for convenience of operation. Extension stems shall be provided for valves installed underground and elsewhere so that the operating wrench does not exceed 8' in length.

Tests and Disinfection

On completion of the pipeline, it is to be filled with water and tested. Water used for this purpose is to be drawn from the existing water system by the Contractor under the direction of the town's Water Department. The test will be conducted no less than four days after the line is filled. The town will require that the contractor conduct water main testing through a town approved firm. The Contractor shall perform water main testing in accordance with The Town of Hadley standards and as specified herein.

A pressure test and a leakage test are to be run simultaneously. The pressure for these two tests is to be measured at the lowest part of the line and is to be per current Town of Hadley regulations. The test is to be conducted for a period of 2 hours or until such time as the town's Water Department indicates acceptance of the pipeline.

Time for Making Test

No pipeline is to be placed under pressure or subjected to hydrostatic pressure until at least 3 days have elapsed after the concrete thrust blocks have been installed. If high early strength concrete is used in the concrete thrust blocks, the hydrostatic pressure can be applied to the main after 2 days have elapsed from time of construction of the thrust blocks.

Procedure

Each section of pipeline to be tested shall be slowly filled with water from the existing system. The operation of connections to the existing system is to be carried out by the Contractor under the direction of the town's Water Department. After the new portion of the line has been brought up to normal operating pressure, all air shall be expelled from the pipeline.

Hydrants and blow-offs are to be used for this purpose insofar as possible. After all air has been expelled, the pressure and leakage test will be started. The pipeline under test is to be raised to the specified pressure (1.5 operating pressure, or 150 psi, whichever is greater). The Contractor will be required to furnish a pump, pipe connections, all necessary apparatus and connections to the new main. The Contractor will furnish all gauges and meters required and will raise the pressure in the new section of main to the specified test pressure by means of the pump, using clean water from the existing water system and will maintain the specified pressure for a period of 2 hours or until the town's Water Department indicates that the pipeline is satisfactory.

ITEMS 371.12 & 379.075 (Continued)

Any, cracked or defective pipes, fittings, valves or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material and the test shall be repeated until satisfactory to Engineer and the town's Water Department.

Leakage Test

The leakage test shall be conducted simultaneously with the pressure test. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. The Town of Hadley Water Department will determine the allowable leakage per linear foot of pipe based on AWWA standards.

Disinfection

The completed pipeline is to be disinfected with a chlorine concentration of approximately 50 ppm prior to being placed in service. The introduction of this chlorine may be accomplished using one of the following methods:

a) by sticking calcium hypochlorite tablets to the interior wall of each length of pipe as it is laid.

b) by pumping or siphoning a calcium hypochlorite solution into the main during the initial filling operations.

Regardless of the method employed, the chlorinated water is to remain in the new pipeline for a period of 24 hours. During this period, proper precautions are to be taken to prevent this chlorinated water from flowing back into the existing system.

Blowing Out

After all disinfection and testing is completed, the Contractor will be required to blow out the new water mains under the direction of the town's Water Department. Blowing out of the main is to be accomplished at as high a velocity as possible consistent with the ability of the existing system to supply water and the ability of the area around the blow-off point to drain the water off. After clean water substantially free of chlorine (chlorine residual equals abutting chlorine residual) is obtained at the blow-off, the flow of water at reduced rates is to be continued for at least one hour.

After completion of the blowing-off operation, a water sample will be taken by a professional water testing laboratory approved by the Engineer. The testing laboratory shall conduct a standard scan test of the sample including testing for total coliform, as well as other common contaminants found in water. If a total coliform zero count (total and background) is found, the new main is to be placed in service. If the test is positive, the line must be flushed again and re-tested. After the second test, if there is still a positive result, re-chlorination is required and the aforementioned steps will be repeated. All costs, including testing, will be borne by the Contractor.

The Contractor shall properly dispose of all chlorinated wastewater from the disinfection process.

ITEMS 371.12 & 379.075 (Continued)

Method of Measurement

Item 371.12 will be measured for payment by the Each 12 inch coupling installed, complete in place.

Item 379.075 will be measured for payment by the Each ¾ inch air release valve installed, complete in place.

Basis Of Payment

Item 371.12 and Item 379.075 will be paid at the respective Contract unit prices per Each, which prices shall include all labor, materials, submittals, testing, lab fees, test pits (if required), equipment and all incidental costs required to complete the work to the satisfaction of the Engineer and the Town of Hadley.

ITEM 373.12 12 INCH WATER PIPE INSULATION FOOT

The work under this Item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

Item 373.12 shall include furnishing and installation of the water pipe insulation as indicated on the plans, required by the Engineer, and specified herein.

MATERIALS

Materials shall meet the requirements specified in Section 301 of the Standard Specifications, in addition, insulation systems with expanded polystyrene or urethane insulation with a high density polyethylene (HDPE) jacket are requested by the Town of Hadley.

The HDPE jacket shall be high density polyethylene conforming to ASTM D1248 and ASTM D3350, Type III, Category 5, Class C. HDPE shall have a minimum of 2% by weight of carbon black and a minimum thickness of 150 mils.

The inner surface of the HDPE jacket shall be oxidized by means of corona treatment, flame treatment, or other approved methods to ensure a secure bond between the jacket and insulation preventing any ingression of water at the jacket/form interface.

The HDPE jacket shall be seamless. Field joint closures shall be in accordance with manufacturer's recommendation. All water main testing shall be completed prior to completing field joint closures.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 373.12 will be measured and paid for in accordance with Subsections 301.80 and 301.81 of the Standard Specifications.

ITEM 504.2 GRANITE CURB TYPE VA4 – SPLAYED END EACH

The work to be done under this item shall conform to the relevant provisions of Subsection 501 of the Standard Specifications and the following:

This item shall include granite curb type VA4, straight or curved sections, as applicable. This item shall also include the granite transition curb sections as shown on the plans to be used where it is necessary to match the proposed bridge curbing to the proposed granite curb type VA4 at two (2) of the corners of the bridge (SW and NW). The curb transitions vary from an 8 inch reveal at the bridge sidewalk to a 6 inch reveal at the approach sidewalks. The curb transition shall be in accordance with MA DOT Construction and Traffic Standard Details, plate numbers 628.24.1 and 628.24.2., except that length of transition curbing may vary to conform to the contract drawings, as required by the Engineer. Any class cement concrete is acceptable for the cement concrete wedge section.

Place the transition curb units in accurate line, with joints spacing no longer than ¼ inch. The end edges of the transition curb units shall be cut so that the edges are vertical when in place.

METHOD OF MEASUREMENT

Item 504.2, Granite Curb Type VA4 – Splayed End, straight or curved as applicable, will be measured for payment by the Each splayed end installed, complete in place.

BASIS OF PAYMENT

Item 504.2, Granite Curb Type VA4 – Splayed End, straight or curved as applicable, will be paid for at the Contract unit price per Each, which price shall include all materials, equipment, tools, sawcutting, labor and incidental costs required to complete the work. The price shall include any additional costs associated with the cutting of the splayed edges as detailed in the drawings, and cutting of the end edges of the transition pieces to be vertical so that the spacing at curb joints shall have standard gap widths.

ITEM 657. TEMPORARY FENCE FOOT
ITEM 657.5 TEMPORARY FENCE REMOVED AND RESET FOOT

The work under these Items shall conform to the relevant provisions of Subsection 644 of the Standard Specifications and the following:

Work done under these items consists of the furnishing, installing, maintaining, removing, resetting and final removal and transportation of the temporary chain link fence and gates around the work site, to secure the work area as shown on the Plans or directed by the Engineer.

The fence shall extend at least six feet above the ground and can be any type acceptable in Subsection 644 of the Standard Specifications. The cost for all end, corner, padlock and intermediate posts as well as gates and all other incidental material, labor and equipment required for the installation, and final removal shall be included under the contract unit price bid per foot. Any relocation of the fence around the work site shall be included in Item 657.5 Temporary Fence Removed and Reset.

This work shall also consist of installation of a temporary construction fence when required by the Engineer to protect a row or continuous configuration of existing trees or plantings. For additional requirements associated with temporary fence used for the purpose of tree protection, see the provisions described under Item 102.521, Tree and Plant Protection Fence.

The temporary fence on the bridge shall either have its base bolted down, or supported in cement concrete block supports, or as otherwise required by the Engineer to ensure that the fence stands securely vertical to the satisfaction of the Engineer. The temporary fence shall at all times be located outside the temporary barrier deflection area when placed directly adjacent to temporary barriers.

Gates shall be built into the fence at such approved locations as required to allow access and egress to the work site.

METHOD OF MEASUREMENT

Items 657. and 657.5, will be measured for payment by the Foot, respectively, of the actual Linear Footage of fence installed or removed and reset as shown on the plans or as required by the Engineer.

BASIS OF PAYMENT

Item 657. will be paid for at the Contract unit price per Foot of fence installed and later removed from the site. Item 657.5 will be paid for at the Contract unit price per Foot of fence removed and reset prior to final removal. The respective Contract unit prices for each item shall be considered full compensation for furnishing, installing, maintaining, and final removal from the site upon completion of the work, or when required by the Engineer. The work shall also include any work necessary to maintain or realign the temporary fence or replace damaged sections of fence while on site.

ITEM 697.1 SILT SACK EACH

Work under this item shall conform to the relevant provisions of Subsections 227 and 670 of the Standard Specifications and the following:

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions, and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Subsection 227 of the Standard Specifications.

ITEM 697.1 (Continued)

COMPENSATION

Silt sacks will be measured and paid at the Contract unit price per each, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 698.31 GEOTEXTILE FABRIC FOR TEMPORARY SOIL PROTECTION SQUARE YARD

The work under this item shall include furnishing and placement of geotextile fabric for temporary soil protection as shown on the plans and/or as required by the Engineer. All work shall be done in conformance with the applicable sections of the Standard Specifications.

Geotextile Fabric for Temporary Soil Protection shall conform to the requirements of AASHTO M 288 and shall be listed on the Qualified Construction Material's List and be approved for Separation.

Six inches of crushed stone shall be placed over the fabric prior to placement of fill. Stone shall meet M2.01.1.

Following completion of construction work, fill, stone, and fabric shall be removed and properly disposed off-site or as required by the Engineer.

METHOD OF MEASUREMENT

Item 698.31 will be measured for payment by the Square Yard of geotextile fabric installed, complete in place.

Overlapped matting will not be measured for payment.

BASIS OF PAYMENT

Item 698.31 will be paid at the Contract unit price per Square Yard, which price will include the fabric, all labor, tools, materials, stone, and removal and disposal of stone and fill, and all incidental items required to complete the work.

Crushed stone and removal of stone will be incidental to this item.

Schedule of Payment shall be as follows:

- 50% upon approval of installation
- 50% upon removal of fabric and stone as required by the Engineer.

ITEM 715.1 MAILBOX REMOVED AND RESET EACH

The work under this Item shall conform to the relevant provisions of Subsection 715.1 of the Standard Specifications, the details shown on the plans, as required by the Engineer and the following:

This work consists of removing and reinstalling Mail Boxes.

Existing Mail Boxes shall be photographed prior to removal and submitted to the Engineer for record. Mail Boxes shall be reset in its proposed location, matching the original condition as closely as possible.

Contractor shall notify the US Postal Service at least 1 week in advance of relocation operations to either coordinate the selection of a temporary location during construction or to verify the proposed final location. Where mail boxes are removed and reset in place the Contractor shall notify US Postal Service to coordinate a schedule of construction operations and conditions for access.

Mail Box shall not be relocated without the written consent of a qualified US Postal Service representative.

METHOD OF MEASUREMENT

Item 715.1 will be measured for payment by the Each mailbox removed and reset, complete in place.

BASIS OF PAYMENT

Item 715.1 will be paid at the Contract unit price per Each, complete in place, which price shall be the full payment for all labor, tools, equipment, materials, sawcutting, transportation, excavation, removal and disposal of the existing foundation, new foundation, backfill and surface restoration, and all incidental costs necessary to complete the work.

ITEM 740. ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH

The work under this Item shall conform to the relevant provisions of Subsection 740 of the Standard Specifications and the following:

Two computer systems and printer system meeting minimum requirements set forth below including installation, maintenance, power, paper, disks, and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

Processor:	Intel, 3.5 GHz
System Memory (RAM):	12 GB
Hard Drive:	500 GB
Optical Drive:	DVD-RW/DVD+RW/CD-RW/CD+RW
Graphics Card:	8 GB
Network Adapter:	10/100 Mbit/s
USB Ports:	6 USB 3.0 ports
Keyboard:	Generic
Mouse:	Optical mouse with scroll, MS-Mouse compliant
Video/Audio	the computer system shall be capable of allow video calling and recording:
Video camera	shall be High Definition 1080p widescreen capable video calling and recording with built in microphone. The microphone system shall capture natural audio while filtering out background noise.
Audio	shall be stereo multimedia speaker system delivering premium sound.
OS:	Latest Windows Professional with all security updates
Web Browser:	Latest Internet Explorer with all security updates
Applications:	Latest MS Office Professional with all security updates Latest Adobe Acrobat Professional with all security updates Latest Autodesk AutoCAD LT Antivirus software with all current security updates maintained through the life of the contract.
Monitors:	Two 27" LED with Full HD resolution. Max. resolution 1920 x 1080
Flash drives:	2 (two) - 128GB USB 3.0
Internet access:	High Speed (min. 24 mbps) internet access with wireless router.

ITEM 740. (Continued)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder (RADF)
- Reduction/enlargement capability
- Ability to copy and print 11" x 17" paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

The Contractor shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

The Engineer's Field Office and the equipment included herein including the computer system, and printer shall remain the property of the Contractor at the completion of the project. Disks, flash drives, and card readers with cards shall become the property of the Department.

Compensation for this work will be made at the contract unit price per month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer.

ITEM 751.7 COMPOST BLANKET CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsection 751 and M1.06.0 Compost of the Standard Specifications and the following:

Work shall consist of furnishing and pneumatically applying compost as a thin mulch blanket (1/2-1 inch depth) over prepared soil to provide temporary soil stabilization and organic matter for plant growth.

SUBMITTALS AND MATERIALS

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance.

Contractor shall submit to the Engineer samples and certified test results no sooner than 60 days prior to application of compost. Vender certification that material delivered meets the test results shall be submitted if requested.

Compost shall meet the requirements for M1.06.0: Compost, Type 2, as referenced in the MassDOT– Highway Division Standard Specifications for Highways and Bridges, Division III: Materials Specifications, latest edition.

The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. Soil preparation shall be as specified under the applicable item for soil placement or for seeding. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Compost blanket shall be pneumatically applied (blown on) to a minimum depth of one half to one inch. Where shown on the plans or when directed by the Engineer depth may be increased to provide berms for sediment control or to otherwise prevent slope erosion.

When compost blanket is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost blanket, as specified under the relevant item for seeding.

When compost blanket is proposed for areas with planting, compost (and seed if applicable) shall be applied after planting. If compost and seed occur prior to planting, areas shall be regraded and compost and seed reapplied to the satisfaction of the Engineer and at the Contractor’s expense.

ITEM 751.7 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.7 will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost blanket shall be compensated under the applicable item for placement of loam, sand, ordinary borrow, wetland soil, topsoil rehandled and spread, tilled existing soil, or other specified substrate.

Seeding, if utilized, will be compensated for under the appropriate seeding items.

ITEM 755.45 WETLAND RESTORATION SQUARE YARD

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

ITEM 755.45 (Continued)

ASSOCIATED ITEMS AND MATERIALS

Geotextile Fabric for Temporary Soil Protection shall be as specified under that item.

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

Wetland Mix – Part Shade
Seeding Rate: Species ecotype shall be as native to New England region as possible. Apply this mix at 20 lbs PLS/acre.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

ITEM 755.45 (Continued)

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

Plant species and sizes to be included in the Restoration Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

ITEM 755.45 (Continued)

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification
Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall be seeded with mulch as specified below. Seeding shall immediately follow soil preparation.

Seeding with Mulch
Upon approval of prepared soil, area shall be seeded. Seeding may be hand broadcast with straw mulch applied or hydroseeded per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Compost shall be pneumatically applied (blown on) to a depth of one half to one inch at the same time that seed is broadcast such that seed is covered by a light application of compost.

When planting occurs on projects with compost topdressing and seed application, planting shall occur prior to application of compost and seed. Otherwise, compost and seed shall be re-applied to the satisfaction of the Engineer and at not cost to the contract.

Seed tags shall be submitted at time of seeding.

ITEM 755.45 (Continued)

Planting

Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND SEED ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

ITEM 755.45 (Continued)

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

ITEM 755.45 (Continued)

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

Excavation of temporary fill will be paid under Item 120.1.
Geotextile Fabric for Temporary Soil Protection will be paid under Item 698.31.
Sediment Control Barrier will be paid under Item 767.121.
Compost Blanket will be paid under Item 751.73.
Timber Mat will be paid under Item 767.91.
Plants will be paid under the respective items.

756.1 CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN LUMP SUM

The work under this item shall consist of the preparation and implementation of a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (CP/PP) as required by a regulatory agency. This Item is applicable to projects that are not subject to the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

The work under this item shall also include the preparation, submission and implementation of a Flood Contingency Plan. The plan shall address the potential need for the temporary relocation of construction and auxiliary equipment situated within the 1% annual chance of flooding zone to designated upland locations above the Base Flood Elevation during flood events. The Flood Contingency Plan shall address any additional MassDEP-required information requirements, as applicable. The Flood Contingency Plan shall be submitted to the Engineer for review and approval at the same time as the CP/PP.

The CP/PP, at a minimum, shall include the following:

- Project & Site Description
- Project Site Contact Information
    - This shall include the phone number for the Contractor Site Superintendent, Project Manager and CP/PP Inspector(s).
- Qualifications of the CP/PP Inspector and documentation of qualifications
    - At a minimum, relevant personnel responsible for erosion and sedimentation control inspections shall have completed the EPA's construction inspection training course and obtained a certificate confirming completion of the training module, or have completed a third-party stormwater course which covers the minimum topics listed in Part 6.3.b of the CGP.
- Reference to and information to address permit Special Conditions relevant to the CP/PP contents. These include but are not limited to the MassDEP 401 Water Quality Certification (Filing Number 24-WW26-0055-APP), dated March 21, 2025, with the following Conditions:
    - A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (CP/PP) shall be developed and implemented as required by 314 CMR 9.06(6)(a)8. A minimum of 14 days prior to the start of work, MassDOT shall submit the CP/PP for review and approval. If the Environmental Protection Agency (EPA) Construction General Permit (CGP) applies, the Stormwater Pollution Prevention Plan (SWPPP) may serve as the CP/PP, providing it includes the measures required to be in the CP/PP per these Special Conditions, in addition to the measures specifically required by the CGP. Any subsequent changes to the Final CP/PP (defined herein as including the construction period SWPPP if applicable) must be approved by MassDEP.

ITEM 756.1 (Continued)

- Training regarding erosion and sedimentation controls is required. The RE, CP/PP Inspector, and any other relevant personnel responsible for erosion and sedimentation controls shall complete the EPA CGP Inspector Training, or other training that meets the CGP requirements, as well as complete a comprehensive review of the Final CP/PP. Proof of completion of the training shall be submitted to MassDEP prior to the start of work

- The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to BVW and LUW, proposed dewatering methods and locations, proposed stockpile locations and their proximity to catch basins or other drainage conveyances that discharge to wetland resource areas, and the location of construction-period erosion and sedimentation controls. Stockpiles shall be located no less than 50 feet from BVWs, LUW, catch basins, or other drainage conveyances that discharge to BVWs or LUW

- Prior to the start of work, approved erosion and sedimentation control measures shall be installed per the approved CP/PP and as applicable, the manufacturer specifications. Erosion and sedimentation control measures may consist of, but are not limited to, silt fence, staked straw bales, silt/turbidity curtains, compost filter tubes, etc.

- The Project shall identify one individual with at least three years of experience with construction period erosion and sedimentation control to be responsible for erosion and sedimentation control inspections (CP/PP Inspector). Under the direction of the CP/PP Inspector, inspection and maintenance of erosion and sediment controls in active work areas may be performed by both the Contractor and RE or other MassDOT project staff. Maintenance is the responsibility of the Contractor; however, the permittee shall be ultimately responsible for erosion and sedimentation control failure. The RE and/or contractor shall immediately notify MassDEP and the Hadley Conservation Commission if any unauthorized discharges to BVW or LUW occur.

- CP/PP inspections shall occur at least once every seven calendar days and within 24 hours of a storm event that produces 0.5 inches or more of rain within a 24-hour period, or at a more stringent frequency if the CP/PP requires.

- Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

ITEM 756.1 (Continued)

- Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Hadley Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the RE or other project staff with knowledge of these practices prior to use to ensure consistency with the approved Control of Water Plan, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to BVW or LUW. Any discharges shall be visibly free of sediment.

- Additional erosion and sedimentation control materials shall be stored on-site at all times for emergency and routine replacement. Materials shall be kept covered, dry, and accessible at all times. The CP/PP Inspector shall be responsible for anticipating the need for and installation of additional erosion and sedimentation controls and shall have the authority to require additional erosion control measures to protect wetland resource areas beyond what is shown on the plans if field conditions or professional judgment dictate that additional protection is necessary.

- Any storm drains with potential to receive discharge from stockpiled materials or construction operations shall be managed to inhibit the inflow of sediment while not increasing the likelihood

- Construction Sequencing/Phasing
- Erosion Prevention, Sediment Control, and Best Management Practices (BMP s) to be implemented
- Maintenance measures and intended timeline to address maintenance and corrective actions for implemented Erosion Prevention Measures, Sediment Control Devices, and BMPs
- Anticipated inspection schedule and sample inspection report form
  - Use the EPA's Site Inspection Report Template found on the EPA's website.
- Site Plans
  - This shall depict, at minimum, the project limits, locations of construction phase erosion prevention measures, construction phase sedimentation control measures, limits of disturbance, staging and laydown areas, proposed dewatering locations and proposed stockpile locations. Depict existing jurisdictional wetland resource areas, drainage conveyances and stormwater treatment features.

The Contractor shall prepare the CP/PP, and update/revise as needed upon changes in site conditions, relevant project personnel, construction phase controls, schedule changes, revised work, regulations, and construction methodologies. The Contractor shall submit the CP/PP to the Engineer for approval at least thirty (30) days prior to prior to commencement of any project related activity that disturbs land, including clearing and grubbing. Submission of the CP/PP to a regulatory agency for review and approval may also be required by a Special Condition associated with a permit issued under the Wetlands Protection Act, or Section 401of the Clean Water Act and their implementing Regulations. It is the responsibility of the Contractor to ensure the CP/PP is submitted to reviewers in a timely manner to support the construction schedule.

ITEM 756.1 (Continued)

It is the responsibility of the Contractor to comply with the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Army Corps of Engineers Section 404 Permit and other environmental permits applicable to the project, and to include in the CP/PP the methods and means necessary to comply with applicable conditions of said permits.

Inspection frequency shall be at least once every seven calendar days and within 24 hours of a storm event that produces 0.5 inches or more of rain within a 24-hour period. The inspections shall be performed by an individual that meets the qualifications specified in the permits and proof of the inspector's qualifications shall be included as an Appendix in the CP/PP. CP/PP inspection reports shall be completed and distributed to the Resident Engineer within 24-hours of each inspection. Special conditions associated with permits may also require submittal of reports to regulators at a certain frequency. Reports shall be maintained throughout the duration of the project. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector.

The Contractor is responsible for preparation of the CP/PP, inspections, and associated reports. The Standard Specifications require adequate erosion and sedimentation control for the duration of the Contract. All control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications, good engineering practices, and MassDOT standard specifications and special provisions. Contractor must maintain all control measures and other protective measures in effective operating conditions in accordance with the additional Special Provisions herein. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department.

Method of Measurement and Basis of Payment

Item 756.1 will be measured at the contract unit price, lump sum, which shall include all work detailed above, including CP/PP and Flood Contingency Plan preparation, required revisions, revisions/addenda during construction, inspections and reports.

Work under this item shall include acceptable completion of the CP/PP, Flood Contingency Plan, site inspections, and revisions/amendments required during construction. In addition, any erosion prevention or sediment control measures beyond those specified in bid items that are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and execution of the work shall be considered incidental to this item.

Payment of thirty (30) % of the contract price shall be made upon acceptance of the CP/PP and Flood Contingency Plan. Payment of forty (40) % of the contract price shall be made in equal installments over the expected duration of stormwater pollution prevention measures. Payment of the final thirty (30) % of the contract price shall be paid when final stabilization has been achieved (minimum of 75% total cover of disturbed vegetated areas with perennial ground cover).

ITEM 765.451 PART SHADE ROADSIDE MIX POUND
ITEM 765.555 WETLAND MIX – PART SHADE POUND

Work under this item shall consist of furnishing and applying the mix(es) specified below at the quantity required.

SUBMITTALS

1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.

2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.

3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.

4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

   Number of tags submitted must correspond to number of bags delivered.

   Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include: variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

   A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

5) Verification of Seed Delivery. Prior to payment, contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company letterhead or a bill of lading. Supplier verification must include all information requested on the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance. Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

ITEMS 765.451 & 765.555 (Continued)

6) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

SEEDING SEASON

The appropriate seeding seasons are:
Spring: April 1 - May 15
Fall: October 1 - December 1 for dormant seeding

PERMANENT SEED MIX(ES)

Seed Mix(es) shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

Application Rate Mix

Wetland Mix – Part Shade: 20 lbs/acre PLS. No cover crop shall be applied.
Part Shade Roadside Mix: 20 lbs/acre PLS. No cover crop shall be applied.

Any species substitutions shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

50% Increase Adjustment for Field Conditions

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season
  OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

ITEMS 765.451 & 765.555 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Part Shade Roadside Mix and Wetland Mix Part Shade will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Part Shade Roadside Mix and Wetland Mix Part Shade will be paid at the Contract unit price per pound of Pure Live Seed delivered and complete in place and upon approval of all Seed Submittal Documentation. Overseeding required to correct poor germination or establishment shall be incidental to the item.

ITEMS 765.451 & 765.555 (Continued)

NATIVE SEED WORKSHEET

Project Description: _____ Project No: _____

Contractor:_____ Contract No: _____

Seed Mix Number & Description: _____

Contractor: Complete Prior To Ordering

Pounds of Seed Required Per Contract:

_____lbs./acre for _____Acre(s) OR _____ SY

Additional 50% increase if required (out of season or seeding over compost blanket):

_____**lbs. Total Seed Required**

Calculated Quantity for **P**ure **L**ive **S**eed (PLS[1]):

_____ **Total Pounds PLS**

Engineer: Verification at Time of Application

Number pounds delivered to site[2]: _____ Date(s): _____

Actual Seed Bag Tag/s Received or photo documented by Engineer: _____

[1] *PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).*
[2]*Quantity delivered should match pounds* ***Total Pounds PLS*** *and* ***Verification of Seed Delivery****. Pounds should be shown on each Seed Tag.*

ITEMS 765.451 & 765.555 (Continued)

SUPPLIER VERIFICATION OF SEED DELIVERY FOR MASSDOT PROJECTS

Date_____

We hereby certify that (*Seed Supplier*):_____

Furnished to (*Contractor*): _____

For use on: (*Project Description*)_____

Project #: _____ Contract #:_____

Pounds of Pure Live Seed: _____

Of Mix (*Description*):_____

Lot Number _____

The material was delivered on (*Date*)_____.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): _____ Title: _____

Supplier:_____

Signature and Seal:_____

ITEMS 765.451 & 765.555 (Continued)

Part Shade Roadside Mix Seed Mix:

Botanical Name	Common Name	% Mix By Weight (PLS)	Approx. Cost 2021
Grass			
Festuca rubra	Creeping Red Fescue	26.0%	$0.51
Elymus virginicus	Virginia Wild Rye	24.0%	$1.44
Schizachyrium scoparium	Little Blue Stem	22.5%	$4.50
Panicum virgatum	Switch Grass	10.0%	$1.00
Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	7.0%	$1.26
Agrostis perennans	Upland Bentgrass	2.0%	$0.30
Carex vulpinoidea	Fox Sedge	2.0%	$0.92
Juncus effusus	Soft Rush	0.2%	$0.09
		93.7%	**$10.01**
Herb/Forb			
Chamaecrista fasciculata	Partridge Pea	3.0%	$0.18
Penstemon digitalis	Beard-tongue	1.0%	$1.71
Zizia aurea	Golden Alexanders	0.3%	$0.79
Solidago bicolor	White Goldenrod	0.2%	$0.68
Solidago caesia	Woodland Goldenrod	0.2%	$0.90
Rudbeckia hirta - VT ecotype	Black-eyed Susan - VT ecotype	0.2%	$0.04
Aster novae-angliae	New England Aster	0.2%	$0.97
Solidago odora	Licorice Scented Goldenrod	0.2%	$0.80
Aster divaricatus	White Wood Aster	0.2%	$0.79
Heliopsis helianthoides	Ox-Eye Sunflower	0.2%	$0.08
Pycnanthemum tenuifolium	Slender Mountain Mint	0.2%	$0.30
Monarda fistulosa	Wild Bergamot	0.1%	$0.11
Eupatorium perfoliatum	Boneset	0.1%	$1.24
Aster lateriflorus	Calico Aster	0.1%	$0.40
Oenothera fruticosa var. fruticosa	Sundrops	0.1%	$0.36
		6.3%	**$9.36**
Seeding Rate: 15.0 lbs PLS/Acre		**100.0%**	**$19.37**

ITEMS 765.451 & 765.555 (Continued)

Wetland Mix – Part Shade Seed Mix:

Botanical Name	Common Name	%PLS By Weight
Grass		
Poa palustris	Fowl Bluegrass	25.00%
Elymus riparius	Riverbank Wild Rye	19.00%
Carex lurida	Shallow Sedge	17.00%
Carex vulpinoidea	Fox Sedge	10.00%
Cinna arundinacea	Sweet Woodreed	5.00%
Sparganium eurycarpum	Giant Bur Reed Eco PA	4.00%
Carex scoparia	Broom sedge	4.00%
Carex lupulina	Hop Sedge	4.00%
Scirpus polyphyllus	Many Leaved Bulrush	3.00%
Juncus effusus	Soft Rush	2.50%
Carex intumescens	Bladder Sedge	2.00%
Sparganium americanum	Burrweed	2.00%
Scirpus cyperinus	Woolgrass	1.00%
Carex crinita	Fringed Sedge	1.00%
Juncus tenuis	Path Rush	0.50%
		100.00%

ITEM 765.635 NATIVE SEEDING AND ESTABLISHMENT SQUARE YARD

Work shall conform to the relevant provisions of Subsections 765 and 767 of the Standard Specifications and the following:

The work under this item shall consist of seeding, mowing, and other care to establish a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term "grass" shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

QUALIFICATIONS

Seeding shall be done by a company having a minimum of five years of experience with native seed establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

SEEDING SEASON

Seeding seasons for native mixes is April 1 - May 15 and October 1 - December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%.

Seeding season for cover crops shall be grain oats January 1 – July 31 and grain rye August 1 – December 1.

MATERIAL AND SUBMITTALS

Seed Mixes and Submittals shall be per the item(s) for permanent and annual (cover crop) seed mixes.

Compost Blanket, if used, shall meet the material and submittal requirements for that item.

Hydromulch shall be wood fiber or straw applied per the Standard Specifications and at the rates specified below and per the manufacturer.

A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of hydromulch, tackifier, and seed, per 100 gallons of water and as applicable to products used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above.

Fertilizer

No fertilizers shall be applied.

ITEM 765.635 (Continued)

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

SEEDING

Seeding shall occur within 72 hours of placement of loam and final grading or the Contractor shall propose a reasonable, alternative schedule that shall be approved by the Engineer.

Surface Preparation

No seeding or soil preparation shall be done if soils are muddy or dry and compacted. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a relatively smooth finish corresponding to the required grades.

When seeding over existing or compacted soil or soil that has sat bare for more than 30 days, surface will be prepared by tilling or raking to a minimum depth of 2 inches prior to seeding and prior to Compost Blanket application (when applied).

Surface preparation shall be compensated for under for loam placement or topsoil rehandled and spread as appropriate to the project.

Jute or coir mesh, when specified in the contract, shall be placed after seeding and per the Standard Specifications and the manufacturer’s instruction.

Surface preparation shall be approved by the Engineer prior to seeding.

Seeding over Various Substrates

Loam: Seeding shall occur within 72 hours of loam placement to prevent loss of topsoil. Seed shall be manually broadcast for areas less than half an acre (each area, not cumulative area) and when specified on the plans. Broadcasting shall be immediately followed by hydromulching as specified below. When not specified on the plans, larger areas may be hydroseeded as specified below.

Compost Blanket: Compost Blanket shall be applied as specified under that item. Seed should be broadcast at the same time as compost application to ensure a thin cover of compost over seed.

When seeding is done after application of Compost Blanket the rate shall be increased by 50%. If the Compost Blanket is applied after December 1, seed shall be broadcast or hydroseeding over the compost in the Spring and the rate increased by 50% specified under Seed Application.

ITEM 765.635 (Continued)

Compost Mulch over Modified Rock: Compost Mulch and seed shall be applied as specified under that item. No hydromulch is required.

Cover Crop

Cover crop shall be used when seeding out of season, when specified with the permanent native seed mix under that item, and as required to prevent erosion until the permanent seed establishes. A cover crop should not be used with a steep slope mix or other permanent mix which already contains either cereal rye or oats in the composition of the mix. A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Seed Application

All seed shall be mulched as specified herein.

Seed application shall be by broadcast seeding or by hydroseeding as described below.

Broadcast Seeding

Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler to achieve an even distribution. Seed shall not be broadcast when wind velocities are greater than 15 mph.

Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction (horizontally and vertically). To ensure seed to soil contact with broadcasting of seed, seeding shall be followed by rolling or tracking with equipment approved by the Engineer.

Broadcast seed shall be mulched with weed-free straw mulch unless seeding is done as part of Compost Blanket in which case it shall be as specified above under seeding with Compost Blanket application.

Hydroseeding and Hydromulching

Hydroseed and mulching shall be per the manufacturer's directions and as follows.

Hydroseeding shall only be used for sites over half an acre in size or with permission of the Engineer.

Tank and hoses shall be cleaned from all previous hydroseeding and hydromulching projects. Seed shall be mixed into the slurry immediately before application and slurry applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

ITEM 765.635 (Continued)

A 2-step process shall be used for seeding in conjunction with hydromulch. Seed shall be applied with 500 lbs/acre of hydromulch in the first pass. A second pass with 1,000 lbs/ acre of hydromulch shall be applied in a second pass. Each pass shall be applied in a different direction.

Once the seed has been added to the tank mixture a one-hour time limit is set for spreading the mixture on the soil. Once the one hour has passed the excess mixture must be discarded.

For broadcast seeding, hydromulch shall be applied immediately following seeding at a rate of 1,000 lbs/acre. Tank shall be cleaned from any previous hydroseeding.

CARE DURING GERMINATION AND ESTABLISHMENT

Contractor shall care for seeded areas as necessary for successful germination. Care will include watering and weed control as necessary to achieve establishment of the specified seeded species after one growing season as specified below.

The contractor shall maintain the stand of grasses to ensure healthy growth of the seeded species. Work shall include mowing or weed-whacking for weed control, watering if necessary, and removal of invasive plants.

Watering shall be sufficient to achieve soil moisture to a depth of 2 inches or more and such moisture is uniform. Method of watering shall not erode or damage soil or grassed surfaces.

General Weed Control: Unless otherwise directed, mowing shall be as specified under Mowing for Weed Control for seed establishment. Weeds shall be mowed prior to weeds setting seed (by the end of July unless otherwise approved).

Control of Invasive and Aggressive Weeds: Invasive and aggressive weeds, including but not limited to mugwort, ragweed, knapweed, foxtail, crabgrass, and chicory must be cut or treated prior to going to seed. Herbicide treatment must be coordinated with MassDOT. Undesired species (such as chicory) introduced due to use of incorrect seed mix shall be removed at the Contractor's expense.

MOWING FOR WEED CONTROL

Mowing for weed control shall be completed after weeds have sprouted and show leaf and bud growth, but prior to setting seed, generally between July 7th and August 1st, unless directed otherwise by the MassDOT Landscape Architect and the Engineer.

Mowing height shall be as needed for weed control, generally to a height of 8 inches and not below 4 inches, unless directed otherwise. Mowing shall be with a brush hog mower or string trimmer other approved equipment. Conventional lawn mowers which cannot achieve the appropriate cut shall not be used.

ITEM 765.635 (Continued)

Contractor shall give 48-hour notice prior to mowing work. Mowing shall only occur in dry sunny weather. Litter pickup should occur prior to mowing in all areas. If required, cut grass shall be raked and removed. Litter pickup and raking and removal of grass shall be incidental to the work.

Mowing equipment shall be approved by the Engineer prior to work.

OVER-SEEDING

Over-seeding rates and methods shall those specified above under Materials and Methods. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact and areas shall be mulched with straw mulch and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.

DETERMINING SATISFACTORY GRASS ESTABLISHMENT

A well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species (not the cover crop) will be visible. Generally:

- A minimum of 75% coverage by the specified permanent seeded species after one growing season. Of that percentage, generally, depending on the mix species:
    - At least 3 types of the permanent seeded grass species shall be visible.
    - At least 3 species of wildflowers shall be visible.
- There will be no significant gaps or bare soil (generally 2-3 feet in diameter or greater).
- There will be no more than 25% coverage by weed species.
- All soil shall be stabilized and there shall be no channeling or erosion.
- There will be no invasive or aggressive species within the stand at the time of acceptance.
- There shall be no evidence of seed from non-native mixes (i.e., clover) due to failure to clean the hydroseeding tank or using incorrect mix.

Invasive and aggressive weeds (such as mugwort, ragweed, knapweed, and chicory) must be cut or treated prior to going to seed for Interim Acceptance. Herbicide treatment must be coordinated with MassDOT.

A warm-season grass mix with perennials will not have uniform growth. A uniform stand of grass may indicate use of an incorrect mix.

ITEM 765.635 (Continued)

ACCEPTANCE OF SEEDING AND ESTABLISHMENT WORK

Conditional Acceptance shall be based on proper application of seed as specified herein.

Interim Acceptance of Care. Seeding will be inspected by mid-July to assess germination and Establishment conditions as described above. When necessary for Interim Acceptance, areas shall be mowed prior to weed species producing seed and as specified above under Weed Control. ***Areas requiring weed control that are not mowed prior to weed seed dispersal will not be approved for Interim Acceptance.*** Seeding that shows good germination and is determined by the Engineer and Landscape Architect to not require weed control at time of inspection shall be accepted for Interim Acceptance payment.

Final Acceptance of Establishment shall be given upon satisfactory Establishment as described above.

If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1st. All remediation shall be at the contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Native Seeding and Establishment will be measured for payment by the square yard, complete in place.

Native Seeding and Establishment will be paid at the Contract unit price by the square yard at the Contract unit price upon Conditional, Interim, and Final Acceptances as described above. This price shall include all submittals, seeding, rolling to ensure seed-to-soil contact, weed control, water, over-seeding, labor, materials, equipment, and all incidental costs required to complete the work of establishing a satisfactory stand of grass.

Native seed and cover crop mixes shall be compensated under the respective items.

Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated under loam placement or topsoil rehandled and spread as relevant to the project. If used, Compost Blanket shall be compensated under the respective item.

Mowing for weed control will be incidental to this item.

Schedule of payment shall be as follows:

30% upon Conditional Acceptance
20% upon Interim Acceptance of Care, except this amount will be reduced to zero and final payment will be reduced accordingly when areas requiring weed control are not mowed as specified in the Interim Acceptance criteria.
50% upon Final Acceptance of Establishment

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

The work under this item shall conform to the relevant provisions of Subsections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment control barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff.

Twelve-inch diameter (after installation) compost filter tubes with biodegradable natural fabric (i.e., cotton, jute, burlap) are intended to be the primary sedimentation control barrier. Photo-biodegradable fabric shall not be used.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods:

- 9-inch compost filter tubes
- Straw bales which shall be trenched

No straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

When required by permits, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, sedimentation fence shall be used in addition to compost filter tubes and straw bales and shall be compensated under that item.

Sediment control barriers shall be installed in the approximate location as shown on the plans and as required so that no excavated or disturbed soil can enter mitigation areas or adjacent wetlands or waterways. If necessary to accommodate field conditions and to maximize effectiveness, barrier locations may be shifted with approval from the Engineer. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

ITEM 767.121 (Continued)

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

Compost Filter Tube

Compost material inside the filter tube shall meet M1.06.0, except for the following: no peat, manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

Straw Bales

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales in order to prevent deterioration of the bindings.

The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. The trench must be deep enough to remove all grass and other material which might allow underflow. After the bales are staked and chinked (filled by wedging), the excavated soil should be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

ITEM 767.121 (Continued)

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

Sedimentation Fence

Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and the following:

Sedimentation fence shall only be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

When used with compost filter tubes, the tube shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

When used with straw bales, an 8-inch deep and 4-inch wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

MAINTENANCE

Maintenance of the sediment control barrier shall be per Section 670.60 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP), whichever is more restrictive.

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact (despite fabric decay) and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Engineer.

ITEM 767.121 (Continued)

Regardless of site context, nonbiodegradable material and components of the sediment barriers, including photo-biodegradable fabric, plastic netting, nylon twine, and sedimentation fence, shall be removed and disposed off-site by the Contractor.

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. In urban, residential, or other locations where aesthetics is a concern, the following shall apply:

- Compost filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (as would be done with a soil amendment or mulch). No more than a 2-inch depth shall be left on soil substrate.
- Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with a seed mix matching adjacent seeding or existing grasses (i.e., lawn or native grass mix).
- Sedimentation fence, stakes, and other debris shall be removed and disposed off-site. Site shall be restored to a neat and clean condition.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.121 will be measured and paid for at the Contract unit price per Foot of sediment control barrier which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of soil, and all incidental costs required to complete the work.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damage by construction activities shall be repaired or replaced as directed by the Engineer at the Contractors expense.

ITEM 767.122 SEDIMENT BARRIER – COIR LOG FOOT

The work under this item shall conform to the relevant provisions of Subsections 101, 120, 170, and 751 of the Standard Specifications and the following:

Sediment Barrier - Coir Log shall be used in wet locations where the barrier will not require removal; when barrier is placed immediately adjacent to existing wetlands; as a check dam in swales; in locations as shown on the Drawings; and/or in locations required by the Engineer.

Permits, Codes and Regulations: The Contractor shall comply with all rules, regulations, laws and ordinances of the City/Town and State, and all other authorities having jurisdiction over the Project site. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Department.

MATERIALS

Coir Log: Coir Log shall be biodegradable coir fiber cylindrical bundles. Inner core shall be 100 percent unsorted, well-cleaned, coir fiber uniformly distributed along the length of the log. The stuffed density of the coir fiber shall be a minimum of 9 pounds per cubic foot.

Outer netting shall be constructed from a minimum 3-ply high strength coir bristle twine. The netting shall have 2-inch by 2-inch rhombic openings with hand-knotted junctions. The average breaking strength of the coir twine shall be a minimum of 80 pounds. Production tolerance for all the above parameters shall not exceed plus or minus 10 percent.

Coir log diameter shall be sized as shown on the drawings. Typical lengths are supplied in 10 foot or 20-foot increments. Coir logs or coir netting may not be cut to decrease length and shall maintain the physical properties as supplied by the Manufacturer.

Notched Wood Stakes: Stakes shall be oak or southern pine with dimensions as shown on the Drawings. Stakes shall be free from knots and other defects which would cause splitting and shall have a downward-angled notch as shown in the drawing.

Coconut Fiber Cord: Coconut fiber cord shall be two-ply braided cord with a breaking strength of 80 pounds, minimum 0.25-inch diameter.

Delivery, Storage and Handling: Protect materials from deterioration during delivery and while stored at site.

CONSTRUCTION METHODS

General: Prior to initial placement of the coir log sediment barrier, the Contractor and the Engineer shall review locations specified on the plans and adjust placement, if required, to ensure that the coir log positioning and configuration will provide maximum sediment capture. Coir log sediment barrier(s) shall be in place prior to excavation work and no work shall take place outside the coir log barrier(s).

ITEM 767.122 (Continued)

Installation: Coir logs shall be staked and secured as shown on the Drawings, as specified herein, and/or as recommended by the Manufacturer. The Contractor shall remove all underlying vegetation or debris to ensure that each coir log is securely in contact with soil, such that there is no flow beneath the log.

When used as a check dam barrier in a swale, the coir log shall be centered in the low point of the swale, perpendicular to the flow, with ends extending upslope. The log check dam barrier shall extend such that the log top elevation at the center of the swale is lower than the lowest elevation at the end log, to ensure that sediment-laden runoff will flow either through or over the coir log but not around it. The coir log check dam barrier shall have length such that no seams occur in the swale.

Notched wood stakes shall be driven parallel on both sides of the coir log at a typical spacing of 5 feet on center, unless site conditions warrant a closer spacing distance to ensure logs are firmly secured to the underlying soil. Stakes shall not extend more than 1 foot beyond the top of the log. Coir twine shall lash the logs to notched stakes in a cross-lashing fashion between stakes, throughout the length of the log barrier.

When utilizing multiple logs for sediment control, each coir log shall be laced together end-to-end (creating a seam) with coir twine to create a continuous length. End-to-end lacing may be completed before or after placement, to facilitate handling.

Maintenance: Maintenance of the coir log sediment barrier shall be per the Stormwater Pollution Prevention Plan (SWPPP).

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. The Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract. Under no condition shall sediment be allowed to accumulate more than 4 inches above the original ground line.

If a breach or other failure of the barrier occurs, the barrier shall be immediately restored. Repair shall include replacement of entire defective segments or for short breaches, revetment with additional coir logs, set directly adjacent to the downslope side of the breech. Revetment coir logs must overlap breech by a minimum of 2 feet on each side. The Engineer must approve breech repair means and methods as well as outcome.

If the coir log sediment barrier is damaged by equipment or undergoes a significant washout or other major failure, the Contractor shall replace the component in its entirety, at the discretion and approval of the Engineer. Any delay in maintaining the barrier shall be cause to immediately suspend the work as provided for in Subsection 8.09: Delay and Suspension of Work.

ITEM 767.122 (Continued)

Disposition/Removal**:** For naturalized areas, coir logs and wooden stakes may be left in place to decompose on-site. For areas where, in the determination of the Engineer, aesthetics are a concern, logs, errant coir fiber material, and stakes may require removal.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.122 Sediment Barrier - Coir Log will be measured for payment by the FOOT, complete in place and will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for coir log(s) follow-up maintenance and repairs, or disposal (if required), but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 816.71 PORTABLE SOLAR POWERED TRAFFIC SIGNAL SYSTEM LUMP SUM

This item is for Solar-Powered Portable Trailer Mounted Three Color Traffic Signal (PTS) System (minimum of two trailers per system). The unit shall comply with the requirements for Portable Traffic Control Signals as defined in the Federal Manual of Uniform Traffic Control Devices (MUTCD), Part IV, including specifically the requirements pertaining to signal heads, lamps, and spacing of signals, clearance, and number of signal faces. The PTS System units shall utilize L.E.D. traffic signal indications meeting the Institute of Traffic Engineers specifications. Each PTS System delivered shall contain the trailer, structural support system, mast arm assembly; lift mechanism, regulated power supply, batteries, solar charging system, trailer-mounted traffic signal controller, signal heads, microwave detector, all necessary wire and cable and all ancillary equipment. The PTS-System shall be able to function continuously, independent of utility power sources. The system trailers shall conform to applicable sections of Massachusetts law governing trailers, including lighting to highway standards.

GENERAL:

PTS System construction, materials, and operation shall conform to the ITE, NFPA, ULI, and NEC. The unit shall be a trailer mounted and equipped with a mechanically lifted mast and arm. It shall be equipped to display (2) 12" (300 mm), 3 section traffic signal heads with back plates. Vehicle heads shall be dark green or federal yellow in color.

TRAILER:

The trailer shall be designed for safe transport at normal highway speeds of 55 mph. Lights, reflectors, and splash guards shall be provided to comply with ICC and Massachusetts regulations. The PTS System shall be delivered with reflective tape, or State approved equal, installed on all four (4) sides of the trailer. Each side of the trailer shall have the minimum equivalent of 72 square inches (465 square centimeters) of reflective tape.

STRUCTURAL SUPPORT:

The deployed structure shall supply adequate support to allow complete traffic signal operation, including raising and lowering of the mast arm, and shall remain stable during wind gusts of 80 mph when stationary.

LIFT MECHANISM:

1. The lift mechanism shall be an electric or electrically assisted hydraulic or mechanically assisted manual mechanism capable of raising and lowering the mast arm.
2. The mechanism shall be capable of being lowered manually.

ITEM 816.71 (Continued)

3. A safety feature shall be provided to prevent the mast arm from lowering once in the raised position. If a safety bolt is used, a self-locking mechanism shall be incorporated into the safety bolt which prevents it from being inadvertently dislodged.
4. The mast arm of the unit shall extend a minimum of 9 feet (2. 7 m) from the side of the trailer and provide a minimum clearance of 17 feet (5. 2 m) over the baseline established by the jacks.

ELECTRICAL:

1. The PTS System shall operate primarily from a solar powered electrical system. Secondary power supply type shall provide capability to accept existing 120V commercial electric service.
2. This system shall consist of a battery power system and solar array panels, and shall be capable of operating the PTS System for at least 14 consecutive days on batteries alone at 70°F (17.7°C). The system shall be designed to operate continuously within Massachusetts, January thru December. Should weather conditions preclude the use of pure solar power the PTS System shall be equipped with an on-board auxiliary charging system to enable the batteries to be recharged via a 120 Volt AC connection.

TRAFFIC SIGNAL OPERATION:

The traffic signal controller shall be enclosed in a cabinet mounted on each trailer. The controller shall be furnished with a keypad and LCD display screen; the use of a PC or laptop only for programming is not acceptable. The controller keyboard or keypad shall be capable of allowing the signal operator to program the signal under all weather conditions. The traffic signal controller shall also:

1. Be capable of operating over a -30 ° to +150 °F (-34 ° to +66°C) range and in a 20% to 100% humidity range.
2. Be capable of performing normal traffic signal operations as defined on the plans.
3. To avoid the possibility of conflicting signal indications, or absence of signal voltages, the traffic signal system shall be either hard-wired or controlled by radio signals, and in either case shall employ the use of a conflict monitors, or similar electronic technology that is typically used in traditional traffic signal operations which will not allow conflicting signal displays.
4. In the event that a conflict is detected the signal heads shall display flashing red indications, and the system shall require the malfunction to be manually reset.
5. Retain programs in the controller's memory in the event of power failure.
6. Be capable of automatic system recovery after power outages without operator intervention.
7. Place the signal into programmed flashing operation when the output voltage drops below the manufacturer's recommendations.
8. Be contained in a weatherproof, lockable housing, and insulated to protect against excessive vibration and temperature. The housing shall have a lockable door latch.

ITEM 816.71 (Continued)

9. Have the ability to be programmed with a password, to help prevent unauthorized access to the controller software in the field.
10. The controller software provided with the PTS System shall not contain any· computer code that would disable such software or system or impair in any way its operation based on the elapsing of a period of time, exceeding an authorized number of copies, advancement to a particular date or other numeral, or other similar self-destruct mechanisms, (sometimes referred to as "time bombs", "time locks", or "drop dead" devices), or that would permit contractor to access the Product to cause such disablement or impairment (sometimes referred to as a "trap door" device).
11. Contractor shall submit shop drawings and specifications of traffic signal controller for the review and approval of the Engineer prior to construction.

BASIS OF PAYMENT

Item 816.71 will be paid for at the Contract Lump Sum price, which price shall include all labor, materials, equipment and incidental costs to complete the work. The Lump Sum price bid for this Item shall include the installing and maintaining of an operable Portable Solar Powered Traffic Signal System.

ITEM 853.22 TEMPORARY BARRIER (TL-3) REMOVED AND RESET FOOT

Work under this item shall consist of removing, transporting and resetting temporary barrier systems and limited deflection temporary barrier systems from alignments established along the roadway to new alignments in accordance with the details shown on the plans, as required by the construction and staged construction operations and as required by the Engineer for the channelization of traffic and/or work zone protection.

The work shall also include furnishing and installing all hardware and associated materials per the details and/or manufacturer's specifications for anchored or restrained temporary barrier systems.

The work shall also include necessary patches and repairs caused by the temporary barrier system to damaged pavement surfaces or any adjacent longitudinal barrier once the system has been removed.

CONSTRUCTION METHODS

Temporary barrier systems and limited deflection temporary barrier systems shall be removed from existing locations and reset in accordance to the Construction Methods stated in Item 853.33.

Damage to the pavement surface or adjacent permanent barriers caused by removing or resetting temporary barrier shall be repaired as directed by the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT

Item 853.22 will be measured for payment by the Foot of temporary barrier (TL-3) removed and replaced, complete in place.

BASIS OF PAYMENT

Item 853.22 will be paid at the Contract unit price per Foot, which shall provide full compensation for removing, relocating, resetting, realigning, and transporting maintaining the temporary barrier system and/or limited deflection temporary barrier system. The Contractor will be paid for this item each time the barrier is relocated either to a new work zone, to off-season storage, or back to the project from storage. The Contractor will not be separately compensated for any work necessary to maintain or re-align units or replace damaged units. No payment will be made for removing and resetting barriers for the purpose of gaining access to the construction work zone. No payment will be made for removing, relocating and resetting any barriers moved for the convenience of the Contractor.

For temporary barrier systems that require anchorage systems, the cost of furnishing, installing and removing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of the item.

ITEM 853.23 TEMPORARY BARRIER (TL-3) FOOT

Work under this item shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of TL-3 temporary barrier systems for channelization of traffic and/or work zone protection.

Materials

The Contractor shall use a temporary barrier system that is listed on the Qualified Traffic Control Equipment List.

The Contractor may submit alternate materials to the Engineer for approval if the temporary barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO Manual on Assessing Safety Hardware (MASH) at Test Level (TL) 3 or higher; and
3. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.

The Contractor shall supply shop drawings to confirm the available clear area behind the barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators shall be installed on all temporary barrier systems in conformance with the relevant provisions of Section 850.69 and shall be incidental to the temporary barrier systems.

Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List shall be used whenever a blunt end of the temporary barrier system is facing traffic within the clear zone unless it is protected by a second barrier system or secured to a separate barrier system or bridge railing by a method approved by the manufacturer.

Construction Methods

Temporary barrier systems shall be placed in line with the drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Contractor shall not place any breaks in the temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining barrier system.

Within the LON section, temporary barrier systems shall only be placed on paved surfaces unless otherwise tested and certified under MASH TL-3 for those conditions.

ITEM 853.23 (Continued)

Damage to the pavement surface caused by the temporary barrier during installation, while in service, and/or during removal shall be repaired as directed by the Engineer at the Contractor's expense.

Temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Section 850.70.

Method of Measurement

Item 853.23 will be measured for payment per Foot, complete in place.

Basis of Payment

Item 853.23 will be paid at the Contract unit price per Foot, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. This price shall include the cost of furnishing, installing, maintaining and final removal of all temporary barrier systems.

For temporary barrier systems that require anchorage systems, the cost of furnishing and installing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of the item.

Payment for temporary barrier removed and reset will be made under Item 853.22.

ITEM 853.33 TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3) FOOT

Work under this item shall consist of furnishing, installing, maintaining and final removal of limited deflection TL-3 temporary barrier systems for channelization of traffic and/or work zone protection. Limited deflection temporary barrier systems shall have a maximum dynamic deflection of 6 inches or less (on-bridge) and shall be used in areas where the available clear area behind the barrier system is 6 inches or less. Limited deflection temporary barrier systems shall have a maximum dynamic deflection of 24 inches or less (off-bridge) and shall be used in areas where the available clear area behind the barrier system is 24 inches or less (off-bridge).

MATERIALS

The following limited deflection temporary barrier systems are acceptable for use:

1. BarrierGuard 800; Highway Care International. http://www.highwaycareint.com/product_info/44/barrierguard800
2. J-J Hooks F-Shape Temporary Concrete Barrier; Easi-Set Industries. http://jjhooks.com/
3. ZoneGuard; Hill & Smith, Inc. http://www.hillandsmith.com/zoneguard/
4. Texas DOT X-Bolt F-Shaped Concrete Safety Barrier

The Contractor may submit alternate materials to the Engineer for approval if the limited deflection temporary barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO *Manual on Assessing Safety Hardware* (MASH) at Test Level (TL) 3 or higher; and
3. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.

The Contractor shall supply shop drawings to confirm the available clear area behind the barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators shall be installed on all limited deflection temporary barrier systems in conformance with the relevant provisions of Section 850.69 and shall be incidental to the temporary barrier systems.

Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List shall be used whenever a blunt end of the limited deflection temporary barrier system is facing traffic within the clear zone unless it is protected by a second barrier system or secured to a separate barrier system or bridge railing by a method approved by the manufacturer.

ITEM 853.33 (Continued)

CONSTRUCTION METHODS

Limited deflection temporary barrier systems shall be placed in line with the drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Contractor shall not place any breaks in the limited deflection temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining limited deflection barrier system.

Within the LON section, limited deflection temporary barrier systems shall only be placed on paved surfaces unless otherwise tested and certified under MASH TL-3 for those conditions.

Damage to the pavement surface caused by the limited deflection temporary barrier during installation, while in service, and/or during removal shall be repaired as directed by the Engineer at the Contractor's expense.

Limited deflection temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Section 850.70.

METHOD OF MEASUREMENT

Measurement for Item 853.33 shall be by the Foot, in place.

BASIS OF PAYMENT

Payment for Item 853.33 shall be made at the Contract price per Foot for limited deflection temporary barrier installed in place, including all incidental items. This price shall include the cost of furnishing, installing, maintaining and final removal of all limited deflection temporary barrier systems.

For limited deflection temporary barrier systems that require anchorage systems, the cost of furnishing and installing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of the item.

Payment for limited deflection temporary barrier removed and reset will be made under Item 853.22.

ITEM 853.501 TEMPORARY IMPACT ATTENUATOR (TL-3) REMOVED AND RESET EACH

ITEM 853.53 TEMPORARY IMPACT ATTENUATOR UNIDIRECTIONAL, NON-REDIRECTIVE (TL-3) EACH

Description

Work under these items shall consist of furnishing, installing, maintaining and final removal of temporary impact attenuator systems for protection of the ends of temporary barrier and other roadside hazards in work zones. All work shall be in conformance with the specifications of the manufacturer and in close conformance with the locations, lines, and grades shown on the plans.

Materials

The Contractor shall supply a temporary attenuator that meets the same or higher crash Test Level (TL) as the adjacent temporary barrier, unless otherwise shown on the plans. The temporary attenuator shall be listed on the Department's Qualified Traffic Control Equipment List.

The temporary impact attenuator shall be designed to fit within reasonably close tolerance of the dimensions given on the plans.

The Contractor shall supply shop drawings for the temporary attenuator and for any anchorage system and for any transitions or connections between the temporary attenuator and the adjacent barrier or other roadside hazard.

The side of the temporary attenuator that faces traffic shall include a Type 3 Object Marker that conforms to the language found in Sections 2C.64 and 2C.65 of the *Manual on Uniform Traffic Control Devices.*

Unless a separate barrier system protects it from opposing traffic, only temporary impact attenuators that are certified for bi-directional use shall be used in medians.

Construction Methods

Installation means and methods shall be per the manufacturer's specifications and/or drawings. Excavation for temporary attenuator foundations and anchorage shall be made to the required depth and to a width that will permit the installation and bracing of forms where necessary. All soft and unsuitable material shall be replaced with compacted gravel borrow.

The Contractor shall supply the Engineer instructions for installation and the manufacturer's recommended routine inspection and maintenance program. The cost of inspection and maintenance of temporary attenuators shall be considered incidental in nature.

ITEM 853.501 & 853.53 (Continued)

Damaged temporary impact attenuators shall be replaced by the Contractor within 24 hours or as directed by the Engineer, at the Contractor's expense. A truck mounted attenuator that meets the same or higher TL, or other means of protecting the damaged temporary impact attenuator, shall be deployed until the repairs or replacement has been completed, at the Contractor's expense.

Method of Measurement

Items 853.501 and 853.53 shall be measured as a single unit Each, furnished and installed in place.

Basis of Payment

Payment for work under these items shall be made at the contract unit price Each. This price shall include the cost of all labor and materials for furnishing, foundations and anchorages, installation, maintenance and final removal, and all incidental work necessary to complete the work as specified.

ITEM 859.1 REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS **EACH**

The work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List. Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCSD.
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

CONSTRUCTION METHODS

The first ten (10) drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

ITEM 859.1 (Continued)

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the contract unit price per day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

ITEM 866.206 6 INCH REFLECTORIZED WHITE LINE (POLYUREA) (RECESSED) FOOT

ITEM 867.206 6 INCH REFLECTORIZED YELLOW LINE (POLYUREA) (RECESSED) FOOT

The work of these items shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and the following:

Work shall consist of the following major activities:
• Cutting or grinding recessed grooves or slots in the pavement, and
• Installing white or yellow pavement markings in the recessed grooves, and
• Periodically measuring and reporting the performance of the pavement markings.

Materials

Material certification shall be submitted to the resident engineer before all applications. All work shall be done in accordance with the Material Supplier's specifications and the following:

Wet reflective polyurea pavement markings shall consists of a liquid binder, first drop beads or elements to provide dry and wet retroreflectivity, and second drop glass beads to improve the durability of the pavement marking, reduce track-free times, and provide supplementary dry retroreflectivity.

Polyurea shall be one of the following binders and first drop beads or elements, or approved equivalent:

1. 3M™ Liquid Pavement Marking Series 5000 with 3M™ All Weather Series 90 elements;
2. Epoplex GLOMARC® 90 with Potters VISIMAX® Glass Bead System; or
3. SWARCO MFUA-12 with SWARCO MEGALUX-BEADS®.

Combination of other binder and first drop bead or element series may only be used at the approval of the Engineer.

Second drop beads shall be manufactured from glass of a composition that is highly resistant to traffic wear and to the effects of weathering. If coating is required to meet the performance requirements, the second drop beads shall be coated to ensure satisfactory embedment and adhesion. Second drop beads retained on a No. 40 U.S. Standard Mesh Sieve shall have a minimum crush strength of 30 lbs. when tested in accordance with ASTM D1213.

Second drop beads shall have a minimum refractive index of 1.51 when tested in accordance with AASHTO M247.

ITEMS 866.206 & 867.206 (Continued)

Second drop beads passing the No. 30 sieve shall have a minimum of 75 percent true spheres when tested in accordance with ASTM D1155. All second drop beads retained on the No. 20 and No. 30 sieves shall have a minimum of 80 percent true spheres as determined by ASTM D1155. Second drop beads shall meet the following gradation requirements when tested in accordance with ASTM D1214:

U.S. Standard Sieve No.	Percent Retained
20	3-10
30	15-35
50	45-75
70	0-10
Pan	0-5

Construction Methods for Installation of Groove

The Contractor shall not cut the recessed grooves without the approval of the Engineer. Prior to cutting the recessed grooves for any lines, the Contractor shall layout the proposed lines on the pavement surface. The Contractor shall use a chalk line or other suitable method to mark the proposed layout. The Contractor may cut the recessed grooves upon approval of the proposed layout by the Engineer.

Grooves shall be positioned so that there shall be a minimum of 4 inches from the edge of the pavement marking to any longitudinal pavement joints. Grooves shall not be installed on bridge joints, at drainage structures, or in other areas identified by the Engineer. For intermittent pavement markings (ie: broken or dotted lane lines), grooves shall be cut in the same intermittent pattern. Grooves for such pavement markings shall not be cut as a single continuous groove, but shall be cut only where markings will be applied.

The use of gang stacked diamond cutting blades to grind a smooth square slot is required for producing all grooves. The spacers between blade cuts shall be such that there will be less than a 10 mil rise in the finished groove between the blades. The acceptability of the surface texture will be determined by the Engineer. The diamond grinder shall have an articulating head so that the slots are installed correctly on grades and super elevated sections.

Grooves that are ground deeper or wider than the specified allowable limits shall be repaired per the direction of the Engineer at no additional cost. Grooves that are ground too shallow, too narrow, or with unacceptable rises between blade cuts shall be reground to the correct size, depth, and surface finish at no additional cost. Slots ground out of alignment shall be patched using an approved method and materials.

Grooves shall be 1 inch ± ¼ inch wider than the pavement marking material. Groove depth shall be 100 mils ±5 mils, unless otherwise approved by the Engineer. Depth shall be consistent across the full width of the groove. Depth plates shall be provided by the Contractor to the Engineer to assure that desired groove depth is achieved.

ITEMS 866.206 & 867.206 (Continued)

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. Shrouds and a vacuum apparatus shall be included as part of the grinder to remove larger pieces of pavement that are ground out. If water is used to clean the groove or the grooving process takes place during rainfall, a minimum of 24 hours of dry time is required prior to the placement of pavement markings.

After the depth, width, length, and surface condition has been approved by the Engineer, an air lance shall be used to remove fine particles from the groove. Air compressors shall initially be blown out away from the application area to prevent compressor condensation build-up from entering the groove. The Contractor shall prevent traffic from traversing the grooves and re-clean grooves, as necessary, prior to application of pavement markings at no additional cost to the Department.

All grooves must be given final approval by the Engineer prior to the placement of pavement markings.

Installation of Wet Reflective Polyurea

Installation of wet reflective polyurea pavement markings shall conform to the Manufacturer's specifications and the following:

Application rate for binder and all beads and elements shall consider final pavement surface composition and smoothness in advance of application to ensure proper wet film thickness and embedment of all beads and elements. The Contractor shall provide the Engineer with documentation from the Manufacturer with all recommended application rates in advance of any pavement marking installation.

The minimum uniform wet thickness for the polyurea binder shall be 25-30 mils. The line thickness shall be met across at least the middle ⅔ of the pavement marking width. Depth plates shall be provided by the Contractor to the Engineer to assure that desired thickness is achieved.

The finished white color shall be free from tint, with good opacity and visibility under both daylight and artificial light. The finished yellow color shall be defined by Federal Test Standard 595 - Color Chip Number 13538, using Federal Test Standard 141 (Method 4252). The finished lines shall be uniform in color and have clean, well-defined edges.

First and second drop beads and/or elements shall be applied in a manner that does not induce rolling or bouncing, to ensure that exposed portions of beads are free of binder material. Beads and elements should be embedded in the binder to a depth of approximately 50% of their diameter.

Drop rate for first drop bead or element shall be per the Manufacturer's specifications.

Drop rate for second drop glass bead shall be 6.4-10.2 lbs. per gallon.

ITEMS 866.206 & 867.206 (Continued)

Newly installed pavement markings shall be protected from tracking during the setting period per Subsection 860.63.

Once the installed pavement markings have been open for traffic for a minimum of 48 hours, the Contractor shall perform retroreflectance readings per the measurement and sampling procedures contained in ASTM D7585 (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments) using the Referee Evaluation Protocol found in section 6.4. The following tests shall be performed during the measurement and sampling process:

1. ASTM E1710 (*Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer)*; and
2. ASTM E2177 *(Standard Test Method for Measuring the Coefficient of Retroreflected Luminance (RL) of Pavement Markings in a Standard Condition of Wetness)*.

The average initial retroreflectance readings shall exceed the following minimum values:

	*White Markings	*Yellow Markings
ASTM E1710 (Dry)	475 mcd/lux/m^2	375 mcd/lux/m^2
ASTM E2177 (Wet Recovery)	375 mcd/lux/m^2	300 mcd/lux/m^2

*Observation Angle = 1.05°, Entrance Angle = 88.8°

Pavement markings with measured average initial retroreflectance readings that do not meet the specified minimum values using the procedures outlined in subsection 6.4.5 of ASTM D7585 shall be removed by a method approved by the Engineer and reapplied at no additional cost.

Pavement Marking Asset Management

Upon completion of the pavement marking installation, the following data shall be tabulated by the Contractor:

1. Retroreflectance readings, including date(s), time(s), and location(s) where readings took place;
2. Liquid binder type(s) and application rate;
3. Reflective element type and drop rate;
4. Date of groove installation;
5. Lot, batch number, or any other material identifiers and manufacturing information;
6. Date and time of final liquid marking installation;
7. Highway location (including direction) of installation;
8. Air and pavement temperature during application;
9. Measured material application thickness, depth of groove; and
10. Any other pertinent information that may assist MassDOT with Quality Control.

ITEMS 866.206 & 867.206 (Continued)

Results for all readings shall be provided within 10 business days of testing to the Engineer, with a second copy sent to:

State Traffic Engineer
Attention: Pavement Marking Retroreflectivity Testing
10 Park Plaza, Room 7210
Boston, MA 02116

The cost to prepare and submit this data shall be considered incidental to the cost of the items.

METHOD OF MEASUREMENT

Items 866.206 and 867.206 will be measured by the Foot, complete in place, in accordance with Subsection 860.80 of the Standard Specifications.

BASIS OF PAYMENT

Items 866.206 and 867.206 will be paid for at the respective Contract unit prices per Foot, in accordance with Subsection 860.81 of the Standard Specifications, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for measuring the pavement marking performance, but all costs in connection therewith shall be included in the Contract unit price bid for the respective item.

ITEM 874.2 TRAFFIC SIGN REMOVED AND RESET EACH

The work under this item shall conform to the relevant provisions of Subsections 828 and 840 of the Standard Specifications and the following:

The Contractor shall carefully remove and reset at new locations all existing signs, attachment hardware and sign support posts not included under other sign items as shown on the drawings and as directed by the Engineer. Existing foundations shall be removed to a depth of at least 12 inches below proposed sidewalk grade and 36 inches below proposed roadway grade. The holes shall be backfilled with gravel. The surface shall be patched with a material to match the existing ground or as directed by the Engineer.

Signs, attachment hardware and sign support posts shall be satisfactorily stored and protected until reset in the proposed work. Sign support posts shall be disposed of in a satisfactory manner. New sign support posts shall be provided under Item 847.1.

Signs, attachment hardware and sign support posts lost, damaged or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new materials at no additional cost to the Owner. New attachment hardware shall be furnished and installed as necessary to replace any missing or unusable existing hardware.

The sign shall be mounted in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and the 1990 Standard Drawings for Signs and Supports. Sign panels shall be cleaned before being reset.

METHOD OF MEASUREMENT

Item 874.2 will be measured for payment by Each traffic sign removed and reset, complete in place.

BASIS OF PAYMENT

Item 874.2 will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment, excavation, removal and disposal of existing foundations and unsuitable materials, backfill, area restoration and all incidental costs required to complete the work.

New posts required are to be measured and paid for under Item 847.1.

ITEM 942.124 STEEL PILE HP 12 X 84 FOOT

The work under this item shall conform to the relevant provisions of Subsection 940 of the Standard Specifications and the following:

Steel piles shall conform to the requirements of AASHTO M270 (ASTM A709) Grade 50. Piles shall be installed where indicated on the contract drawings and the tops of piles shall be within 3 inches of plan location.

Splicing of the steel piles shall be performed in accordance with Subsection 940 except that piles shall not be spliced within the top 20'. At splice locations the welds shall be 100% Ultrasonic Tested (UT).

METHOD OF MEASUREMENT

Item 942.124 will be measured for payment by the Foot of steel pile HP 12 X 84.

BASIS OF PAYMENT

Item 942.124 will be paid at the Contract unit price per Foot, which price will include all labor, materials, tools, equipment, vibration monitoring and all incidental costs required to complete the work.

ITEM 943.24 STEEL PIPE PILE 24 INCH OUTSIDE DIAMETER FOOT

The work under this Item shall conform to the relevant provisions of Subsection 940, Driven Piles, of the Standard and Supplemental Specifications except as modified herein.

MATERIALS

Steel pipe piles shall conform to Section M8.05.5, except as follows:

A. 24-inch diameter pipe piles for intermediate piers shall conform to the requirement of ASTM A 252, Grade 3 and shall be driven closed-end as shown on the Plans.

Concrete fill shall conform to Section M4.02.00 for 5,000 psi HP Cement Concrete.

Pipe piles shall be coated with coal tar epoxy as described below. Coal tar epoxy shall extend to at least 10 feet below mud line.

PILE INSTALLATION

Procedures for driving piles shall conform to Subsection 940.65 of Standard Specifications except that the driving tolerance for the Pipe Piles shall be superseded by the following:

A. Drive piles to the following tolerances:
   i. Axial Alignment – Within 1% of the specified alignment
   ii. Pile location at the cutoff elevation – Within 2 inches of the location shown on the Plans
   iii. Pile Cutoff – Cutoff to a true plane within ½ inches of the elevation shown on the Plans

B. If any pile after driving is beyond the specified tolerances for batter or plan location as shown on the Plans, the Contractor shall extract the misaligned pile in its entirety, and shall drive a replacement pile to satisfy the tolerances specified in these Special Provisions. All of such corrective work shall be done without extra compensation for that pile which is being pulled.

C. Pulling laterally on piles and/or heat treating of piles to correct misalignment will not be allowed.

COAL TAR EPOXY COATING

General

The Contractor shall furnish coal tar epoxy coating for pipe piles.

ITEM 943.24 (Continued)

Submittals

The Contractor shall submit the following information for review and approval by the Engineer.

1. Manufacturer's printed Technical Data Sheets and Material.
2. Manufacturer's printed product label and application instructions.

Materials

Coal tar epoxy coatings for pipe piles shall conform to Section M7.00.0, and as stated herein. Piles installed for support of the intermediate bridge piers shall be coated on all surfaces to a depth of at least 10 feet below the mud line unless indicated otherwise with a coal tar epoxy polyamide coating system. Any damage to the epoxy coating system shall be repaired prior to pile installation.

Coal tar epoxies shall be black in color, self-priming two-component, coal-tar epoxy polyamide meeting or exceeding the requirements of SSPC Paint Spec 16 and U.S. Army Corps of Engineers C-200. Minimum percent solids by volume shall be 74%.

Touch-up coatings for repair of coating defects and damage shall be of the same manufacture as the original coating and shall be applied as recommended by the approved coating manufacturer.

Store materials not in actual use in tightly covered containers at a minimum ambient temperature of 45 degrees F in a well-ventilated area. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue. Protect from freezing where necessary.

Surface Preparation

All surfaces of piles to be coated with coal tar epoxy coating shall be thoroughly prepared for coating application in strict accordance with the coating manufacturer's recommendations. All cleaning and coating work must be performed in a heated building. Written procedures for performing surface preparation including but not limited to, the preparation of surfaces, abrasive “work mix” analysis; coating mixing, application, and repair; recoat times and cleaning between coats; and specific details for the preparation and coating of welds shall be provided to the Engineer for review.

All surfaces to be coated must be completely dry, free of moisture, soil, dust and grit at the time the coating is applied. Remove slag, flux deposits, weld spatter, and surface irregularities such as slivers, tears, fins, and hackles; all within AWS D1.5 Guidelines. Grind all resulting burrs smooth, including burrs around holes. Do not remove any weld material that will weaken weld strength. Prior to dry abrasive blast cleaning, remove all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants from bare steel in accordance with SSPC-SP 1 Solvent Cleaning.

ITEM 943.24 (Continued)

Thoroughly clean the surface of each coat prior to the application of the next to remove spent abrasive, dirt, dust, cement spatter, and other deleterious materials. Pay particular attention to the removal of detrimental residue from surfaces such as corners and pockets. Clean the surfaces by vacuuming or blowing down with compressed air.

If grease or oil have become deposited on the bare steel or on the surface of any of the applied coats, remove by solvent cleaning in accordance with SSPC-SP 1 prior to the application of the next coat. Use a solvent that is acceptable to the coating manufacturer.

Abrasives shall be dry and free of oil, grease, corrosion producing chemicals, or other deleterious contaminants. Do not use silica sand. All steel surfaces to be coated shall have SSPC-SP 10 Near White Blast Cleaning. Abrasives shall be shaped and sized to produce a sharp, angular, uniform anchor pattern with a profile height of 2-3 mils, unless the requirements of the coating manufacturer are more restrictive. Peak counts per square inch shall be 80 or greater, when tested in accordance with ASTM D 4417, Method C. SSPC-VIS 1 shall be used as an aid in determining the quality of cleaning.

Material Application

Apply the coatings in accordance with the requirements of this Section, the coating manufacturer, and SSPC-PA 1.

In the event of a conflict between the manufacturer's technical data and the requirements of this Section, comply with this Section unless the requirements of the manufacturer are more restrictive.

In these cases, advise the Engineer of the discrepancies in writing, and comply with the Engineer's written resolution.

Apply the first coat within 12 hours of cleaning to bare metal. If the bare substrate is allowed to remain uncoated for more than 12 hours, or re-rusting is evident, re-clean the surface prior to painting.

Do not perform coating application in areas where dust is being generated.

Coat steel surfaces using spray application to a minimum total dry film thickness of 16 mils, as measured in accordance with SSPC-PA. Apply in multiple coats of no more than 8 to 10 mils per coat. Apply number of coats required to achieve total specified minimum dry film thickness.

ITEM 943.24 (Continued)

Apply coatings under the following conditions unless the requirements of the coating manufacturer are more restrictive:

a. Surface and Air Temperatures - Between 50°F and 100°F.
b. Relative Humidity - Less than 90%.
c. Dew Point - Surface temperature at least 5°F above the dew point temperature of the surrounding air.
d. Frost/Rain - Do not apply coatings to surfaces containing frost or free standing water, or during rain, fog, or similar detrimental weather conditions.

Storage and Transport

Care should be exercised in handling parts before they are fully cured. Do not handle or move coated steel until the coating has cured. Nylon slings should be used to handle coated steel during handling, shipment and delivery to the construction site. Existing work shall be protected from spillage and spattering during application of coatings. All spillages and spatterings shall be cleaned up immediately. Contractor is responsible to leave existing areas free of all such foreign materials. Coating which in the opinion of the Owner does not meet acceptance shall be redone at no additional cost to the Owner.

Performance Requirements

The cured coating shall be of uniform color, gloss and thickness, and shall be free of blisters, pinholes, fish eyes, sags, runs, and any other irregularities.

Test for continuity of coating with a holiday tester of 100 volts or less and repair all holidays detected to meet such test.

Conduct adhesion tests in accordance with ASTM D3359 or ASTM D4541 as directed by the Engineer and repair all test areas. The acceptance criteria for the testing shall be obtained by the Contractor from the coating manufacturer and submitted for approval by the Engineer. Remove all defective coating and reblast and recoat such areas in accordance with this Specification.

Quality Control

The coater shall be responsible for all quality control checking including visual inspection, thickness measurement, and holiday testing, and shall keep records on the results of all such inspections in a form suitable to the Engineer. Maintain all quality control records on the results of all inspections and submit all results to the Engineer.

The Engineer shall have access to each part of the process and shall have the right and opportunity to witness any of the quality control test and/or perform such test himself on a random sampling basis.

ITEM 943.24 (Continued)

Repair of Damaged Coatings or Field Welds

Based upon results of the tests stipulated in the Performance Requirements Section herein, repair coating as follows:

1. Surface preparation of defective area.
    a. Prepare the surface by cleaning in accordance with SSPC-SP1 Solvent Cleaning followed by SSPC- SP3 Power Tool Cleaning. Use a solvent that is acceptable to the approved coating manufacturer.
    b. If the damage exposes the substrate, remove all loose material and prepare the steel in accordance with SSPC SP 11.

2. Coating Application in Repair Areas:
    a. When the bare substrate is exposed in the repair area, reapply all coats of the system to the specified thickness.
    b. When the damage does not extend to the bare substrate, reapply to only the affected coats.
    c. Maintain the thickness of the system in overlap areas within the specified total thickness tolerances.
    d. For field touch-up after driving, use touch-up coatings as recommended by the approved coating manufacturer.

METHOD OF MEASUREMENT

Item 943.24 will be measured for payment by the total length in Feet of steel pipe piles installed, measured from the pile tip to the cutoff elevation, including pile splicing and epoxy repair of splice, if required.

BASIS OF PAYMENT

Item 943.24 will be paid for at the Contract unit price per Foot, which price shall include all labor, material, equipment, concrete, coal tar epoxy and incidental costs required to complete the work. No separate payment will be made for mobilization, installation or surveying but all costs in connection therewith shall be included in the unit price bid.

ITEM 948.1 SHORT DURATION LOAD TEST EACH

The work under this Item shall conform to the relevant provisions of Subsection 940.62, requirements on the Plans, and the following for load testing of one sacrificial HP12x84 steel pile at the north abutment at a location as agreed to by the Contractor and Engineer:

Description of Work

The work covered by this Item, without limiting the generality thereof, consists of furnishing all labor, equipment, materials and incidentals necessary in connection with the following:

1. Preparation of work area.
2. Install reaction piles or tiedowns or provide dead-weight.
3. Providing instrumentation and survey.
4. Performing one successful static load test.
5. Recording load, settlement and deflection data during the load test.
6. Dismantling and removal of load testing equipment and materials.
7. Removing or cutting off test pile and reaction piles or tiedowns 4 feet below finished ground surface.
8. Preparing and submitting load test report prepared by the Contractor's Engineer.

Quality Assurance

A. Contractor's Engineer shall be a Professional Engineer registered in the Commonwealth of Massachusetts and shall have successfully completed at least three (3) pile load tests of similar scope and magnitude required for this project within the last 5 years.

B. The person in charge of the pile load testing at the site shall have be experienced in such testing and shall have successfully been in charge of conducting at least three (3) pile load tests of similar scope and magnitude required for this project within the last 5 years.

Submittals

A. Provide detailed information and sketches on test method, type and layout of measuring equipment, tell tales, reaction type and layout, protective covering, safety devices, and calibration equipment. Provide space, approximately twelve inches (12"), within the load test setup for placement of a load cell and associated steel shims. Provide design drawing of loading frame with calculations showing the frame is adequate to withstand at least 200 percent of the factored design load. Drawings and calculations shall be stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts.

B. Provide a calibration record for the load cells and hydraulic jack to be used for the test. The load cell and jack, including the complete assembly of pumps, gages, and ram to be used in the tests, shall be calibrated for this project by an approved testing laboratory. A minimum of three (3) calibration runs shall be performed at ram extensions of one inch (1"), mid-range, and one inch (1") less than full range within 2 weeks of load test.

C. Submit documentation of experience requirements.

ITEM 948.1 (Continued)

Materials

A. Equipment type, reaction system, load instrumentation: Conform to ASTM D1143 unless otherwise stated.

B. The Contractor shall provide and install dial gauges, calibrated load cell, survey equipment and other data recording instruments. The Contractor shall protect all equipment from damage prior to and during the load test.

C. Geokon arc weldable model 4000, or equal, vibrating wire stain gauges shall be used to measure load transfer in the test pile during the load test. Pairs of strain gauges (one on each side of the web) shall be installed at 10-foot intervals along the length of the pile starting 1 foot from the tip of the pile. A protective steel angle shall be welded onto the pile over the strain gauges along the full length of the pile. Design of the protective steel angle shall be by the Contractor's Engineer.

Pile Loading Procedure

Contractor shall perform the load test in accordance with Short Duration Test procedure to up to the minimum required nominal geotechnical resistance based on a factored design load of 192 kips and using a resistance factor of 0.8. Applied test loads during the test shall be primarily based on load cell measurements. After completion of the load test using the Short Duration Test procedure, the pile shall be loaded using the quick load test procedure up to 150 percent of the minimum required nominal geotechnical resistance or failure, whichever occurs first.

Pile Load Test Reporting

Submit load test report to the Engineer for review following completion of each test. Production piles shall not be ordered until the Short Duration Test load test report has been reviewed and accepted by the Engineer. Load test report shall include as-installed record information.

METHOD OF MEASUREMENT

Item 948.1 will be measured for payment by the Each Short Duration Load Test.

BASIS OF PAYMENT

A. Payment for performance of successful static pile load testing shall be paid at the Contract unit price per Each Short Duration Load Test, which price will be full compensation for all Contractor's support, labor, materials and incidentals necessary to perform each successful static pile load test and all other work specified in this Section.

ITEM 948.1 (Continued)

B. Compression pile load tests will be measured for payment as complete units if acceptable. Acceptance of each pile load test will be based on the Contractor maintaining the required load magnitude for the required duration. Tests terminated due to failure of loading or measurement equipment supplied by the Contractor or due to Contractor's work will not be measured for payment. Measurement of pile installation is covered in other specification Sections.

C. The pile load test unit price shall include constructing and removing the test load reaction system; driving and removing temporary piles and supports; furnishing protective coverings; operating and reading jacks, gages, and related equipment; and all labor, materials, equipment, tools, and incidentals necessary for proper execution of the pile load test as specified.

ITEM 948.4 DYNAMIC LOAD TEST PREPARATION EACH

The work under this item shall conform to the relevant provisions of Subsection 940 of the Standard Specifications and the following:

The work shall include furnishing all equipment, labor, materials, and incidental work required to complete Dynamic Load Test Preparation at the piles selected as part of the test pile program. The test pile locations shall be in accordance with the plans established by the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 948.4 will be measured for payment per Each.

Item 948.4 will be paid for at the Contract unit price for each pile tested.

ITEM 948.41 DYNAMIC LOAD TEST BY CONTRACTOR EACH

The work under this item shall conform to the relevant provisions of Subsection 940 of the Standard Specifications and the following:

The work shall include furnishing all equipment, labor, materials, and incidental work required to perform dynamic load test measurements of piles selected as part of the test pile program. The test pile locations shall be in accordance with the plans established by the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 948.41 will be measured for payment per Each.

Item 948.41 will be paid for at the Contract unit price for each pile tested.

ITEM 948.5 PILE SHOES EACH

Work under this Item shall conform to the relevant provisions of Subsection 940 of the Standard Specifications, requirements on the Plans and the following:

Pile shoes for HP12x84 piles conform to ASTM A148 90/60.

Pile shoes for 24-inch OD pipe piles shall conform to ASTM A148 90/60 or ASTM A694 F60.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 948.5 will be measured and paid in accordance with Subsections 948.80 and 948.81 of the Standard Specifications, respectively.

ITEM 950.11 TEMPORARY EARTH SUPPORT SYSTEMS SQUARE FOOT

The work under this Item consists of designing, furnishing, installing, maintaining, and removing temporary earth support system as required for demolition and construction of both abutments and the wingwalls for Bridge H-01-005 (C1H), and as required for local grading at the end of the temporary walkway structure between STA 6+90 and 7+40. All work shall conform to the relevant provisions of Section 950, and the following:

GENERAL

Conceptual locations and lateral extent of temporary earth support for support of excavation are shown on the Plans.

Prior to installation of the temporary earth support system, the Contractor shall submit plans and design calculations of their proposed temporary earth support system. The plan shall outline sequence and method of installation, materials, bracing and method of removal. The earth support system shall be designed to withstand all pressures including equipment and crane surcharge loads if applicable. Earth support system shall be designed to laterally support all adjacent temporary precast concrete barriers where earth support is required between and beyond existing structures. Earth support system shall support lateral loads consistent with Temporary Barrier TL-3 Railing criteria, as per recommended guidelines in the 1993 National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedures for the Safety Performing Evaluation of Highway Features (NCHRP Report 350) and AASHTO LRFD Chapter 13. Where temporary earth support system is to utilize existing concrete abutments for anchorage of tiebacks, rods or other methods, the Contractor shall take representative core samples and test for compressive strength to establish criteria for anchorage design. The method and all submissions shall be prepared under the supervision of a Professional Engineer registered in Massachusetts. Such Engineer must be familiar with the MassDOT Standard Specifications, those of the American Association of State Highway and Transportation Officials (AASHTO), the Work, and be experienced in this technical field. All submitted sheets must be stamped by supervising licensed engineer.

Work shall not be started until all materials and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required. Sufficient labor and equipment shall be employed to ensure the completion of the excavation, placing of the concrete, driving of piles, and construction in the shortest possible time.

Where no other direction is given, the earth support system shall extend to such depth that the bottom of the trench below the abutment may be lowered at least 18 inches below the elevation shown on the Plans without any change in the earth support system as installed.

The earth support system shall be securely and satisfactorily braced or tied to withstand all pressures to which it may be subjected and be sufficiently tight to prevent any flow of water or material into the work zone. The bottom edge of the earth support system shall lead away from the excavation.

Where the earth support system is to be used as a form for placing concrete the entire system shall be placed entirely outside the neat lines shown on the Plans for the concrete.

ITEM 950.11 (Continued)

The responsibility for the exact satisfactory construction and maintenance of the earth support system complete in place shall rest with the Contractor, and any work done which in the performance of incidental construction is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at no additional cost to the Department.

Temporary earth support system shall be removed from the project site when it is not needed unless otherwise approved by the Engineer. Supporting soil shall be defined as all soil directly below the footing contained within a series of planes that originate at the perimeter of the bottom of the footing and project down and away from the footing at an angle of 45 degrees from the horizontal.

Whether support of excavation is indicated on the Plans or not, the Contractor shall be informed by the Special Provisions that any part of the support system that protrudes into the supporting soil below the bridge or retaining wall structure, as defined in the paragraph above, shall be cut off 12" below the bottom of footing and left in place and no additional payment will be made for this part.

Dewatering, if needed, shall be considered incidental to these Items.

GEOTECHNICAL INSTRUMENTATION AND MONITORING

Contractor shall furnish, install, protect, replace, monitor and report on survey deformation monitoring points (DMPs) established along the top of the excavation support systems and the existing bridge structure components that are required to remain active during the staged construction. The DMP shall be developed by a Massachusetts Structural/Geotechnical PE and be submitted for review and approval.

Qualifications of Contractor's Instrumentation Personnel

For the installation of deformation monitoring points and collection of survey data, the Contractor's personnel shall be as follows:

1. The person in responsible charge of the surveyors shall be a Registered Land Surveyor in the Commonwealth of Massachusetts with a minimum of 3 years of experience in deformation measurements of the types and accuracies specified herein. The field survey party chief shall have a minimum of one year of experience in deformation survey measurements of the types and accuracies specified herein.
2. Interpretations of data shall be made by the Contractor as part of reporting the data to the Engineer.

ITEM 950.11 (Continued)

Deformation Monitoring

The Contractor shall furnish, install, protect, replace, monitor and report on survey deformation monitoring points (DMPs) at the following locations as a minimum:

1. DMPs shall be established a minimum of one every 20 linear feet along the top of the excavation support wall, to measure horizontal displacements during the Work.
2. A minimum of 2 DMPs at each existing bent along the western portion of the bridge to remain in service during staged construction, to measure horizontal and vertical displacements during the Work.
3. A minimum of 2 DMPs on each abutment along the western portion of the existing bridge to remain in service during staged construction to measure horizontal and vertical displacements during the Work.
4. Other locations requested by the Engineer or MassDOT.

The Contractor's registered Surveyor shall monitor and maintain the instrumentation. The Contractor shall perform a baseline survey of each DMP consisting of two sets of independent readings prior to the beginning of excavation and demolition. DMPs shall be monitored at least one time daily during excavation, demolition, and pile driving activities. The Contractor shall provide survey data to the Engineer for review within 24 hours of collection of data. The number of points to be monitored on a daily basis and the frequency of monitoring may be increased or decreased in agreement with the Engineer based on the results of the monitoring. Survey data shall be reported to an accuracy of 0.01 feet.

Stop work, immediately notify the Engineer, and take immediate remedial action if lateral movement of the existing structure or earth support system exceeds one-inch (1") during progress of the work. This movement is only to establish a guideline, and in no way relieve the Contractor of his responsibility for preventing detrimental movements or damage causing structural distress in the various structures, roadways, or embankment. The Contractor shall provide all measures necessary to control movements to within the established performance criteria, or to lesser amounts as required to prevent damage. The Engineer may require the Contractor to take steps to control movements to levels which are lower, at no additional cost to the Owner, if in the Engineer's opinion the measured or observed movements are detrimental or damaging.

The work shall be executed in such a manner as to prevent damage to existing structures and other public and private property and existing improvements. The Contractor shall protect existing improvements from damage caused by settlement, lateral movement, loss of ground, undermining, washout, and other potential hazards which may be initiated by underpinning operations. Damage to existing facilities shall be repaired by the Contractor at his own expense.

ITEM 950.11 (Continued)

METHOD OF MEASUREMENT

Item 950.11, Temporary Earth Support Systems, will be measured for payment per Square Foot. The dimensions will be determined by the vertical plan dimensions of exposed surface from supported ground surface at the top to the bottom of excavation by the horizontal length of the earth support system. The horizontal length shall be measured between the top edge of a 1.5 to 1 open cut slope at the top of the excavation to the opposite side of the open cut top edge of the excavation or the intersecting corner of adjoining segments of the earth support system. No separate measurement for monitoring shall be made.

Where temporary earth support is installed between two stages, and the earth support is to be utilized for more than one stage, only the area supported for one of the stages will be measured for payment.

BASIS OF PAYMENT

Item 950.11, Temporary Earth Support System, will be paid for at the Contract unit price per Square Foot necessary to demolish and reconstruct the abutments and wingwalls of Bridge No. H- 01-005. Such payment will be considered full compensation for all labor, materials, hauling, dewatering, equipment, submittals, and incidental costs required to complete the work in conformance with the Plans, approved shop drawings, these specifications and to the satisfaction of the Engineer.

No separate payment for survey deformation monitoring shall be made.

ITEM 983.2 RIPRAP CUBIC YARD

The work under this item shall conform to the relevant provisions of Subsection 983 of the Standard Specifications and the following:

The work shall include furnishing and installing stone riprap and geotextile fabric at locations shown on the plans for channel protection in front of proposed abutments and wingwalls. Riprap for this project shall conform to Subsection 983.62 and material specification M2.02.0 and the riprap shall be so graded that when placed the entire mass will be compact.

An underlying Geotextile Fabric shall be placed under the proposed riprap. The geotextile fabric shall conform to the requirements of AASHTO M 288 and shall be selected from the Departments QCML for woven or unwoven used for Permanent Erosion Control (both woven and unwoven are acceptable). Construction and installation shall be in accordance with AASHTO M 288 and the following:

Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days.

Traffic or construction equipment will not be permitted directly on the geotextile. Geotextiles may be joined by either sewing or overlapping. Sewn seams shall be lapped minimum of four inches and double sewn. The thread used to sew the seam shall be nylon or polypropylene. Overlapped seams shall have a minimum overlap of eighteen (18) inches, except where placed under water where the overlap shall be a minimum of three (3) feet. Overlaps shall be in the direction of flow. All seams shall be subject to the approval of the Engineer. Geotextile that becomes torn or damaged shall be replaced or patched. The patch shall extend three (3) feet beyond the perimeter of the tear or damage.

Riprap, stone filling (heavy) or stone filling (medium) shall not be dropped onto the geotextile from a height greater than one (1) foot. Slope protection and smaller sizes of stone filling shall not be dropped onto the geotextile from a height exceeding three (3) feet. The surface upon which the geotextile is to be placed shall be within reasonable conformance to the proposed grade. The geotextile shall be laid loosely, so that placement of the overlying material will not stretch or tear the geotextile.

The work shall include furnishing and placing geotextile fabric for permanent erosion control under and around the riprap as shown on the plans that is in accordance with the standard specifications.

METHOD OF MEASUREMENT

Item 983.2 will be measured for payment by the Cubic Yard of stone riprap actually furnished and placed.

ITEM 983.2 (Continued)

BASIS OF PAYMENT

The work under this item will be paid at the Contract unit price by the Cubic Yard of stone riprap actually furnished and placed and shall include all labor, materials and equipment to place the riprap as shown on the plans. The furnishing and placement of geotextile fabric for placement under and around the riprap shall also be included under this item and will not be measured separately for payment.

Excavation for the placement of riprap, crushed stone and geotextile fabric shall be paid for under Bridge Channel Excavation Item 143. Control of water needed to place riprap, crushed stone and geotextile fabric in the dry shall be provided for under the contract bid price for Item 991.1 Control of Water - Structure No. H-01-005.

ITEM 983.521 STREAMBED RESTORATION CUBIC YARD

This work shall consist of the following:

- Fort River
  - Stockpiling and replacing material within the limits shown on the plans. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, roughness, shape, profile, and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel.

- Intermittent Stream
  - Restoring the existing intermittent stream where disturbance takes place in the project area within the limits of work. Disturbance may take place as a result of the placement/removal of the cofferdams as part of the work-in-water, as well as regrading of the upland bank as part of the bridge construction. The streambed restoration shall replicate the existing natural intermittent stream channel bed outside the work area in terms of material, roughness, shape, profile and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the existing intermittent stream channel.

The Contractor shall coordinate with his/her subcontractors to ensure all required equipment is available on-site to complete the work in this manner. The streambed restoration is required to comply with environmental permits issued for the project. MassDOT Environmental Services will provide a Fluvial Geomorphologist (Geomorphologist) to provide a pre-construction meeting, on-site oversight during construction, and assistance during streambed restoration construction to ensure the restoration is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an initial (virtual or in person) meeting with MassDOT's Geomorphologist, Contractor, and Resident Engineer. At this meeting, the Geomorphologist will provide an overview of the restoration work. The Contractor should be prepared to discuss the anticipated means, methods, and schedule.

Process Approval:

In lieu of a mockup, the Contractor shall schedule an onsite meeting to discuss the streambed restoration with the Geomorphologist and respective parties from MassDOT. The Geomorphologist shall be onsite during initial streambed restoration. The Contractor shall provide the Geomorphologist adequate access to observe, direct, and inspect the channel restoration work throughout the duration of the removal, stockpile, and reinstallation of the existing streambed material.

ITEM 983.521 (Continued)

MATERIAL – FORT RIVER

The streambed material excavated from the existing Fort River streambed shall be removed and regraded to create a smooth streambed. The excavated streambed material shall also be reused to fill the voids in the proposed riprap placed below the ordinary high water/bank line within the area of streambed restoration.

In the event that the excavated material is not suitable or there is not enough available suitable material, additional streambed restoration material shall be locally sourced that matches the composition of the existing native river bed. The following gradation sampled from a similar streambed surface shall be used as a guide.

Stream Bed Material Gradation – Fort River

Particle	Percent (%) Composition
+ 3" diameter	0
Gravel	21.7
Sand	69.3
Fines	9

The streambed material shall be approved by the Resident Engineer and Geomorphologist prior to use.

MATERIAL – INTERMITTENT STREAM

No excavation of streambed material is proposed within the intermittent stream, therefore no new material is anticipated.

RELATED ITEMS

Riprap Stone shall conform to the requirements of Item 983. and shall be paid for under that item.

CONSTRUCTION – FORT RIVER

Channel

The streambed material shall be reinstalled over riprap (MassDOT Item 983.2), as depicted on the plans, to an average thickness of 1 foot, with variations in thickness as necessary to replicate existing channel conditions. The initial placement of streambed material shall fill the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

ITEM 983.521 (Continued)

Reinstallation of the stockpiled streambed material shall be placed on top of the riprap to restore streambed habitat and fish passage. The streambed materials shall be installed during normal low water conditions behind cofferdams in accordance with the environmental permits.

Completion – Fort River

Once all material has been placed in the stream channel and approved by the Geomorphologist and Resident Engineer, the Contractor shall remove the cofferdams in such a way as to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed shall maintain the general configuration of the existing streambed bedform and there shall be minimal subsurface flow upon final inspection by the Resident Engineer and Geomorphologist. The project must be passable by fish and other aquatic organisms following construction.

The streambed restoration to be measured for payment will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Resident Engineer and Geomorphologist.

CONSTRUCTION – INTERMITTENT STREAM

The streambed material shall be restored in place to match existing conditions prior to installation of sandbag cofferdams as part of Item 991.1. Any materials used to level the existing intermittent streambed to install the sandbag cofferdams shall be removed upon removal of the cofferdams. The removal of those materials shall be paid for under Item 991.1.

The final intermittent streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

Completion – Intermittent Stream

The streambed restoration to be measured for payment will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Engineer and the Geomorphologist.

METHOD OF MEASUREMENT

Item 983.521 will be measured for payment by the Cubic Yard.

ITEM 983.521 (Continued)

BASIS OF PAYMENT

Item 983.521 will be paid at the Contract unit price per Cubic Yard, which price will be full compensation for excavating, stockpiling, transporting, and placing the material specified and for furnishing all labor, tools, equipment, testing, and incidentals required to complete the work.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

ITEM 991.1 CONTROL OF WATER – STRUCTURE NO. H-01-005 LUMP SUM

The work under this item shall conform to the relevant provisions of Section 100 and consists of all equipment, labor and materials, placement of straw bales, cofferdams, sedimentation and de-watering basins, and other water control devices required for the control of water for construction of the proposed piers, removal and replacement of riprap, placement of new riprap and natural streambed material, demolition of existing piers, removal of existing timber piles, and for any other work that may be required to complete the replacement of Bridge No. H-01-005, as shown on the plans, as directed by the Engineer, and as specified herein.

The Contractor shall make his/her own investigations prior to bidding to determine how best to accomplish the control of water during the required work to be done. The cofferdams shown in the proposed plans are conceptual only, and the contractor may propose an alternate method for control of water provided that it meets all existing requirements of these special provisions and relevant contract documents.

The Contractor shall follow the guidelines of this specification for which dewatering is to be accomplished. However, except for payment, all work shall conform to the relevant requirements of Subsection 140.

This work shall be done within the limits of the Water Quality Plans and their associated impact areas.

The Contractor shall submit complete working drawings and computations of his or her proposed dewatering system with supporting data as necessary to the Engineer for approval in accordance with Subsection 5.02 and the Special Provisions. These drawings shall be accompanied by design calculations. Both shall be certified by a Professional Engineer registered in the Commonwealth of Massachusetts. The Contractor shall make his or her own evaluation of existing conditions and water flow, and of the effects of his/her proposed temporary works and construction methods, and shall provide in his or her design for all loads and construction conditions necessary to permit demolition and construction of the specified structure while maintaining public safety and protecting complete work and all third party property from damage resulting from construction operations.

Measures to control the discharge of pollutants into water resource areas shall include, but not be limited to the following:

- Rigorous management of construction operations involving potentially hazardous materials, such as, refueling and maintenance of construction equipment.

- Formulation of contingency plans to control accidental spillage from potentially hazardous materials.

ITEM 991.1 (Continued)

- Siting of construction staging areas outside of the riverfront inner riparian area and Wetlands buffer zones, and locating construction staging on relatively flat ground.

- Scheduling of work within the resource areas to avoid periods of high flood (e.g., spring floods) and inclement weather.

- Installation and continuous maintenance of staked straw bales and sedimentation fences to prevent sediment migration into adjacent downstream resource areas. Placement of erosion controls shall be as shown on the plans, as specified herein, or as directed by the Engineer, so as to accomplish maximum control of project related sediment mobilization. Additional erosion control measures shall be employed as necessary to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the contract. Straw bales and sedimentation fences used to prevent sediment migration into adjacent downstream resource areas shall be considered incidental to Item 991.1, and additional compensation shall not be made to the Contractor.

- All discharge resulting from dewatering activities shall be directed to temporary sedimentation/retention basins located as necessary to control turbidity. At no time shall said discharge be directly released into adjacent resource areas. The Contractor is advised that if portable dam type structures are approved and utilized, additional seepage under sealing aprons should be expected. In these situations the Contractor will be required to provide multiple, or oversized, dewatering basins to provide additional detention time needed to properly dewater the work zones. Multiple or oversized dewatering basins shall be considered incidental to Item 991.1, and additional compensation shall not be made to the Contractor.

The Contractor shall provide cofferdams utilizing acceptable methods (see below), sedimentation/retention basins and/or other effective procedures or structures together with all labor, materials, and equipment necessary for controlling water under and around the bridge. Such work shall be subject to the approval of the Engineer, but such approval will not relieve the Contractor of responsibility for the adequacy of construction, maintenance, operation and safety of the water control system.

The Contractor shall utilize no-fill methods for coffer damming activities:

Acceptable cofferdam methods include:

- Sandbags
- Portable dam type systems
- Jersey Barriers
- Sheet piles
- Steel soldier piles and lagging
- Wooden frame/impervious liner

ITEM 991.1 (Continued)

Unacceptable cofferdam methods (fills):

- Section concrete
- Grout bags

The Contractor is advised that the work to be performed under this item shall be in conformance with the environmental permits associated with this contract.

All work (including all labor, tools, equipment, materials, maintenance and fees) required in order to conform to the above environmental permitting sections, if not included separately under other items, shall be considered incidental to Item 991.1, and no additional compensation shall be made to the Contractor.

Also included shall be all necessary additional permits that may be required in performing the work under this item. The Contractor is advised that the use of sandbags or jersey barriers, for cofferdam control of water on this project, would constitute a temporary fill in waters of the United States, and would require permitting under Section 404 of the Clean Water Act, the Army Corp Permit.

Upon completion of the work, the cofferdams, temporary sheeting, water barriers, and/or other water control items, etc., shall be removed from the site.

BASIS OF PAYMENT

Item 991.1 will be paid at the Contract Lump Sum price for Control of Water, which price shall include full compensation for all labor, tools, equipment, materials, submittals, permitting, permitting fees, installation, maintenance, and removal of all temporary water barriers and/or other materials as described above, all diverting systems or material, all sedimentation fences, sedimentation/retention basins, pumping operations, and all incidental costs required to complete the work.

ITEM 993.5 TEMPORARY WALKWAY STRUCTURE LUMP SUM

The work under this Item shall conform to the applicable provisions of Subsections 644, 900, 955, 960, and 995 of the Standard Specifications and the specific requirements stipulated below for the component parts of this Item. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

The Contractor shall make his/her own investigations prior to bidding to determine how best to construct the temporary walkway structure during the required work to be done. The contractor may construct the temporary walkway structure as shown in the proposed plans, or the contractor may propose an alternate design provided that it meets all existing requirements of these special provisions and relevant contract documents.

If the Contractor proposes an alternate design, they shall submit complete working drawings and computations of his or her proposed temporary walkway structure with supporting data as necessary to the Engineer for approval. These drawings shall be accompanied by design calculations. Both shall be certified by a Professional Engineer registered in the Commonwealth of Massachusetts. The Contractor shall make his or her own evaluation of existing conditions, and of the effects of his/her proposed temporary walkway structure and construction methods, and shall provide in his or her design for all loads and construction conditions necessary to permit demolition and construction of the specified structure while maintaining public safety and protecting complete work and all third-party property from damage resulting from construction operations.

Work under this Item shall include all materials, equipment and labor needed to construct the temporary walkway structure including but not limited to: Reinforced Concrete Abutments, Structural Steel, Timber Decking and Floor Beams, Chain Link Fencing, Handrails and Footboards, Bearings, and any incidentals required to complete the work.

Payment for materials shown on the Plans as being part of this walkway structure or which may be incidental to its construction shall be included in the Lump Sum price of this Item.

The following list is a breakdown of the concrete materials to be used for various elements of the bridge:

4000 PSI, 1 1/2", 565 CEMENT CONCRETE

The work under this heading shall conform to the relevant provisions of Section 900 of the Standard Specifications and shall include the Temporary Walkway Abutments.

TEMPORARY FENCING

The work under this heading shall conform to the relevant provisions of Subsection 644 of the Standard Specifications and shall include the protective fencing on the temporary walkway.

ITEM 993.5 (Continued)

TREATED TIMBER

The work under this heading shall conform to the relevant provisions of Subsection 955 of the Standard Specifications and shall include all timber decking, timber floor beams, handrails and all other timber used for the structure.

STRUCTURAL STEEL

General

The work under this heading shall conform to the relevant provisions of Subsections 960 and 995 of the Standard Specifications and shall include the supply, fabrication, and installation of uncoated structural steel as shown on the Plans. All structural steel shall conform to the requirements of AASHTO M270 Grade 50W as indicated on the plans. Structural steel shall be fabricated and erected in accordance with Subsection 961.61 of the Standard Specifications. Bolts shall be F3125 HS Type 1 bolts and shall be galvanized per ASTM A153 or B695 Class 50.

Material

Steel plates and shapes shall conform to AASHTO designation M270 Grade 50W, as indicated on the plans.

All bolts shall be high strength bolts meeting the requirements of ASTM F3125 and ASTM A563 of the appropriate diameters and installed in accordance with the Specifications. Nuts shall conform to ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts. Washers shall conform to ASTM F436 Standard Specification for Hardened Steel Washers.

Welding shall be performed in accordance with AASHTO/AWS/ANSI D1.5.

BASIS FOR PARTIAL PAYMENT

Within ten (10) days after the Notice to Proceed, the Contractor shall submit, in duplicate, for the approval of the Engineer, a schedule of quantities and unit prices for the major components of the walkway structure as listed below. The walkway structure Lump Sum breakdown quantities provided below are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the lump sum contract price regardless of the accuracy of the quantities furnished by the Engineer for the individual walkway components. The cost of labor and materials for any sub-Item not listed but required to complete the work shall be considered incidental to Item 993.5 and no further compensation will be allowed:

② Addendum No. 2, September 2, 2025

ITEM 993.5 (Continued)

Item 993.5 – Temporary Walkway Structure

Sub-Item	Description	Quantity	Unit	Unit Price	Total
638.11	Protective Screen (Chain Link) with Handrail	265	FT		
901	4000 PSI – 1 ½ Inch – 565 Cement Concrete	1	CY		
910.1	Steel Reinforcement for Structures – Epoxy Coated	40	LB		
955	Treated Timber	2	MBF		
② 960.11	Structural Steel – Uncoated	18,000	LB		
				Total Cost of Item 993.5 =	

The above schedule applies only to Temporary Walkway Structure. Payment for similar materials and construction at locations other than at this structure shall not be included under this Item.

Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

ITEM 995.01 BRIDGE STRUCTURE, BRIDGE NO. H-01-005 LUMP SUM

The work under this Item shall conform to the relevant provisions of Subsection 995 of the Standard Specifications and the specific requirements stipulated below for the component parts of this Item. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this Item shall include all materials, equipment and labor needed to construct the following: Abutments, Wingwalls, Piers, Approach Slabs, Bridge Deck, Sidewalk, Safety Curb, Prestressed Concrete Beams, Spray Applied Waterproofing Membrane, Elastomeric Bearings, Sidewalks, Asphaltic Joint Systems, Mechanical Splicers, Bridge Railings, Highway Guardrail Transitions, Controlled Density Fill (Non-Excavatable), and any incidentals required to complete the work.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of this bridge structure or which may be incidental to its construction (including cutting of existing abutment piles as detailed in the contract plans) and are not specifically included for payment under another Item shall be considered incidental to the work performed under this Item and shall be included in the unit price of the component of which they are a part.

The following list is a breakdown of the concrete materials to be used for various elements of the bridge:

4000 psi, 1 1/2", 565 CEMENT CONCRETE

- Abutment Stem Walls
- Approach Slabs

5000 psi, 3/4", 685 HIGH PERFORMANCE CEMENT CONCRETE

- Sidewalk and Safety Curb

4000 psi, 3/4", 585 HIGH PERFORMANCE CEMENT CONCRETE

- Deck
- Pier and Abutment End Diaphragms
- Pier Caps and Keeper Blocks

ITEM 995.01 (Continued)

The work to be done under these Headings shall conform to the applicable provisions of Subsection 901 of the Standard (and/or Supplemental) Specifications and the following:

The following items shall be considered as included in the unit price per cubic yard of concrete, as stated by the Contractor and as approved by the Engineer in the respective "Basis for Partial Payments": stay in place forms, form liners, neoprene seals, backer rods, waterstops, preformed and premolded filler, joint sealer, leveling devices, lifting hardware, closed cell foam, weep holes with bagged stone, all piping and drains, waterproofing protective course, and all other work considered as incidental to the work involved in furnishing and placing the cast in place and precast concrete elements.

4000 PSI – ¾ Inch - 585 HP CEMENT CONCRETE

The work to be done under this heading shall conform to the relevant provisions of Subsection 901 of the Supplemental Specifications and the following:

4000 PSI, ¾ IN., 585 HP Cement Concrete shall be used to construct the deck slab and at those areas designated by the Engineer, and/or as designated on the Plans. This concrete shall conform to all material requirements contained in Subsection M4.06.1 of the Supplemental Specifications, with the exception of the cementitious content, which shall be limited to a maximum of 585 pounds per cubic yard.

PRECAST HIGHWAY GUARDRAIL TRANSITIONS

A. General.

The work under this Heading consists of fabricating, transporting and installing precast highway guardrail transitions and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The work shall conform with the MassDOT Standard, Supplemental, and Interim Specifications and the requirements of the current AASHTO LRFD Bridge Construction Specifications, supplemented by the current relevant provisions of the latest edition of PCI MNL-116 (The Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products), and Subsection M4.09.0: Precast, Prestressed, and Prefabricated Concrete Products, except as noted herein.

QUALITY ASSURANCE

A. General.

Quality Assurance includes all the planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. It is an all-encompassing term that includes Quality Control (performed by the Fabricator) and Acceptance (performed by MassDOT). Quality Control is the system used by the Contractor and Fabricator to monitor and assess their production processes at the plant facility and installation activities at the project site to ensure that the final product will meet the specified level of quality. Acceptance includes all factors used by MassDOT to determine the corresponding value for the product. MassDOT Acceptance inspection at the plant facility is intended as a means of evaluation of compliance with contract requirements. Contractor and Fabricator Quality Control activities and MassDOT Acceptance activities shall remain independent from one another. MassDOT Acceptance activities shall not replace Fabricator Quality Control activities.

ITEM 995.01 (Continued)

B. Fabricator Quality Control.

Quality Control shall be performed by the Fabricator to ensure that the product is fabricated in conformance with the specifications herein. The Fabricator shall maintain a Quality Control system to monitor, assess, and adjust placement and fabrication processes to ensure the Precast Concrete Bridge Element(s) meet the specified level of quality, through sufficient Quality Control sampling, testing, inspection, and corrective action (where required). The Fabricator's Quality Control system shall address all key activities during the placement and fabrication and shall be performed in conformance with the Fabricator's NPCA or PCI Certification. Quality Control documentation shall meet the requirements of the *Fabricator Quality Control – Documentation* section below. Upon request, Fabricator Quality Control documentation shall be provided to the MassDOT Plant Inspector.

1. Plant.

Prior to the fabrication of Precast Concrete Bridge Elements, the Fabricator's precast concrete plant shall obtain the following:

(a) Certification by the National Precast Concrete Association (NPCA) Plant Certification Program or Precast/Prestressed Concrete Institute (PCI) Plant Certification Program, for the applicable types of Precast Concrete Bridge Element(s) being fabricated
(b) MassDOT Prequalification
(c) MassDOT Mix Design Approval

All concrete for a given Precast Concrete Bridge Element shall be produced by a single company and plant, unless otherwise approved by the Engineer.

2. Personnel.

The Fabricator shall provide adequate training for all QC personnel in accordance with NPCA or PCI certification. There shall be sufficient personnel trained and certified to perform the tests listed under Subsection M4.02.13, Part D. At a minimum, the Fabricator's Quality Control Personnel shall maintain the following qualifications and certifications:

(a) QC Manager with an active NETTCP Field Technician or ACI Concrete Field Testing Technician – Grade I certification or higher, and a minimum of 4 years continuous experience in the manufacture of Precast Concrete Bridge Elements for state transportation departments. The QC Manager shall be on site while the batch plant is producing and placing concrete for MassDOT projects.
(b) A Technician/Inspector having the Precast/Prestressed Concrete Institute (PCI) Technician/Inspector Level I or NorthEast Transportation Training and Certification Program (NETTCP) Precast Concrete Inspector, or higher.

The Contractor shall submit to the Engineer a copy of the Fabricator's Quality Control Personnel required qualifications, as specified above.

ITEM 995.01 (Continued)

3. Laboratory.

The Fabricator shall provide a room of sufficient size to house all equipment and to adequately perform all testing. The room shall have either a separate moisture storage room or curing box for concrete cylinders, and it shall be thermostatically controlled to maintain temperatures consistent with AASHTO T 23. It shall include a desk and file cabinet for proper record keeping, and have good lighting and ventilation. This room shall be kept for testing and quality control and not used for any other purpose. An additional desk and file cabinet shall be provided for exclusive use of the Engineer. No exception from these requirements will be allowed without the express written permission of the Engineer.

4. Testing Equipment.

At a minimum, the Fabricator's plant facility shall have the following testing equipment:

(a) Air Content Meter Type A or B: AASHTO T 152
(b) Air Content Meter Volumetric Method: AASHTO T 196 (Required for Lightweight Concrete)
(c) Slump Cone: AASHTO T 119
(d) Cylinder Molds AASHTO M 205
(e) Concrete Testing Machine: AASHTO T 22
(f) Screening Sieve: AASHTO T 27, AASHTO T 11
(g) Curing Box: AASHTO T 23
(h) Spread Test Base Plate for Self-Consolidating Concrete (SCC): ASTM C1611
(i) All other equipment prescribed by AASHTO and ASTM standards for the tests to be performed by the Fabricator as specified

5. Inspection.

Quality Control personnel shall monitor and inspect the fabrication of each Precast Concrete Bridge Element. Quality Control personnel shall report all inspection activities on Quality Control Inspection Reports and non-conformances on Non-Conformance Reports (NCRs) throughout the entire fabrication process, as speciefied herein.

6. Temperature Monitoring.

At a minimum, the Fabricator shall monitor, record, and report the temperatures of the form, ambient temperatures surrounding the concrete, and temperatures of the concrete continuously, without interruption as specified below:

(a) Prior to placement of concrete to verify that $Ti \geq 50°F$.
(b) Immediately after placement to verify that $T_i \geq 50°F$ is maintained.
(c) Throughout the entire duration of the curing cycle, at regular intervals not to exceed one hour until 100% Design Strength (f'_c) is attained and concrete has cooled to within 40°F of the ambient temperature surrounding the Precast Concrete Bridge Element.

ITEM 995.01 (Continued)

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°F. At least two temperature sensors (thermocouples) shall be positioned to record the maximum and minimum anticipated concrete temperatures. The anticipated minimum temperature shall be measured with one or more thermocouples at a distance no greater than 2 inches from the surface of the thinnest section. The anticipated maximum temperature shall be measured with one or more thermocouples at the center of the thickest section. Proposed temperature measurement locations shall be submitted to the Engineer for approval. Temperature recording devices shall be located within the curing enclosure and calibrated as required by PCI MNL-116 Section 4.18.4. Maximum heat increase and cool down rates shall comply with PCI MNL-116, Section 4.19. The Contractor shall furnish temperature logs recorded at a minimum frequency of once per hour to the Inspector as required, with each post-pour QC inspection report.

7. Sampling and Testing.

At a minimum, the Fabricator shall perform random Quality Control sampling and testing as specified in *Table 1: Quality Control Sampling and Testing*. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during fabrication. Test Specimens shall conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60, with the exception of the Stripping (80% f'_c) set of cylinders. Stripping (80 % f'_c) cylinders shall be cured in the same location and environment as the Precast Bridge Elements they represent. If approved by the Engineer, compressive strength cylinder match curing equipment, that maintains the same concrete conditions that the corresponding Precast Bridge Element is exposed to, may be utilized in lieu of Stripping (80 % f'_c) field cured cylinders, with the use of thermocouples, controllers, and heaters.

ITEM 995.01 (Continued)

Table 1: Quality Control Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size (c)	Sublot Size (d)	Frequency	Point of Sampling
Slump (in.) (a)	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of Concrete (cy) produced on a Contract, per Type of Element fabricated, per Mix Design	20 cy	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	Stripping Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 80% f'_c at Stripping				
		7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'_c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'_c at 56 days (b)				

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
(b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f'_c).
(c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
(d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

ITEM 995.01 (Continued)

8. Certificate of Compliance.

The Fabricator shall provide a Certificate of Compliance in accordance with Standard Specifications, Division I, Section 6.01, stating that QC test cylinders have achieved the design strength, f'_c. A Certificate of Compliance shall accompany each shipment and shall be presented to the MassDOT Resident Engineer or designee upon delivery to the site.

9. Documentation.

At a minimum, the Fabricator shall maintain a filing system for the following QC records and documentation. All QC records and documentation shall be made available to MassDOT upon the request of the Department.

(a) Current MassDOT Approved Mix Design Sheet(s) and Approval Letter(s)
(b) PCI or NPCA Certification
(c) Current Qualifications and Certifications for QC Manager(s) and QC Technician(s)
(d) Most current set of Approved Shop Drawings
(e) Approved Placement, Finishing and Curing Plan
(f) Approved Dunnage Plan
(g) Fabricator Certificate of Compliance for each fabricated Precast Concrete Bridge Element
(h) Admixture Manufacturer's Certification of Compliance for each approved Admixture
(i) Completed QC Inspection Report for each fabricated Precast Concrete Bridge Element
(j) Identification Number for each fabricated Precast Concrete Bridge Element
(k) Time and date of casting of each fabricated Precast Concrete Bridge Element
(l) Date of stripping of each fabricated Precast Concrete Bridge Element
(m) Batch Ticket Printout reporting the quantity of concrete produced for each batch of concrete produced
(n) Concrete temperature records for each Precast Concrete Bridge Element fabricated
(o) QC Test Report Forms for each sublot of concrete produced
(p) Non-Conformance Reports (NCRs)
(q) Documentation of Repairs (if applicable)

C. Acceptance.

MassDOT will perform Acceptance inspection, sampling, and testing during fabrication and installation, to evaluate the quality and degree of compliance of the fabricated Precast Concrete Bridge Element to MassDOT specifications. Additionally, MassDOT Inspectors will monitor the Fabricator's Quality Control activities to ensure the Fabricator is properly administering Quality Control in conformance with the Fabricator's NPCA or PCI Certification. Acceptance inspection and test results not meeting MassDOT specifications will result in Non-conformance Reports (NCR) being issued by MassDOT to the Fabricator or Contractor for corrective action. Final Acceptance for the fabricated Precast Concrete Bridge Elements shall be determined by MassDOT.

ITEM 995.01 (Continued)

1. Inspection.

A MassDOT MassDOT Inspector will be assigned to perform Acceptance activities during fabrication, which includes the inspection of the materials, work procedures, and Precast Concrete Bridge Elements. At least seven (7) days prior to the scheduled start of fabrication, the Fabricator shall contact the MassDOT Research and Materials Section (RMS) to provide notice of the scheduled fabrication start date. The Fabricator shall complete the following activites prior to notifying MassDOT RMS of the scheduled start date:

(a) Receive approval for all submitted Fabricator cement concrete mix designs from the MassDOT Research and Materials Section for the current year, as specified under the *Mix Design* section and *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete shall meet the requirements of M4.02.17.
(b) Receive approval for the submitted Fabricator Placement, Finishing, and Curing Plan from the MassDOT Research and Materials Section, as specified under the *Placement, Finishing, and Curing Plan* section.
(c) Receive Engineer of Record approved shop drawings from the MassDOT Research and Materials Section as specified under the *Shop Drawings* section.
(d) Participate in the pre-production meeting, as described under the *Pre-Production Meeting* section (if required).

Prior to the start of fabrication, the Fabricator shall review the fabrication schedule with the MassDOT Inspector. Fabrication shall only proceed when:

(a) The QC Inspector and MassDOT Inspector are present to inspect the Precast Concrete Bridge Element(s) being fabricated.
(b) The QC Manager is present at the Fabricator's plant.

The Fabricator shall grant access to all required areas of the Fabricator's plant to the MassDOT Inspector, during the hours of fabrication. Fabrication without MassDOT Inspector access to required areas is prohibited, and will result in the rejection of the fabricated Precast Concrete Bridge Element(s).

Additionally, the MassDOT Inspector will monitor the adequacy of the Fabricator's Quality Control activities. MassDOT Inspector Acceptance activities performed at the Fabricator's plant shall remain independent from the Fabricator, and does not replace the Fabricator's required Quality Control activities.

2. Sampling and Testing.

At a minimum, the MassDOT Inspector will perform random Acceptance sampling and testing for each Sublot of concrete produced as specified in *Table 2: Acceptance Sampling and Testing.* The MassDOT Inspector will also perform Acceptance sampling and testing on concrete that has been retempered with admixtures or hold-back water during production. Test Specimens will conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60.

ITEM 995.01 (Continued)

Table 2: Acceptance Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size [(c)]	Sublot Size [(d)]	Frequency	Point of Sampling
Slump (in.) [(a)]	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of Concrete (cy) produced on a Contract, per Type of Element fabricated, per Mix Design	20 cy	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'_c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'_c at 56 days [(b)]				

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
(b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f'_c).
(c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
(d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

ITEM 995.01 (Continued)

MATERIALS

A. Materials.

Materials shall meet the following specifications (if applicable):

General	M4.00.00
Portland Cement	M4.01.0
Blended Hydraulic Cements	M4.01.1
Fly Ash	M4.01.2
Cement Concrete	M4.02.00
Cement	M4.02.01
Cement Mortar	M4.02.15
Aggregates	M4.02.02
Lightweight Aggregates	M4.02.03
Water	M4.02.04
Cement Concrete Additives	M4.02.05
Proportioning	M4.02.06
Mixing and Delivery	M4.02.10
Test Specimens	M4.02.13
Mortar for Filling Keyways	M4.04.0
Slag	AASHTO M 302
High Performance Cement Concrete	M4.06.1
Self-Consolidating Concrete (SCC)	M4.02.17
Controlled Density Fill – Non-Excavatable	M4.08.0
Reinforcing Bars	M8.01.0
Epoxy Coated Reinforcing Bars	M8.01.7
Galvanized Reinforcing Bars	M8.01.8
Welded Wire Reinforcement	M8.01.2
Mechanical Reinforcing Bar Splicer	M8.01.9
Lifting Devices	PCI MNL-116
Corrugated Metal Pipe	AASHTO M 36

1. Cement Concrete Mix Design.

The cement concrete shall be comprised of specified proportions of water and MassDOT approved aggregates, cement, supplementary cementitious materials (SCMs), and admixtures to form a homogenous composition. Cement concrete for Precast Concrete Bridge Elements shall meet the requirements of M4.06.1 High Performance Cement Concrete, with the exception that the "Total Cementitious Content" specified shall be considered the "Maximum Allowable Cementitious Content". When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

Prior to production of cement concrete, the Fabricator shall report and submit all proposed mix design formulations and its constituent materials onto the MassDOT Cement Concrete Mix Design Sheet to the MassDOT Research and Materials Section for review and approval. All mix design yields shall be designed for 1.0 cubic yards of concrete, with an allowable tolerance of +/- 1.0 %. All liquids incorporated into the proposed mix design(s) shall include both water and admixtures in the liquid mass calculation.

ITEM 995.01 (Continued)

During production of cement concrete, the Fabricator shall not alter the previously approved mix design formulation or its constituent materials. Proposed alterations in source, type, batch quantity, or gradation to any of the constituent materials of the previously approved mix design formulation shall require a new MassDOT Mix Design Sheet submission to the MassDOT Research and materials Section for review and approval. Fabrication shall not occur without prior MassDOT mix design approval.

The Fabricator shall notify MassDOT RMS to schedule trial batch testing for the new mix design(s). Trial batch testing shall meet the following requirements:

(a) Performed by a qualified laboratory and/or AASHTO accredited laboratory.
(b) Performed and/or sampled in the presence of a MassDOT Inspector.
(c) Meet the requirements as specified in *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete (SCC) shall meet M4.02.17.

Failure to perform all of the required trial batch testing or provide MassDOT RMS trial batch test results within the Specification Limits (as specified in Table 3) will result in the disqualification of the Fabricator's proposed mix design(s).

ITEM 995.01 (Continued)

Table 3: Trial Batch Sampling and Testing for New Mix Designs

Quality Characteristic	Test Method	Sample Size	Specification Limit	Performed By
Slump [a]	AASHTO T 119	Per AASHTO	Max. 8 inches or as approved by the Engineer	Quality Control
Air Content (AC)	AASHTO T 152	Per AASHTO	5% ≤ AC ≤ 8%	Quality Control
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F	Quality Control
Compressive Strength [b]	AASHTO T 22 AASHTO T 23	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Lab Mixed f'_{cr} = 1.3 f'_c at 28 days Batch Mixed f'_{cr} = 1.2 f'_c at 28 days	MassDOT
Alkali-Silica Reaction (ASR) [d]	ASTM C 1567	Per ASTM	M4.02.00	Quality Control
Resistance to Chloride Ion Penetration Chloride Ion Penetration [e]	AASHTO T 358 [f]	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Resistivity ≥ 21 kΩ-cm at 28 days	MassDOT
Freeze/Thaw Durability [c]	AASHTO T 161 (Procedure A)	Per AASHTO	Relative Dynamic Modulus of Elasticity after 300 cycles ≥ 80%	Quality Control

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
(b) Trial batch compressive strength testing shall be performed by MassDOT. Laboratory mixed trial batch compressive strength results shall achieve 130% Design Strength (f'_c). Batch-mixed trial batch compressive results shall achieve 120% f'_c. Acceptance will be based on compressive strength testing performed by MassDOT.
(c) If an AASHTO accredited laboratory is preparing the trial batch test specimens, MassDOT Acceptance presence is not required. If the Fabricator is preparing the trial batch test specimens, MassDOT Acceptance presence is required during trial batch test specimen preparation.
(d) Alkali Silica Reaction (ASR) testing shall meet the requirements of M4.02.00. Independent laboratories performing ASR testing shall be listed on the MassDOT Quality Construction Materials List (QCML).
(e) Calcium nitrite shall be removed from mix designs containing the admixture and replaced by an equivalent quantity of water when preparing Chloride Ion Penetration resistance trial batch test specimens.
(f) The Wenner probe tip spacing "a" shall be 1.5.

ITEM 995.01 (Continued)

2. Vertical Adjustment Assembly.

Vertical Adjustment Assembly details and material requirements shall be as shown on the plans. Alternate devices may be used provided that they are adjustable and can support the anticipated loads. The design of the leveling devices, with necessary calculations, shall be submitted to the Engineer of Record for approval.

3. Grout.

Grout used for shear keys, vertical adjustment assembly voids, and hand holes shall be in accordance with M4.04.0.

4. Reinforcement.

All reinforcing steel shall be coated Grade 60 unless otherwise noted on the plans. Mechanical reinforcing bar splicers shall be epoxy coated.

5. Threaded Inserts.

Threaded inserts are permissible to facilitate forming the keyway pours. Threaded inserts shall be hot dip galvanized or made of stainless steel. The number of threaded inserts shall be minimized, and the inserts shall not come in contact with the reinforcing steel.

6. Corrugated Metal Pipe.

Corrugated Metal Pipe to be used for forming voids as specified on the plans shall be fabricated from steel and shall have a protective metallic coating of zinc (galvanizing).

CONSTRUCTION METHODS – PLANT FABRICATION

A. Shop Drawings.

Prior to performing any work under this Section, the Contractor shall receive approval for all shop drawings for the Precast Concrete Bridge Element being worked on and any special Contract requirements, provided that a complete shop drawing package is provided. The Contractor shall not order materials or begin work before receiving approved shop drawings. MassDOT will reject Precast Concrete Bridge Elements that deviate from the approved drawings or are fabricated prior to receiving written approval of the shop drawings. The Contractor shall bear full responsibility and costs for all materials ordered or work performed prior to the approval of the shop drawings or written authorization from MassDOT.

Contractor shall submit scaled shop drawings to the Engineer of Record for review and approval. Upon approval, the Engineer of Record will forward two (2) sets of scaled, full size (minimum 24x36") paper copies of the Approved (or Approved As Noted) shop drawings to the MassDOT Director of Research and Materials. Calculations are not to be included in any submittal to the Research and Materials Section. An approval stamp shall appear on every shop drawing sheet. Wet-stamping or wet-signing is not required, provided that the stamp and reviewer name are legible. The Fabricator's name and address shall appear on each sheet.

Resubmittal of "Approved as Noted" shop drawings is not necessary for minor revisions, provided that the correction can be clearly understood and is unambiguous without possibility of misinterpretation. Shop drawings with questions or comments that require a response and/or additional information from the Fabricator must be resubmitted.

ITEM 995.01 (Continued)

Detailed shop drawings shall be prepared in accordance with the relevant provisions of Subsection 5.02 and shall, at a minimum, contain the following:

(a) Number and type and/or piece mark of the precast concrete bridge element including overall length, width and height.
(b) Skew angle.
(c) Location, size and geometry of all steel reinforcement, including mechanical reinforcing bar splicers to be used for connecting Precast Concrete Bridge Elements together in the field.
(d) Location and details of all inserts, anchors, Vertical Adjustment Assemblies, and any other items required to be cast into the Precast Concrete Bridge Elements (whether detailed on the plans by the Engineer of Record or provided for the Contractor's convenience). Precast Concrete Bridge Elements shall not be fired or drilled into for attachment purposes. All hardware shall be galvanized except as noted.
(e) Locations and details of the lifting devices, including supporting calculations, type and amount of any additional reinforcing required for lifting. The Fabricator shall design all lifting devices based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (7^{th} edition).
(f) The minimum compressive strength required prior to handling the precast concrete bridge element.

The shop drawings shall not include procedures for placement, finishing, and curing of concrete. These details shall be included in the Placement, Finishing and Curing Plan that is to be submitted to MassDOT Research and Materials Section as described under *Placement, Finishing, and Curing Plan*.

B. Fabrication.

All Precast Concrete Bridge Elements shall be fabricated in accordance with the latest edition of PCI MNL-116 as modified herein.

C. Placement, Finishing and Curing Plan.

At least 30 days prior to start of fabrication, the Contractor shall submit the Fabricator's proposed Placement, Finishing and Curing Plan to the Engineer for approval by MassDOT Research and Materials Section. This shall be an independent submittal, separate from the fabrication shop drawings. The Placement, Finishing and Curing Plan shall include the following:

(a) Method of Mixing
(b) Method of Placement
(c) Method of Consolidation
(d) Method of Finishing
(e) Method of Initial Curing
(f) Method of Intermediate Curing
(g) Method of Final Curing
(h) Moisture Retention Materials and Equipment (water spray equipment, saturated covers, sheet materials, liquid membrane-forming compounds, accelerated curing equipment, etc.)
(i) Cylinder Curing Methods, Location, and Environmental Control (temperature, humidity, etc.)
(j) Temperature Monitoring, Recording, and Reporting

ITEM 995.01 (Continued)

D. Dunnage Plan Shop Drawings.

At least 30 days prior to the start of fabrication, the Contractor shall submit proposed Dunnage Plan Shop Drawings to the Engineer of Record for review and approval. This shall be an independent submittal, separate from the fabrication shop drawings. Upon approval, the Engineer of Record will forward two (2) sets of scaled, full size (minimum 24"x36") paper copies of the Approved (or Approved As Noted) Dunnage Plan to the MassDOT Director of Research and Materials. Calculations are not to be included in any submittal to the Research and Materials Section. The Dunnage Plan shall include the following:

(a) Proposed layout of the Precast Concrete Bridge Elements for storage in yard and during shipping
(b) Support and blocking point locations
(c) Support and blocking materials

E. Pre-Production Meeting.

The Contractor shall notify the MassDOT Research and Materials Section to determine if a pre-production meeting will be required to review the specification, shop drawings, curing plan, schedule, and discuss any specific requirements. The meeting shall be held prior to scheduling a MassDOT Inspector (refer to Section *Quality Assurance – Precast Concrete, C. Acceptance, A. Inspection*), and at least seven (7) days prior to the scheduled casting of any Precast Concrete Bridge Element or control section. The Contractor shall schedule the meeting, which shall include representatives of the Fabricator and MassDOT.

F. Reinforcement.

The reinforcing bars shall be installed in accordance with Section 901.62 of the Supplemental Specifications, including tolerances for cover and horizontal spacing of bars. Components of mechanical reinforcing bar splicers shall be set with the tolerances shown on the plans. The reinforcing bars and mechanical reinforcing bar splicers shall be assembled into a rigid cage that will maintain its shape in the form and which will not allow individual reinforcing bars to move during the placement of concrete. This cage shall be secured in the form so that the clearances to all faces of the concrete, as shown on the plans, shall be maintained.

Where reinforcing bars are to protrude from one Precast Concrete Bridge Element in order to mate with reinforcing bar splicers in a second precast concrete element, the fabricator shall set the reinforcing bars and the reinforcing bar splicers with a template in order to ensure proper fit up within the tolerances specified on the plans.

G. Tolerances.

Fabrication shall comply with tolerances specified on the plans. Tolerances for steel reinforcement placement shall be in accordance with 901.62. In the absence of specifications on the plans, tolerances shall comply with the latest version of the PCI MNL 135, Precast Tolerance Manual.

ITEM 995.01 (Continued)

H. Forms.

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Bridge Elements within specified tolerances to the shapes, lines and dimensions shown on the approved fabrication drawings. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. Any defects or damage of more than "Category 2, Minor Defects" made to the concrete, due to form work, stripping or handling, shall be subject to repair or rejection, as defined in the *Repairs and Replacement* section. If threaded inserts are cast into the elements for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

I. Mixing of Concrete.

The concrete shall be proportioned and mixed in conformance with the Fabricator's MassDOT approved mix design and M4.02.10 Mixing and Delivery Fabrication shall not occur without prior MassDOT mix design approval. The Fabricator shall provide copies of batch tickets to the MassDOT Plant Inspector. The MassDOT Plant Inspector will verify if the batch ticket quantities are within the tolerances of the Fabricator's MassDOT approved mix design.

J. Placement of Concrete.

Prior to the placement of concrete, the temperature of the forms shall be greater than or equal to 50°F. Quality Control inspection shall be performed by the Fabricator as specified in the *Fabricator Quality Control* section. Placement of the concrete shall not proceed until the MassDOT Plant Inspector is present to perform inspection and begin monitoring Fabricator Quality Control inspection activities, and is in compliance with specifications. The MassDOT Plant Inspector shall inspect and accept the placement of the reinforcing steel prior to the placement of concrete into the forms. The Fabricator shall verify all materials and equipment required for protecting and curing the concrete are readily available and meet the requirements of the *Final Curing Methods* section below. All items encased in the concrete shall be accurately placed in the position shown on the Plans and firmly held during the placing and setting of the concrete. Clearance from the forms shall be maintained by supports, spacers, or hangers and shall be of approved shape and dimension.

During placement, the concrete shall maintain a concrete temperature range between 50°F and 90°F. The Fabricator shall minimize the time to concrete placement (measured from start of mixing to completion of placement). In no event shall time to placement exceed 90 minutes. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during the placement of the concrete as specified in the *Fabricator Quality Control* section above. Delays or shutdowns of over 30 minutes shall not be allowed during the continuous filling of individual forms.

ITEM 995.01 (Continued)

K. Consolidation of Concrete.

Suitable means shall be used for placing concrete to prevent segregation or displacement of reinforcing steel or forms. The concrete shall be thoroughly consolidated by external or internal vibrators or a combination of both. Vibrators shall not be used to move concrete within the forms. Vibrators shall be used as specified in 901.63C and as directed by the Engineer. Concrete shall be placed and consolidated in a way that minimizes the presence of surface voids or bug holes on the formed surfaces. When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

L. Finishing of Concrete.

The finish of the Precast Concrete Bridge Elements shall be as indicated on the plans. Where Precast Concrete Bridge Elements have keyways for grout or closure pours, the surfaces of these shear keys shall be abrasive blasted prior to shipment. The Fabricator may utilize a surface retarder with water blast, sandblast, or a combination of both to achieve the desired keyway finish. At a minimum, the profile of the keyway surfaces shall be similar to that of 60 grit sand paper. The exposed reinforcing steel in the precast slab shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer.

The Fabricator shall permanently mark each precast concrete bridge element with its type and/or piece mark, date of casting, and supplier identification either by stamp markings in fresh concrete, waterproof paint, or other approved means on a surface that will not be exposed after assembly.

M. Exposed Surfaces of Precast Concrete Bridge Elements.

As soon as conditions permit, before the concrete has fully hardened, all dirt, laitance, and loose aggregate shall be removed from the exposed concrete surfaces. Contractor shall not allow foot traffic on the uncured concrete until it has reached sufficient strength to prevent damage.

N. Exposed Surfaces of Closure Pour Shear Keys.

The closure pour shear key cast in the sides of the beam flanges shall have an exposed aggregate finish. The closure pour reinforcing steel and its coating shall not be damaged by the process for creating the exposed aggregate surface. Fabricator may utilize a surface retarder with water blast, abrasive blast, or a combination of both to achieve the desired shear key finish. The abrasive blast shall use oil free compressed air. The profile of the shear key surfaces shall be similar to that of 60 grit sand paper.

O. Initial Curing Methods.

After the placement of concrete and prior to concrete finishing, the Fabricator shall initiate initial curing methods when the concrete surface begins to dry, to reduce moisture loss from the surface. Application of one or more of the following initial curing methods shall occur immediately after the bleed water sheen has disappeared.

1. Fogging.

Fogging nozzles shall atomize water into a fog-like mist. The fog spray shall be directed and remain visibly suspended above the concrete surface, to increase the humidity of the air and reduce the rate of evaporation. Water from fogging shall not be worked into the surface during finishing operations and shall be removed or allowed to evaporate prior to finishing.

ITEM 995.01 (Continued)

2. Liquid-applied Evaporation Reducers

Evaporation reducers shall be sprayed onto the freshly placed concrete surface to produce an effective monomolecular film that reduces the risk of plastic-shrinkage cracking and rate of evaporation of the bleed water from the concrete surface. Evaporation reducers shall be applied in accordance with manufacturer's recommendations.

P. Intermediate Curing Methods.

The Fabricator shall initiate intermediate curing methods if concrete finishing has taken place prior to the concrete reaching final set. The freshly finished concrete surface shall be protected from moisture loss, by the continuation of initial curing methods (fogging and evaporation reducers) until final curing methods are applied or by the use of liquid membrane-forming curing compounds (see *Liquid Membrane-Forming Compounds for Curing* section).

Q. Final Curing Methods.

The Fabricator shall initiate and apply final curing methods to the concrete immediately after the following conditions are met:

(a) Completion of concrete finishing
(b) Final set of concrete
(c) Concrete has hardened sufficiently enough to prevent surface damage

During fabrication of Precast Concrete Bridge Elements, the Fabricator shall maintain the required concrete temperature ranges throughout the entire duration of the final curing method cycle as specified herein. Controlled and gradual termination of the final curing method shall occur after all specified conditions are met. The concrete temperature shall be reduced at a rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the final curing method enclosure. The Fabricator shall maintain a minimum concrete temperature of 40°F until 100% f'c is attained (see *Handling and Storage* section below).

1. Water Spray Curing.

All exposed concrete surfaces shall remain moist with a continuous fine spray of water throughout the entire duration of the final curing method cycle (see *Table 4: Final Curing Method Cycle for Water Spray*).

Table 4: Final Curing Method Cycle for Water Spray

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Five (5) days	≥ 80% f'_c

ITEM 995.01 (Continued)

2. Saturated Covers for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of saturated covers throughout the entire duration of the final curing method cycle (see *Table 5: Final Curing Method Cycle for Saturated Covers*). Saturated covers shall be allowed to dry thoroughly before removal to provide uniform, slow drying of the concrete surface.

Table 5: Final Curing Method Cycle for Saturated Covers

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f'_c

Saturated covers, such as burlap, cotton mats, and other coverings of absorbent materials shall meet the requirements of AASHTO M 182, Class 3. Saturated covers shall be in good condition, free from holes, tears, or other defects that would render it unsuitable for curing concrete. Saturated covers shall be dried to prevent mildew when storing. Prior to application, saturated covers shall be thoroughly rinsed in water and free of harmful substances that are deleterious or cause discoloration to the concrete. Saturated covers shall have sufficient thickness and proper positioning onto the concrete surface to maximize moisture retention.

Saturated covers shall contain a sufficient amount of moisture to prevent moisture loss from the surface of the concrete. Saturated covers shall be kept continuously moist so that a film of water remains on the concrete surface throughout the entire duration of the final curing method cycle. The Fabricator shall not permit the saturated covers to dry and absorb water from the concrete. Use of polyethylene film (see *Polyethylene Film* section) may be applied over the saturated cover to potentially decrease the need for continuous watering.

3. Sheet Materials for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of curing sheet materials throughout the entire duration of the final curing method cycle (see *Table 6: Final Curing Method Cycle for Curing Sheet Materials*).

Table 6: Final Curing Method Cycle for Sheet Materials

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f'_c

Sheet Materials used for curing, such as polyethylene film, white burlap-polyethylene sheeting, and reinforced paper shall meet the requirements of ASTM C171 and the specifications herein. Sheet materials shall inhibit moisture loss and reduce temperature rise in concrete exposed to radiation from the sun during the final curing method cycle. Adjoining covers shall overlap not less than 12 inches. All edges of the covers shall be secured to maintain a moist environment.

ITEM 995.01 (Continued)

(a) Polyethylene Film.

Polyethylene film shall meet the requirements of ASTM C171, consist of a single sheet manufactured from polyethylene resins, be free of visible defects, and have a uniform appearance. Careful considerations shall be taken by the Fabricator to prevent the film from tearing during storage and application, so as to not disrupt the continuity of the film (polyethylene film reinforced with glass or other fibers is more durable and less likely to be torn). The Fabricator shall monitor the application of the film to prevent uneven spots from appearing (mottling) on the concrete surface, due to variations in temperature, moisture content, or both. The Fabricator shall prevent mottling from occurring on the concrete surface by applying additional water under the film or applying a combination of polyethylene film bonded to absorbent fabric to the concrete surface to retain and evenly distribute the moisture.
Immediately following final finishing, polyethylene film shall be placed over the surface of the fresh concrete surface, so as to not damage the surface of the concrete and shall be placed and weighted so that it remains in contact with the concrete throughout the entire duration of the final curing method cycle. The film shall extend beyond the edges of the concrete surface. The film shall be placed flat on the concrete surface, avoiding wrinkles, to minimize mottling. Edges of adjacent polyethylene film shall overlap a minimum of 6 inches and be tightly sealed with the use of sand, wood planks, pressure-sensitive tape, mastic, or glue to maintain close contact with the concrete surface, retain moisture, and prevent the formation of air pockets throughout the entire duration of the final curing method cycle.

(b) White Burlap-Polyethylene Sheeting

White burlap-polyethylene sheeting shall meet the requirements of ASTM C171, be securely bonded to the burlap so to avoid separation of the materials during handling and curing of the concrete, and be applied in the same manner as the polyethylene film.

(c) Reinforced Impervious Paper.

Reinforced impervious paper shall meet the requirements of ASTM C171, consist of two sheets of kraft paper cemented together with a bituminous adhesive and reinforced with embedded cords or strands of fiber running in both directions, and be white in color. Reinforced impervious paper shall be treated to prevent tearing when wetted and dried.

Reinforced impervious paper can be reused so long as it is effective in retaining moisture on the concrete surface. The Fabricator shall visually inspect the reinforced impervious paper for all holes, tears, and pin holes from deterioration of the paper through repeated use by holding the paper up to the light. The paper shall be discarded and prohibited from use when the moisture is no longer retained.

After the concrete has hardened sufficiently to prevent surface damage, the concrete surface shall be thoroughly wetted prior to the application of the reinforced impervious paper, and be applied in the same manner as the polyethylene film.

4. Liquid Membrane-Forming Compounds for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of liquid membrane-forming compounds throughout the entire duration of the final curing method cycle (see *Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds*).

ITEM 995.01 (Continued)

Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 80% f'_c

Liquid membrane-forming compounds shall meet the requirements of ASTM C 1315, Type I, Class A and shall exhibit specific properties, such as alkali resistance, acid resistance, adhesion-promoting quality, and resistance to degradation by ultraviolet light, in addition to moisture-retention capabilities. Liquid membrane-forming compounds shall consist of waxes, resins, chlorinated rubber, or other materials to reduce evaporation of moisture from concrete. Liquid membrane-forming compounds shall be applied in accordance with the manufacturer's recommendations.

Liquid membrane-forming compounds shall be applied immediately after the disappearance of the surface water sheen following final finishing. All exposed surfaces shall be wetted immediately after form removal and kept moist to prevent absorption of the compound, allowing the curing membrane to remain on the concrete surface for proper membrane moisture retention. The concrete shall reach a uniformly damp appearance with no free water on the surface prior to the application of the compound.

If patching or finishing repairs are to be performed prior to the application of the compound, the Precast Concrete Bridge Element shall be covered temporarily with saturated covers until the repairs are completed and the compound is applied. Only areas being repaired shall be uncovered during this period. While the saturated covers are removed to facilitate the patching process, the work shall continue uninterrupted. If for any reason the work is interrupted, saturated covers shall be placed onto the uncovered concrete surface, until the work continues and is completed, at which time the curing compound shall be applied to the repaired area.

Careful considerations shall be made by the Fabricator to determine if the evaporation rate is exceeding the rate of bleeding, thus causing the surface to appear dry even though bleeding is still occurring. Under such conditions, the application of liquid membrane-forming compounds to the concrete surface shall be delayed, in order to prevent bleed water from being sealed below the concrete surface and avert map cracking of the membrane films, reduction in moisture-retention capability, and reapplication of the compound. To diagnose and prevent this condition, the Fabricator shall place a transparent plastic sheet over a test area of the uncured and unfinished concrete surface and shall determine if any bleed water accumulates under the plastic.

The compound shall be applied in two applications at right angles to each other to ensure uniform and more complete coverage. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of a troweled or floated surface. In such cases, two separate applications may be needed, each at 200 ft^2/gal., with the first being allowed to become tacky before the second is applied.

The curing compound shall be applied by power sprayer, using appropriate wands and nozzles with pressures between 25 and 100 psi. For very small areas such as repairs, the compound shall be applied with a wide, soft-bristled brush or paint roller. The compound shall be stirred or agitated before use and applied uniformly in accordance with the manufacturer's recommended rate. The Fabricator shall verify the application rates are in accordance with the manufacturer's recommended rate.

When the concrete surface is to receive paint, finishes, or toppings that require positive bond to the concrete, it is critical that the curing procedures and subsequent coatings, finishes, or toppings be compatible to achieve the necessary bond.

ITEM 995.01 (Continued)

After the termination of the final curing method cycle has occured, liquid membrane-forming compounds shall be removed by blast-cleaning from any concrete surface that is to receive paint, finishes, plastic concrete from secondary pour, grout, or any other toppings that require bonding to the concrete surface. These surfaces shall be further blast-cleaned to remove the cement matrix down to exposed aggregate to ensure proper bonding to the material. The method used to remove the curing compound shall not damage the reinforcement and coating. Compounds are prohibited on any concrete surface that will have a penetrating or coating type treatment such as a sealer, stain, or waterproofing membrane applied to it.

5. Accelerated Curing.

Accelerated curing shall use live steam or radiant heat with moisture in accordance with PCI MNL-116 as modified herein. The concrete temperature shall meet the maximum heat increase and cool down rates as specified herein. Concrete temperature monitoring shall meet the requirements of the *Temperature Monitoring* section. Excessive and fluctuating rates of heating and cooling shall be prohibited. The concrete temperature shall not exceed 158°F at any time. The Fabricator shall meet the following accelerated curing sequencing and requirements.

(a) Initial Delay Period.

The initial delay period shall be defined as the duration immediately following the placement of the concrete and the attainment of initial set of the concrete. The Fabricator shall determine the time of initial set in accordance with AASHTO T 197 specifications. Throughout the entire duration of the preset period, initial curing shall be implemented. The temperature increase period (see *Temperature Increase Period* section) shall not occur until initial set of the concrete is attained. During the initial delay period, the concrete temperature shall meet the following requirements:

i. Concrete temperature rate of increase shall not exceed 10°F per hour.
ii. Total concrete temperature increase shall not exceed 40°F higher than the placement concrete temperature or 100°F, whichever is less

(b) Temperature Increase Period.

The temperature increase period shall be defined as the duration immediately following the completion of the initial delay period (after initial set) and immediately prior to the start of the constant maximum temperature period. Application of steam to the enclosure shall not occur until the initial delay period is complete. After the initial delay period is complete, all exposed concrete surfaces shall be cured in a moist environment where the concrete temperature increases at a rate not to exceed 36°F per hour.

(c) Constant Maximum Temperature Period.

The constant maximum temperature period shall be defined as the duration immediately following the completion of the temperature increase period and immediately prior to the start of the temperature decrease period. After the temperature increase period is complete, all exposed concrete surfaces shall be cured in a moist environment at a controlled and constant elevated temperature throughout the entire duration of the constant maximum temperature period. Termination of the constant maximum temperature period and the start of the termination decrease period shall occur after all specified conditions are met (see *Table 8: Constant Maximum Temperature Period*).

ITEM 995.01 (Continued)

Table 8: Constant Maximum Temperature Period

Sustained Concrete Temperature	Constant Maximum Temperature Period	Compressive Strength
120°F ≤ °F ≤ 158°F	6 hrs ≤ Time ≤ 48 hrs	≥ 80% f'_c

(d) Temperature Decrease Period.

After the constant maximum temperature period is complete, the concrete temperature shall be cured in a moist environment at a controlled and reduced rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the curing enclosure.

R. Stripping.

The Fabricator shall not strip forms or handle the Precast Concrete Bridge Element until Quality Control compressive strength cylinders attain a minimum compressive strength of 80% Design Strength (f'_c) or the value indicated on the approved drawings has been achieved. After removal from the form, all exposed concrete surfaces shall continue to be cured in conformance with the *Final Curing Methods* sections until completion.

S. Handling and Storage of Precast Concrete Bridge Elements.

Precast Concrete Bridge Elements may be exposed to temperatures below freezing (32°F) when the chosen curing cycle has been completed, provided that the following conditions are met:

(a) Precast Concrete Bridge Elements are protected from precipitation with polyethylene curing covers until 100% f'_c is attained
(b) Precast Concrete Bridge Elements maintain a minimum concrete temperature of 40°F until 100% f'_c is attained

Precast Concrete Bridge Elements damaged during handling and storage will be repaired or replaced at MassDOT's direction at no cost to MassDOT. Precast Concrete Bridge Elements shall be lifted at the designated points by approved lifting devices embedded in the concrete and in accordance with proper lifting and handling procedures. Storage areas shall be smooth and well compacted to prevent damage due to differential settlement. Precast Concrete Bridge Elements shall be supported on the ground by means of continuous blocking, in accordance with the approved dunnage plan.

Precast Concrete Bridge Elements shall be loaded on a trailer with blocking as described above, in accordance with the approved dunnage plan. Shock-absorbing cushioning material shall be used at all bearing points during transportation of the Precast Concrete Bridge Elements. Blocking shall be provided at all locations of tie-down straps. Precast Concrete Bridge Elements stored prior to shipment shall be inspected by the Contractor prior to being delivered to the site to identify damage that would be cause for repair or rejection.

ITEM 995.01 (Continued)

T. Repairs and Replacement.

In the event defects are identified, they shall be classified in the following categories and a non-conformance report (NCR) shall be filed if required. The NCR shall be submitted to MassDOT for review. Defects in all categories shall be documented by plant Quality Control personnel and made available to MassDOT upon request. Any required repairs shall utilize materials listed on the MassDOT QCML.

Where noted, defects shall be repaired according to the PCI Northeast Region Guidelines for Resolution of Non-Conformances in Precast Concrete Bridge Elements, Report Number PCINE-18-RNPCBE. Please note that reference to PCINE-18-RNPCBE is made for repair details only. In the case of conflicts with this Special Provision, this Special Provision shall govern.

1. Category 1, Surface Defects.

Category 1 defects do not need to be repaired, and an NCR does not need to be filed. Surface defects are defined as the following:

(a) Surface voids or bug holes that are less than 5/8-inch in diameter and less than ¼-inch deep, except when classified as Category 4
(b) Cracks less than or equal to 0.006 inches wide
(c) Cracks less than or equal to 0.125 inches wide on surfaces that will receive a field-cast concrete overlay

2. Category 2, Minor Defects.

Category 2 defects shall be repaired, but an NCR does not need to be filed. Minor defects are defined as the following:

(a) Spalls, honeycombing, surface voids that are less than 2 inches deep and have no dimension greater than 12 inches
(b) Cracks less than or equal to 0.016 inches that will not receive a concrete overlay
(c) Broken or spalled corners that will be covered by field-cast concrete

Minor defects shall be repaired according to PCINE-18-RNPCBE. Cracks shall be sealed according to the PCI Repair Procedure #14 in PCINE-18-RNPCBE.

3. Category 3, Major Defects.

For Category 3 defects, the Fabricator shall prepare an NCR that documents the defect and describes the proposed repair procedure. The NCR shall be submitted to MassDOT for approval prior to performing the repair. Major defects are defined as the following:

(a) Spalls, honeycombing and surface voids that are deeper than 2 inches or have any dimension greater than 12 inches, when measured along a straight line
(b) Concentrated area of defects consisting of four or more Category 2 Defects within a 4-square foot area.
(c) Exposed reinforcing steel
(d) Cracks greater than 0.016 inches and less than or equal to 0.060 inches in width that will not receive a concrete overlay
(e) Bearing area spalls with dimensions not exceeding 3 inches
(f) Cracks, spalls and honeycombing that will be encased in cast in place concrete need not be repaired, but the limits and location of the defects shall be documented with an NCR

ITEM 995.01 (Continued)

Upon MassDOT approval, defects and cracks shall be repaired according to PCINE-18-RNPCBE and this specification. All repairs shall be completed at the expense of the Contractor.

4. Category 4, Rejectable Defects.

Rejectable defects as determined by the MassDOT Inspector, RMS, and Engineer may be cause for rejection. Fabricator may submit an NCR with a proposed repair procedure, requesting approval. Some rejectable defects are defined as the following:

(a) Surface defects on more than 5% of the surface area which will be exposed to view after installation
(b) Minor defects that in total make up more than 5% of the surface area of the unit
(c) Cracks greater than 0.060 inches in width except as noted in Category 1
(d) Elements fabricated outside of the specified tolerances
(e) MassDOT compressive strength testing that does not meet the specified Design Strength, f'_c

U. Loading.

Prior to the Fabricator loading the Precast Bridge Element on to the truck for shipping, the Fabricator shall provide the MassDOT Plant Inspector and RMS a minimum seven (7) days' notice of the Fabricator's intent to load the Precast Bridge Element. Inspection by the MassDOT Plant Inspector shall take place while the element is still on dunnage in the yard. The element shall not be loaded onto the truck until the MassDOT Plant Inspector has performed the inspection.

V. Shipping.

Prior to shipment, the Fabricator shall perform the following actions and provide the required documentation to the MassDOT Plant Inspector:

(a) Precast Concrete Bridge Elements shall remain at the Fabricator's plant for a minimum of 7 days after cast date.
(b) QC Inspection Reports shall be signed by the Quality Control Manager and provided to the MassDOT Plant Inspector.
(c) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Precast Concrete Bridge Element's representative Sublot shall be generated by the Fabricator and provided to the MassDOT Plant Inspector.
(d) Certificate of Compliance shall be generated by the Fabricator as described under the Fabricator Quality Control section and provided to the MassDOT Plant Inspector.
(e) All MassDOT RMS approved Corrective Actions submitted on the Non-Conformance Reports (NCR), shall be verified to have been completed by the MassDOT Plant Inspector and Quality Control Manager.
(f) All NCRs shall be signed off by the Quality Control Manager, MassDOT Inspector and MassDOT RMS.

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W. Delivery.

Upon Delivery, the following documentation shall be provided to the MassDOT Resident Engineer or designee:

(a) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Precast Concrete Bridge Element's representative sublot.
(b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
(c) QC Inspection Reports signed by the Quality Control Manager.

The Contractor shall inspect Precast Concrete Bridge Elements upon receipt at the site. Precast Concrete Bridge Elements damaged during delivery shall be repaired or replaced at MassDOT's direction at no cost to MassDOT.

CONSTRUCTION METHODS – FIELD CONSTRUCTION

A. General.

All of the Contractor's field personnel involved in the erection and assembly of the Precast Concrete Bridge Elements shall have knowledge of and follow the approved Erection Procedure.

Prior to installation, the following documentation shall be reviewed and confirmed by the MassDOT Resident Engineer or designee:

(a) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Precast Concrete Bridge Element's representative sublot.
(b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
(c) QC Inspection Reports signed by the Quality Control Manager.

Field construction staff shall verify that the Resident Engineer has accepted all Precast Concrete Bridge Elements prior to installation.

B. Erection Procedure

Prior to the erection, the Contractor shall submit an Erection Procedure for approval by the Engineer. This submittal shall include computations and drawings for the transport, hoisting, erection and handling of the Precast Concrete Bridge Elements. The Erection Procedure shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the bridge. The Erection Procedure shall, at a minimum, include the following:

ITEM 995.01 (Continued)

1. Erection Procedure

The Erection Procedure shall be prepared to conform to the requirements of 960.61, Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (seventh edition) for handling, erection, and bracing requirements. At a minimum, the Erection Procedure shall provide:

(a) Minimum concrete compressive strength for handling the Precast Concrete Bridge Elements.
(b) Concrete stresses during handling, transport, and erection.
(c) Crane capacities, pick radii, sling geometry, and lifting hardware.
(d) Verification that the equipment can handle all pick loads and weights with the required factor of safety.
(e) Evaluation of construction sequence and evaluation of any geometric conflicts in the lifting of the Precast Concrete Bridge Elements and setting them as shown on the plans.
(f) Design of crane supports including verification of subgrade for support.
(g) Location and design of all temporary bracing that will be required during erection.

Non-shrink grout and concrete materials, approved by the Engineer, shall be placed as shown on the plans. Fill joints, keyways, and voids, in strict accordance with the specifications and manufacturer's recommendations and instructions.

For footings, approach slabs and highway guardrail transitions, once these Precast Concrete Bridge Elements have been set to the correct horizontal and vertical alignment, the void between them and the supporting soil shall be filled with Controlled Density Fill – Non-Excavatable to the limits as shown on the plans. Add additional grout ports in the footings to facilitate the bedding process if required.

Joints shall be filled flush to the top with non-shrink grout, and any vertical misalignment between adjacent elements shall be feathered out on a slope of 1 to 12.

Curing of grout or concrete shall be performed in strict accordance with the specifications and manufacturer's recommendations. Filling shall not be completed in cold weather when either the ambient temperature or the precast member's temperature is below the manufacturer's recommendation. No localized heating of either the precast members or of the air surrounding the element will be permitted in an attempt to reach application temperatures.

If the joints or voids are not filled within five days after the Precast Bridge Elements are erected, the Contractor shall cover and protect the openings from weather and debris until they are filled.

C. Survey and Layout.

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. MassDOT reserves the right to perform additional independent survey. If discrepancies are found, the Contractor may be required to verify previous survey data.

D. Preparation of Closure Pour Keyways.

Immediately prior to erecting the Precast Concrete Bridge Elements, the closure pour shear keys shall be cleaned at the job site of all dust, dirt, carbonation, laitance, and other potentially detrimental materials which may interfere with the bonding of the closure pour concrete and precast concrete using a high-pressure water blast. The exposed reinforcing steel in the precast concrete shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer. The surfaces of the shear keys shall be wetted so that the surfaces shall have a Saturated Surface Dry (SSD) condition for at least 24 hours prior to the placement of the closure pour concrete.

ITEM 995.01 (Continued)

E. Erection.

The elements shall be placed in the sequence and according to the methods outlined in the Erection Procedure. As the erection proceeds, the Contractor shall constantly monitor the assembly to ensure that the precast concrete bridge element is within proper horizontal and vertical location and tolerances prior to releasing it from the crane and setting the next unit. The Contractor may use shims to maintain proper setting tolerances.

The concrete elements shall be lifted only by the lifting devices, and the utmost care shall be taken to prevent distortion of the elements during handling, transportation or storage.

Suitable spreaders shall be used during lifting so that only a vertical pull will be made on the lifting device. A non-vertical lifting force may be permitted if prior written approval is given by the Engineer. This approval will be contingent on the Contractor demonstrating by calculations, prepared by a Professional Engineer registered in Massachusetts, that the elements will not be damaged by the non-vertical lifting force and by documentation that the capacity of the lifting devices is adequate for the non-vertical lifting force.

Precast components shall be pre-bed with non-shrink grout thicker than shim stacks prior to placing other precast elements on top of them.

After all Precast Concrete Bridge Elements have been placed, the actual overall dimensions of the structure both horizontal and vertical, as laid out shall not deviate from the nominal dimensions shown on the plans beyond a tolerance of +0 inches and -1 inches. Once the layout of Precast Concrete Bridge Elements has been accepted by the Engineer, the Contractor shall cut all lifting devices off below the surfaces of the elements.

F. Filling of Blockouts for Lifting Devices and Threaded inserts.

If the blockouts in the Precast Concrete Bridge Elements where the lifting devices were located will be exposed and visible after assembly is complete, the Contractor shall fill these blockouts with Cement Mortar (M4.02.15) or grout.

After the formwork has been removed, all threaded inserts that have been cast into the precast concrete bridge deck for support of the formwork shall be filled with a grout of the same color as that of the precast concrete.

ITEM 995.01 (Continued)

COMPENSATION

A. Basis of Payment.
The furnishing, fabricating, and erecting of all precast highway guardrail transitions for the structure shall be paid for at the contract unit price EACH under the Lump Sum Item 995.01, complete in place.

STEEL REINFORCEMENT FOR STRUCTURE – EPOXY COATED

The work to be done under this heading shall conform to the relevant provisions of Subsection 901. Epoxy coated bars shall be used unless noted otherwise on the plans.

Support device coatings shall match the steel reinforcing bars' and shall be used when installing reinforcing steel. Specified clearances cover requirements, and all other reinforcing steel geometry requirements must be maintained.

PRESTRESSED CONCRETE DECK BEAMS (S36-18)
PRESTRESSED CONCRETE DECK BEAMS (S48-18)

B. General.
The work under this Heading consists of fabricating, transporting and installing precast concrete deck beams and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The work shall conform to the MassDOT Standard Specifications and the requirements of the current AASHTO LRFD Bridge Construction Specifications, supplemented by the current relevant provisions of the latest edition of PCI MNL-116 (The Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products), except as noted herein. MassDOT contract documents shall take precedence over the AASHTO LRFD Bridge Construction Specifications and PCI MNL-116. Section 930, M4.02.14, and M4.03.00 through M4.03.14 of the MassDOT Standard Specifications are superseded in their entirety by the requirements specified below.

QUALITY ASSURANCE

A. General.
Quality Assurance includes all the planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. It is an all-encompassing term that includes Quality Control (performed by the Fabricator) and Acceptance (performed by MassDOT). Quality Control is the system used by the Contractor and Fabricator to monitor and assess their production processes at the plant facility and installation activities at the project site to ensure that the final product will meet the specified level of quality. Acceptance includes all factors used by MassDOT to determine the corresponding value for the product. MassDOT Acceptance inspection at the plant facility is intended as a means of evaluation of compliance with contract requirements. Contractor and Fabricator Quality Control activities and MassDOT Acceptance activities shall remain independent from one another. MassDOT Acceptance activities shall not replace Fabricator Quality Control activities.

ITEM 995.01 (Continued)

B. Fabricator Quality Control.

Quality Control shall be performed by the Fabricator to ensure that the product is fabricated in conformance with the specifications herein. The Fabricator shall maintain a Quality Control system to monitor, assess, and adjust placement and fabrication processes to ensure the Prestressed Concrete Beam(s) meet the specified level of quality, through sufficient Quality Control sampling, testing, inspection, and corrective action (where required). The Fabricator's Quality Control system shall address all key activities during the placement and fabrication and shall be performed in conformance with the Fabricator's PCI Certification. Quality Control documentation shall meet the requirements of the *Fabricator Quality Control – Documentation* section below. Upon request, Fabricator Quality Control documentation shall be provided to the MassDOT Plant Inspector.

1. Plant.

Prior to the fabrication of Prestressed Concrete Beams, the Fabricator's precast concrete plant shall obtain the following:

(d) Certification by the Precast/Prestressed Concrete Institute (PCI) Plant Certification Program, for Prestressed Concrete Beam fabrication, Category B3 level or higher
(e) MassDOT Prequalification
(f) MassDOT Mix Design Approval

All concrete for a given Prestressed Concrete Beam shall be produced by a single company and plant, unless otherwise approved by the Engineer.

2. Personnel.

The Fabricator shall provide adequate training for all QC personnel in accordance with PCI certification. There shall be sufficient personnel trained and certified to perform the tests listed under Subsection M4.02.13, Part D. At a minimum, the Fabricator's Quality Control Personnel shall maintain the following qualifications and certifications:

(a) QC Manager with an active Precast/Prestressed Concrete Institute (PCI) Technician/Inspector Level II or higher, and a minimum of 5 years continuous experience in the manufacture of Prestressed Concrete Beams for state transportation departments. The QC Manager shall be on site while the batch plant is producing and placing concrete for MassDOT projects.
(b) A Technician/Inspector having the Precast/Prestressed Concrete Institute (PCI) Technician/Inspector Level II or higher

The Contractor shall submit to the Engineer a copy of the Fabricator's Quality Control Personnel required qualifications, as specified above.

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3. Laboratory.

The Fabricator shall provide a room of sufficient size to house all equipment and to adequately perform all testing. The room shall have either a separate moisture storage room or curing box for concrete cylinders, and it shall be thermostatically controlled to maintain temperatures consistent with AASHTO T 23. It shall include a desk and file cabinet for proper record keeping, and have good lighting and ventilation. This room shall be kept for testing and quality control and not used for any other purpose. An additional desk and file cabinet shall be provided for exclusive use of the Engineer. No exception from these requirements will be allowed without the express written permission of the Engineer.

4. Testing Equipment.

At a minimum, the Fabricator's plant facility shall have the following testing equipment:

(a) Air Content Meter Type A or B: AASHTO T 152
(b) Air Content Meter Volumetric Method: AASHTO T 196 (Required for Lightweight Concrete)
(c) Slump Cone: AASHTO T 119
(d) Cylinder Molds AASHTO M 205
(e) Concrete Testing Machine: AASHTO T 22
(f) Screening Sieve: AASHTO T 27, AASHTO T 11
(g) Curing Box: AASHTO T 23
(h) Spread Test Base Plate for Self-Consolidating Concrete (SCC): ASTM C1611
(i) All other equipment prescribed by AASHTO and ASTM standards for the tests to be performed by the Fabricator as specified

5. Inspection.

Quality Control personnel shall monitor and inspect the fabrication of each Prestressed Concrete Beam. Quality Control personnel shall report all inspection activities on Quality Control Inspection Reports and non-conformances on Non-Conformance Reports (NCRs) throughout the entire fabrication process, as speciefied herein.

6. Temperature Monitoring.

At a minimum, the Fabricator shall monitor, record, and report the temperatures of the form, ambient temperatures surrounding the concrete, and temperatures of the concrete continuously, without interruption as specified below:

(a) Prior to placement of concrete to verify that $Ti \geq 50°F$.
(b) Immediately after placement to verify that $T_i \geq 50°F$ is maintained.
(c) Throughout the entire duration of the curing cycle, at regular intervals not to exceed one hour until 100% Design Strength (f'_c) is attained and concrete has cooled to within 40°F of the ambient temperature surrounding the Prestressed Concrete Beam.

ITEM 995.01 (Continued)

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°F. At least two temperature sensors (thermocouples) shall be positioned to record the maximum and minimum anticipated concrete temperatures. The anticipated minimum temperature shall be measured with one or more thermocouples at a distance no greater than 2 inches from the surface of the thinnest section. The anticipated maximum temperature shall be measured with one or more thermocouples at the center of the thickest section. Proposed temperature measurement locations shall be submitted to the Engineer for approval. Temperature recording devices shall be located within the curing enclosure and calibrated as required by PCI MNL-116 Section 4.18.4. Maximum heat increase and cool down rates shall comply with PCI MNL-116, Section 4.19. The Contractor shall furnish temperature logs recorded at a minimum frequency of once per hour to the Inspector as required, with each post-pour QC inspection report.

7. Sampling and Testing.

At a minimum, the Fabricator shall perform random Quality Control sampling and testing as specified in *Table 1: Quality Control Sampling and Testing*. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during fabrication. Test Specimens shall conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60, with the exception of the Stripping (80% f'_c) set of cylinders. Stripping (80% f'_c) cylinders shall be cured in the same location and environment as the Prestressed Concrete Beam they represent. If approved by the Engineer, compressive strength cylinder match curing equipment, that maintains the same concrete conditions that the corresponding Prestressed Concrete Beam is exposed to, may be utilized in lieu of Stripping (80% f'_c) field cured cylinders, with the use of thermocouples, controllers, and heaters.

ITEM 995.01 (Continued)

Table 1: Quality Control Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size [c]	Sublot Size [d]	Frequency	Point of Sampling
Slump (in.) [a]	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of Beams fabricated on a Contract, per Bid Item, per Mix Design	One (1) Beam	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	Stripping Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 80% f'c at Stripping				
		7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'c at 56 days [b]				

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
(b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f'_c).
(c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
(d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

8. Certificate of Compliance.

The Fabricator shall provide a Certificate of Compliance in accordance with Standard Specifications, Division I, Section 6.01, stating that QC test cylinders have achieved the design strength, f'_c. A Certificate of Compliance shall accompany each shipment and shall be presented to the MassDOT Resident Engineer or designee upon delivery to the site.

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9. Documentation.

At a minimum, the Fabricator shall maintain a filing system for the following QC records and documentation. All QC records and documentation shall be made available to MassDOT upon the request of the Department.

(a) Current MassDOT Approved Mix Design Sheet(s) and Approval Letter(s)
(b) PCI Certification
(c) Current Qualifications and Certifications for QC Manager(s) and QC Technician(s)
(d) Most current set of Approved Shop Drawings
(e) Approved Placement, Finishing and Curing Plan
(f) Approved Dunnage Plan
(g) Fabricator Certificate of Compliance for each fabricated Prestressed Concrete Beam
(h) Admixture Manufacturer's Certification of Compliance for each approved Admixture
(i) Completed QC Inspection Report for each fabricated Prestressed Concrete Beam
(j) Identification Number for each fabricated Prestressed Concrete Beam
(k) Time and date of casting of each fabricated Prestressed Concrete Beam
(l) Date of stripping of each fabricated Prestressed Concrete Beam
(m) Batch Ticket Printout reporting the quantity of concrete produced for each batch of concrete produced
(n) Concrete temperature records for each fabricated Prestressed Concrete Beam
(o) QC Test Report Forms for each sublot of concrete produced
(p) Non-Conformance Reports (NCRs)
(q) Documentation of Repairs (if applicable)

C. Acceptance.

MassDOT will perform Acceptance inspection, sampling, and testing during fabrication and installation, to evaluate the quality and degree of compliance of the fabricated Prestressed Concrete Beam to MassDOT specifications. Additionally, MassDOT Inspectors will monitor the Fabricator's Quality Control activities to ensure the Fabricator is properly administering Quality Control in conformance with the Fabricator's NPCA or PCI Certification. Acceptance inspection and test results not meeting MassDOT specifications will result in Non-conformance Reports (NCR) being issued by MassDOT to the Fabricator or Contractor for corrective action. Final Acceptance for the fabricated Prestressed Concrete Beams shall be determined by MassDOT.

1. Inspection.

A MassDOT MassDOT Inspector will be assigned to perform Acceptance activities during fabrication, which includes the inspection of the materials, work procedures, and Prestressed Concrete Beams. At least seven (7) days prior to the scheduled start of fabrication, the Fabricator shall contact the MassDOT Research and Materials Section (RMS) to provide notice of the scheduled fabrication start date. The Fabricator shall complete the following activites prior to notifying MassDOT RMS of the scheduled start date:

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(a) Receive approval for all submitted Fabricator cement concrete mix designs from the MassDOT Research and Materials Section for the current year, as specified under the *Mix Design* section and *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete shall meet the requirements of M4.02.17.
(b) Receive approval for the submitted Fabricator Placement, Finishing, and Curing Plan from the MassDOT Research and Materials Section, as specified under the *Placement, Finishing, and Curing Plan* section.
(c) Receive Engineer of Record approved shop drawings from the MassDOT Research and Materials Section as specified under the *Shop Drawings* section.
(d) Participate in the pre-production meeting, as described under the *Pre-Production Meeting* section (if required).

Prior to the start of fabrication, the Fabricator shall review the fabrication schedule with the MassDOT Inspector. Fabrication shall only proceed when:

(a) The QC Inspector and MassDOT Inspector are present to inspect the Prestressed Concrete Beam(s) being fabricated.
(b) The QC Manager is present at the Fabricator's plant.

The Fabricator shall grant access to all required areas of the Fabricator's plant to the MassDOT Inspector, during the hours of fabrication. Fabrication without MassDOT Inspector access to required areas is prohibited, and will result in the rejection of the Prestressed Concrete Beam(s).

Additionally, the MassDOT Inspector will monitor the adequacy of the Fabricator's Quality Control activities. MassDOT Inspector Acceptance activities performed at the Fabricator's plant shall remain independent from the Fabricator, and does not replace the Fabricator's required Quality Control activities.

2. Sampling and Testing.

At a minimum, the MassDOT Inspector will perform random Acceptance sampling and testing for each Sublot of concrete produced as specified in *Table 2: Acceptance Sampling and Testing.* The MassDOT Inspector will also perform Acceptance sampling and testing on concrete that has been retempered with admixtures or hold-back water during production. Test Specimens will conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60.

ITEM 995.01 (Continued)

Table 2: Acceptance Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size [(c)]	Sublot Size [(d)]	Frequency	Point of Sampling
Slump (in.) [(a)]	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of Beams fabricated on a Contract, per Bid Item, per Mix Design	One (1) Beam	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'_c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'_c at 56 days [(b)]				

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
(b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f'_c).
(c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
(d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

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MATERIALS

A. Materials.
Materials shall meet the following specifications (if applicable):

General	M4.00.00
Portland Cement	M4.01.0
Blended Hydraulic Cements	M4.01.1
Fly Ash	M4.01.2
Cement Concrete	M4.02.00
Cement	M4.02.01
Cement Mortar	M4.02.15
Aggregates	M4.02.02
Lightweight Aggregates	M4.02.03
Water	M4.02.04
Cement Concrete Additives	M4.02.05
Proportioning	M4.02.06
Mixing and Delivery	M4.02.10
Test Specimens	M4.02.13
Mortar for Filling Keyways	M4.04.0
Slag	AASHTO M 302
High Performance Cement Concrete	M4.06.1
Self-Consolidating Concrete (SCC)	M4.02.17
Prestressing Strands	AASHTO M 203
Reinforcing Bars	M8.01.0
Epoxy Coated Reinforcing Bars	M8.01.7
Welded Wire Reinforcement	M8.01.2
Mechanical Reinforcing Bar Splicer	M8.01.9
Strand Chuck	M8.15.0
Lifting Devices	PCI MNL-116

2. Cement Concrete Mix Design.

The cement concrete shall be comprised of specified proportions of water and MassDOT approved aggregates, cement, supplementary cementitious materials (SCMs), and admixtures to form a homogenous composition. When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

The Fabricator is responsible for developing the concrete mix to be used for fabricating prestressed beams and having it prequalified by the MassDOT Research and Materials Section. The mix design compressive strength shall be as shown on the plans and as prequalified by the MassDOT Research and Materials Section. Prequalification shall include the trial batch testing shown in Table 3. For previously prequalified mixes, the Fabricator shall perform any tests specified in Table 3 that were not previously performed.

ITEM 995.01 (Continued)

If the concrete mix has not been prequalified by the MassDOT Research and Materials Section, the Fabricator shall design and submit for approval, the proportions and test results for a concrete mix that shall attain the requirements specified in Table 3. The proposed mix design and all required test results shall be submitted to the MassDOT Research and Materials Section for approval. Requirements for additional testing and receipt of additional documentation from the Fabricator will be determined by RMS. Unsatisfactory results or other conditions identified during this additional testing and additional documentation review, will require re-submission of a new mix design for review and approval.

The mix shall be formulated with calcium nitrite corrosion inhibitors, which shall be added at a rate of 3 gallons per cubic yard of concrete in order to increase the active corrosion threshold to 9.9 pounds of chloride per cubic yard of concrete at the reinforcing bar level.Prior to production of cement concrete, the Fabricator shall report and submit all proposed mix design formulations and its constituent materials onto the MassDOT Cement Concrete Mix Design Sheet to the MassDOT Research and Materials Section for review and approval. All mix design yields shall be designed for 1.0 cubic yards of concrete, with an allowable tolerance of +/- 1.0 %. All liquids incorporated into the proposed mix design(s) shall include both water and admixtures in the liquid mass calculation.

During production of cement concrete, the Fabricator shall not alter the previously approved mix design formulation or its constituent materials. Proposed alterations in source, type, batch quantity, or gradation to any of the constituent materials of the previously approved mix design formulation shall require a new MassDOT Mix Design Sheet submission to the MassDOT Research and materials Section for review and approval. Fabrication shall not occur without prior MassDOT mix design approval. All concrete used for prestressed concrete beams shall be batched by the Fabricator producing the prestressed concrete beams. The use of ready-mix concrete batched by others shall not be permitted.

The Fabricator shall notify MassDOT RMS to schedule trial batch testing for the new mix design(s). Trial batch testing shall meet the following requirements:

(a) Performed by a qualified laboratory and/or AASHTO accredited laboratory.
(b) Performed and/or sampled in the presence of a MassDOT Inspector.
(c) Meet the requirements as specified in *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete (SCC) shall meet M4.02.17.

Failure to perform all of the required trial batch testing or provide MassDOT RMS trial batch test results within the Specification Limits (as specified in Table 3) will result in the disqualification of the Fabricator's proposed mix design(s).

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Table 3: Trial Batch Sampling and Testing for New Mix Designs

Quality Characteristic	Test Method	Sample Size	Specification Limit	Performed By
Slump [(a)]	AASHTO T 119	Per AASHTO	Max. 8 inches or as approved by the Engineer	Quality Control
Air Content (AC)	AASHTO T 152	Per AASHTO	5% ≤ AC ≤ 8%	Quality Control
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F	Quality Control
Compressive Strength [(b)]	AASHTO T 22 AASHTO T 23	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Lab Mixed $f'_{cr} = 1.3\ f'_c$ at 28 days	MassDOT
			Batch Mixed $f'_{cr} = 1.2\ f'_c$ at 28 days	
Alkali-Silica Reaction (ASR) [(d)]	ASTM C 1567	Per ASTM	M4.02.00	Quality Control
Resistance to Chloride Ion Penetration Chloride Ion Penetration [(e)]	AASHTO T 358 [(f)]	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Resistivity ≥ 21 kΩ-cm at 28 days	MassDOT
Freeze/Thaw Durability [(c)]	AASHTO T 161 (Procedure A)	Per AASHTO	Relative Dynamic Modulus of Elasticity after 300 cycles ≥ 80%	Quality Control

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
(b) Trial batch compressive strength testing shall be performed by MassDOT. Acceptance will be based on compressive strength testing performed by MassDOT. For mixes requiring $f'_c > 8{,}000$ psi, three consecutive trial batches shall be performed, all achieving $f'_{cr} \geq 1.1\ f'_c$, for MassDOT approval.
(c) If an AASHTO accredited laboratory is preparing the trial batch test specimens, MassDOT Acceptance presence is not required. If the Fabricator is preparing the trial batch test specimens, MassDOT Acceptance presence is required during trial batch test specimen preparation.
(d) Alkali Silica Reaction (ASR) testing shall meet the requirements of M4.02.00. Independent laboratories performing ASR testing shall be listed on the MassDOT Quality Construction Materials List (QCML).
(e) Calcium nitrite shall be removed from mix designs containing the admixture and replaced by an equivalent quantity of water when preparing Chloride Ion Penetration resistance trial batch test specimens.
(f) The Wenner probe tip spacing "a" shall be 1.5.

3. Reinforcement and Prestressing Strands.

The size and grade of steel reinforcement and prestressing strands shall be as indicated on the plans. All reinforcing steel shall be epoxy coated, Grade 60. All prestressing strands shall be uncoated.

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4. Threaded Inserts

Threaded inserts are permissible in Prestressed Concrete Beams for installing formwork, utility supports, or deck drains. Threaded inserts shall be hot dip galvanized or made of stainless steeland shall not come in contact with the reinforcing steel. The number of threaded inserts installed for the Contractor's convenience shall be kept to a minimum.

CONSTRUCTION METHODS – PLANT FABRICATION

A. Shop Drawings

Prior to performing any work under this Section, the Contractor shall receive approval for all shop drawings for the Prestressed Concrete Beam being worked on and any special Contract requirements, provided that a complete shop drawing package is provided. The Contractor shall not order materials or begin work before receiving approved shop drawings. MassDOT will reject any precast concrete bridge decks that deviate from the approved drawings or are fabricated prior to receiving written approval of the shop drawings. The Contractor shall bear full responsibility and costs for all materials ordered or work performed prior to the approval of the shop drawings or written authorization from MassDOT.

The Contractor shall submit scaled shop drawings to the Engineer of Record for review and approval. Upon approval, the Engineer of Record will forward two (2) sets of scaled, full size (minimum 24x36") paper copies of the Approved (or Approved As Noted) shop drawings to the MassDOT Director of Research and Materials. Calculations are not to be included in any submittal to the Research and Materials Section. An approval stamp shall appear on every shop drawing sheet. Wet-stamping or wet-signing is not required, provided that the stamp and reviewer name are legible. The Fabricator's name and address shall appear on each sheet.

Resubmittal of "Approved as Noted" shop drawings is not necessary for minor revisions, provided that the correction can be clearly understood and is unambiguous without possibility of misinterpretation. Shop drawings with questions or comments that require a response and/or additional information from the Fabricator must be resubmitted.

Detailed shop drawings shall be prepared in accordance with the relevant provisions of Subsection 5.02 and shall, at a minimum, contain the following:

(a) Number and type of Prestressed Concrete Beams including overall length, width and height.
(b) Skew angle.
(c) Location and spacing of strands, draped strands and their geometry, and/or location and spacing of strands to be debonded including the length of each strand's debondment.
(d) Location, size and geometry of all steel reinforcement, and mechanical reinforcing bar splicers if called for on the plans.
(e) Location and details of all inserts, anchors, and any other items required to be cast into the Prestressed Concrete Beams (whether detailed on the plans by the Engineer of Record or provided for the Contractor's convenience). Prestressed Concrete Beams shall not be fired or drilled into for attachment purposes. All hardware shall be galvanized except as noted.
(f) Locations and details of the lifting devices, including supporting calculations, type and amount of any additional reinforcing required for lifting. The Fabricator shall design all lifting devices based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (7^{th} edition).
(g) The minimum compressive strength required prior to release of prestressing and prior to handling the Prestressed Concrete Beam.

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The shop drawings shall not include procedures for placement, finishing, and curing of concrete. These details shall be included in the Placement, Finishing and Curing Plan that is to be submitted to MassDOT Research and Materials Section as described under *Placement, Finishing, and Curing Plan*.

B. Fabrication.

All Prestressed Concrete Beams shall be fabricated in accordance with the latest edition of PCI MNL-116 as modified herein.

C. Placement, Finishing and Curing Plan.

At least 30 days prior to start of fabrication, the Contractor shall submit the Fabricator's proposed Placement, Finishing and Curing Plan to the Engineer for approval by MassDOT Research and Materials Section. This shall be an independent submittal, separate from the fabrication shop drawings. The Placement, Finishing and Curing Plan shall include the following:

(a) Method of Mixing
(b) Method of Placement
(c) Method of Consolidation
(d) Method of Finishing
(e) Method of Initial Curing
(f) Method of Intermediate Curing
(g) Method of Final Curing
(h) Moisture Retention Materials and Equipment (water spray equipment, saturated covers, sheet materials, liquid membrane-forming compounds, accelerated curing equipment, etc.)
(i) Cylinder Curing Methods, Location, and Environmental Control (temperature, humidity, etc.)
(j) Temperature Monitoring, Recording, and Reporting

D. Dunnage Plan Shop Drawings.

At least 30 days prior to the start of fabrication, the Contractor shall submit proposed Dunnage Plan Shop Drawings to the Engineer of Record for review and approval. This shall be an independent submittal, separate from the fabrication shop drawings. Upon approval, the Engineer of Record will forward two (2) sets of scaled, full size (minimum 24"x36") paper copies of the Approved (or Approved As Noted) Dunnage Plan Shop Drawings to the MassDOT Director of Research and Materials. Calculations are not to be included in any submittal to the Research and Materials Section. The Dunnage Plan Shop Drawings shall include the following:

(a) Proposed layout of the Prestressed Concrete Beams for storage in yard and during shipping
(b) Support and blocking point locations
(c) Support and blocking materials

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E. Pre-Production Meeting.

The Contractor shall notify the MassDOT Research and Materials Section to determine if a pre-production meeting will be required to review the specification, shop drawings, curing plan, schedule, and discuss any specific requirements. The meeting shall be held prior to scheduling a MassDOT Inspector (refer to Section *Quality Assurance – Precast Concrete, C. Acceptance, A. Inspection*), and at least seven (7) days prior to the scheduled casting of any Prestressed Concrete Beam or control section. The Contractor shall schedule the meeting, which shall include representatives of the Fabricator and MassDOT.

F. Reinforcement.

The reinforcing bars shall be installed in accordance with Section 901.62 of the Supplemental Specifications, including tolerances for cover and horizontal spacing of bars. Components of mechanical reinforcing bar splicers shall be set with the tolerances shown on the plans. The reinforcing bars and mechanical reinforcing bar splicers shall be assembled into a rigid cage that will maintain its shape in the form and which will not allow individual reinforcing bars to move during the placement of concrete. This cage shall be secured in the form so that the clearances to all faces of the concrete, as shown on the plans, shall be maintained.

G. Placing and Tensioning Strands.

Placing and tensioning strands shall be in accordance with PCI MNL-116. The location of all prestressing strands shall be as indicated on the plans.

H. Tolerances.

Fabrication shall comply with tolerances specified on the plans. Tolerances for steel reinforcement placement shall be in accordance with 901.62. In the absence of specifications on the plans, tolerances shall comply with the latest version of the PCI MNL 135, Precast Tolerance Manual.

I. Forms.

Concrete shall be cast in rigidly constructed forms, which will maintain the Prestressed Concrete Beams within specified tolerances to the shapes, lines and dimensions shown on the approved fabrication drawings. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. Any defects or damage of more than "Category 2, Minor Defects" made to the concrete, due to form work, stripping or handling, shall be subject to repair or rejection, as defined in the *Repairs and Replacement* section. If threaded inserts are cast into the elements for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

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Where applicable, the material used for forming voids in concrete deck beams and box beams shall be sufficiently strong and resistant to water to support the wet concrete, which is to be packed around the void forms, without collapsing. The void forms shall be securely anchored so that no movement will occur during placing and consolidation of the concrete. Void drains shall be installed at the locations shown on the plans and Fabricator shall ensure that the drains are in contact with the void form. After the beams have been cast and removed from the forms, the Fabricator shall check that the drains are still in contact with the void form by inserting a rigid probe into the drain for a distance greater than the thickness of the concrete at the void drain.

J. Mixing of Concrete.

The concrete shall be proportioned and mixed in conformance with the Fabricator's MassDOT approved mix design and M4.02.10 Mixing and Delivery. Fabrication shall not occur without prior MassDOT mix design approval. The Fabricator shall provide copies of batch tickets to the MassDOT Plant Inspector. The MassDOT Plant Inspector will verify if the batch ticket quantities are within the tolerances of the Fabricator's MassDOT approved mix design.

K. Placement of Concrete.

Prior to the placement of concrete, the temperature of the forms shall be greater than or equal to 50°F. Quality Control inspection shall be performed by the Fabricator as specified in the *Fabricator Quality Control* section. Placement of the concrete shall not proceed until the MassDOT Plant Inspector is present to perform inspection and begin monitoring Fabricator Quality Control inspection activities and is in compliance with specifications. The MassDOT Plant Inspector shall inspect and accept the placement of the reinforcing steel and prestressing strands prior to the placement of concrete into the forms. The Fabricator shall verify all materials and equipment required for protecting and curing the concrete are readily available and meet the requirements of the *Final Curing Methods* section below. All items encased in the concrete shall be accurately placed in the position shown on the Plans and firmly held during the placing and setting of the concrete. Clearance from the forms shall be maintained by supports, spacers, or hangers and shall be of approved shape and dimension.

During placement, the concrete shall maintain a concrete temperature range between 50°F and 90°F. The Fabricator shall minimize the time to concrete placement (measured from start of mixing to completion of placement). In no event shall time to placement exceed 90 minutes. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during the placement of the concrete as specified in the *Fabricator Quality Control* section above. Delays or shutdowns of over 30 minutes shall not be allowed during the continuous filling of individual forms.

L. Consolidation of Concrete.

Suitable means shall be used for placing concrete to prevent segregation or displacement of reinforcing steel or forms. The concrete shall be thoroughly consolidated by external or internal vibrators or a combination of both. Vibrators shall not be used to move concrete within the forms. Vibrators shall be used as specified in 901.63C and as directed by the Engineer. Concrete shall be placed and consolidated in a way that minimizes the presence of surface voids or bug holes on the formed surfaces. When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

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M. Finishing of Concrete.

The top of the prestressed concrete beams shall be given a rake finish with a ¼" amplitude applied transversely across the beam to the limits shown on the plans.

N. Exposed Surfaces of Prestressed Concrete Beams.

As soon as conditions permit, before the concrete has fully hardened, all dirt, laitance, and loose aggregate shall be removed from the exposed concrete surfaces. Contractor shall not allow foot traffic on the uncured concrete until it has reached sufficient strength to prevent damage.

O. Initial Curing Methods.

After the placement of concrete and prior to concrete finishing, the Fabricator shall initiate initial curing methods when the concrete surface begins to dry, to reduce moisture loss from the surface. Application of one or more of the following initial curing methods shall occur immediately after the bleed water sheen has disappeared.

1. Fogging.

Fogging nozzles shall atomize water into a fog-like mist. The fog spray shall be directed and remain visibly suspended above the concrete surface, to increase the humidity of the air and reduce the rate of evaporation. Water from fogging shall not be worked into the surface during finishing operations and shall be removed or allowed to evaporate prior to finishing.

2. Liquid-applied Evaporation Reducers

Evaporation reducers shall be sprayed onto the freshly placed concrete surface to produce an effective monomolecular film that reduces the risk of plastic-shrinkage cracking and rate of evaporation of the bleed water from the concrete surface. Evaporation reducers shall be applied in accordance with manufacturer's recommendations.

P. Intermediate Curing Methods.

The Fabricator shall initiate intermediate curing methods if concrete finishing has taken place prior to the concrete reaching final set. The freshly finished concrete surface shall be protected from moisture loss, by the continuation of initial curing methods (fogging and evaporation reducers) until final curing methods are applied or by the use of liquid membrane-forming curing compounds (see *Liquid Membrane-Forming Compounds for Curing* section).

Q. Final Curing Methods.

The Fabricator shall initiate and apply final curing methods to the concrete immediately after the following conditions are met:

(d) Completion of concrete finishing
(e) Final set of concrete
(f) Concrete has hardened sufficiently enough to prevent surface damage

ITEM 995.01 (Continued)

During fabrication of Prestressed Concrete Beams, the Fabricator shall maintain the required concrete temperature ranges throughout the entire duration of the final curing method cycle as specified herein. Controlled and gradual termination of the final curing method shall occur after all specified conditions are met. The concrete temperature shall be reduced at a rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the final curing method enclosure. The Fabricator shall maintain a minimum concrete temperature of 40°F until 100% f'c is attained (see *Handling and Storage* section below).

1. Water Spray Curing.

All exposed concrete surfaces shall remain moist with a continuous fine spray of water throughout the entire duration of the final curing method cycle (see *Table 4: Final Curing Method Cycle for Water Spray*).

Table 4: Final Curing Method Cycle for Water Spray

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Five (5) days	≥ 80% f'_c

2. Saturated Covers for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of saturated covers throughout the entire duration of the final curing method cycle (see *Table 5: Final Curing Method Cycle for Saturated Covers*). Saturated covers shall be allowed to dry thoroughly before removal to provide uniform, slow drying of the concrete surface.

Table 5: Final Curing Method Cycle for Saturated Covers

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f'_c

Saturated covers, such as burlap, cotton mats, and other coverings of absorbent materials shall meet the requirements of AASHTO M 182, Class 3. Saturated covers shall be in good condition, free from holes, tears, or other defects that would render it unsuitable for curing concrete. Saturated covers shall be dried to prevent mildew when storing. Prior to application, saturated covers shall be thoroughly rinsed in water and free of harmful substances that are deleterious or cause discoloration to the concrete. Saturated covers shall have sufficient thickness and proper positioning onto the concrete surface to maximize moisture retention.

Saturated covers shall contain a sufficient amount of moisture to prevent moisture loss from the surface of the concrete. Saturated covers shall be kept continuously moist so that a film of water remains on the concrete surface throughout the entire duration of the final curing method cycle. The Fabricator shall not permit the saturated covers to dry and absorb water from the concrete. Use of polyethylene film (see *Polyethylene Film* section) may be applied over the saturated cover to potentially decrease the need for continuous watering.

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3. Sheet Materials for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of curing sheet materials throughout the entire duration of the final curing method cycle (see *Table 6: Final Curing Method Cycle for Curing Sheet Materials*).

Table 6: Final Curing Method Cycle for Sheet Materials

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f'_c

Sheet Materials used for curing, such as polyethylene film, white burlap-polyethylene sheeting, and reinforced paper shall meet the requirements of ASTM C171 and the specifications herein. Sheet materials shall inhibit moisture loss and reduce temperature rise in concrete exposed to radiation from the sun during the final curing method cycle. Adjoining covers shall overlap not less than 12 inches. All edges of the covers shall be secured to maintain a moist environment.

(a) Polyethylene Film.

Polyethylene film shall meet the requirements of ASTM C171, consist of a single sheet manufactured from polyethylene resins, be free of visible defects, and have a uniform appearance. Careful considerations shall be taken by the Fabricator to prevent the film from tearing during storage and application, so as to not disrupt the continuity of the film (polyethylene film reinforced with glass or other fibers is more durable and less likely to be torn). The Fabricator shall monitor the application of the film to prevent uneven spots from appearing (mottling) on the concrete surface, due to variations in temperature, moisture content, or both. The Fabricator shall prevent mottling from occurring on the concrete surface by applying additional water under the film or applying a combination of polyethylene film bonded to absorbent fabric to the concrete surface to retain and evenly distribute the moisture.
Immediately following final finishing, polyethylene film shall be placed over the surface of the fresh concrete surface, so as to not damage the surface of the concrete and shall be placed and weighted so that it remains in contact with the concrete throughout the entire duration of the final curing method cycle. The film shall extend beyond the edges of the concrete surface. The film shall be placed flat on the concrete surface, avoiding wrinkles, to minimize mottling. Edges of adjacent polyethylene film shall overlap a minimum of 6 inches and be tightly sealed with the use of sand, wood planks, pressure-sensitive tape, mastic, or glue to maintain close contact with the concrete surface, retain moisture, and prevent the formation of air pockets throughout the entire duration of the final curing method cycle.

(b) White Burlap-Polyethylene Sheeting

White burlap-polyethylene sheeting shall meet the requirements of ASTM C171, be securely bonded to the burlap so to avoid separation of the materials during handling and curing of the concrete, and be applied in the same manner as the polyethylene film.

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(c) Reinforced Impervious Paper.

Reinforced impervious paper shall meet the requirements of ASTM C171, consist of two sheets of kraft paper cemented together with a bituminous adhesive and reinforced with embedded cords or strands of fiber running in both directions, and be white in color. Reinforced impervious paper shall be treated to prevent tearing when wetted and dried.

Reinforced impervious paper can be reused so long as it is effective in retaining moisture on the concrete surface. The Fabricator shall visually inspect the reinforced impervious paper for all holes, tears, and pin holes from deterioration of the paper through repeated use by holding the paper up to the light. The paper shall be discarded and prohibited from use when the moisture is no longer retained.

After the concrete has hardened sufficiently to prevent surface damage, the concrete surface shall be thoroughly wetted prior to the application of the reinforced impervious paper, and be applied in the same manner as the polyethylene film.

4. Liquid Membrane-Forming Compounds for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of liquid membrane-forming compounds throughout the entire duration of the final curing method cycle (see *Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds*).

Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 80% f'_c

Liquid membrane-forming compounds shall meet the requirements of ASTM C 1315, Type I, Class A and shall exhibit specific properties, such as alkali resistance, acid resistance, adhesion-promoting quality, and resistance to degradation by ultraviolet light, in addition to moisture-retention capabilities. Liquid membrane-forming compounds shall consist of waxes, resins, chlorinated rubber, or other materials to reduce evaporation of moisture from concrete. Liquid membrane-forming compounds shall be applied in accordance with the manufacturer's recommendations.

Liquid membrane-forming compounds shall be applied immediately after the disappearance of the surface water sheen following final finishing. All exposed surfaces shall be wetted immediately after form removal and kept moist to prevent absorption of the compound, allowing the curing membrane to remain on the concrete surface for proper membrane moisture retention. The concrete shall reach a uniformly damp appearance with no free water on the surface prior to the application of the compound.

If patching or finishing repairs are to be performed prior to the application of the compound, the Precast Concrete Bridge Element shall be covered temporarily with saturated covers until the repairs are completed and the compound is applied. Only areas being repaired shall be uncovered during this period. While the saturated covers are removed to facilitate the patching process, the work shall continue uninterrupted. If for any reason the work is interrupted, saturated covers shall be placed onto the uncovered concrete surface, until the work continues and is completed, at which time the curing compound shall be applied to the repaired area.

ITEM 995.01 (Continued)

Careful considerations shall be made by the Fabricator to determine if the evaporation rate is exceeding the rate of bleeding, thus causing the surface to appear dry even though bleeding is still occurring. Under such conditions, the application of liquid membrane-forming compounds to the concrete surface shall be delayed, in order to prevent bleed water from being sealed below the concrete surface and avert map cracking of the membrane films, reduction in moisture-retention capability, and reapplication of the compound. To diagnose and prevent this condition, the Fabricator shall place a transparent plastic sheet over a test area of the uncured and unfinished concrete surface and shall determine if any bleed water accumulates under the plastic.

The compound shall be applied in two applications at right angles to each other to ensure uniform and more complete coverage. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of a troweled or floated surface. In such cases, two separate applications may be needed, each at 200 ft^2/gal., with the first being allowed to become tacky before the second is applied.

The curing compound shall be applied by power sprayer, using appropriate wands and nozzles with pressures between 25 and 100 psi. For very small areas such as repairs, the compound shall be applied with a wide, soft-bristled brush or paint roller. The compound shall be stirred or agitated before use and applied uniformly in accordance with the manufacturer's recommended rate. The Fabricator shall verify the application rates are in accordance with the manufacturer's recommended rate.

When the concrete surface is to receive paint, finishes, or toppings that require positive bond to the concrete, it is critical that the curing procedures and subsequent coatings, finishes, or toppings be compatible to achieve the necessary bond

After the termination of the final curing method cycle has occured, liquid membrane-forming compounds shall be removed by blast-cleaning from any concrete surface that is to receive paint, finishes, plastic concrete from secondary pour, grout, or any other toppings that require bonding to the concrete surface. These surfaces shall be further blast-cleaned to remove the cement matrix down to exposed aggregate to ensure proper bonding to the material. The method used to remove the curing compound shall not damage the reinforcement and coating. Compounds are prohibited on any concrete surface that will have a penetrating or coating type treatment such as a sealer, stain, or waterproofing membrane applied to it.

5. Accelerated Curing.

Accelerated curing shall use live steam or radiant heat with moisture in accordance with PCI MNL-116 as modified herein. The concrete temperature shall meet the maximum heat increase and cool down rates as specified herein. Concrete temperature monitoring shall meet the requirements of the *Temperature Monitoring* section. Excessive and fluctuating rates of heating and cooling shall be prohibited. The concrete temperature shall not exceed 158°F at any time. The Fabricator shall meet the following accelerated curing sequencing and requirements.

ITEM 995.01 (Continued)

(a) Initial Delay Period.

The initial delay period shall be defined as the duration immediately following the placement of the concrete and the attainment of initial set of the concrete. The Fabricator shall determine the time of initial set in accordance with AASHTO T 197 specifications. Throughout the entire duration of the initial delay period, initial curing shall be implemented. The temperature increase period (see *Temperature Increase Period* section) shall not occur until initial set of the concrete is attained. During the initial delay period, the concrete temperature shall meet the following requirements:

i. Concrete temperature rate of increase shall not exceed 10°F per hour.
ii. Total concrete temperature increase shall not exceed 40°F higher than the placement concrete temperature or 100°F, whichever is less

(b) Temperature Increase Period.

The temperature increase period shall be defined as the duration immediately following the completion of the initial delay period (after initial set) and immediately prior to the start of the constant maximum temperature period. Application of steam to the enclosure shall not occur until the initial delay period is complete. After the initial delay period is complete, all exposed concrete surfaces shall be cured in a moist environment where the concrete temperature increases at a rate not to exceed 36°F per hour.

(c) Constant Maximum Temperature Period.

The constant maximum temperature period shall be defined as the duration immediately following the completion of the temperature increase period and immediately prior to the start of the temperature decrease period. After the temperature increase period is complete, all exposed concrete surfaces shall be cured in a moist environment at a controlled and constant elevated temperature throughout the entire duration of the constant maximum temperature period. Termination of the constant maximum temperature period and the start of the termination decrease period shall occur after all specified conditions are met (see *Table 8: Constant Maximum Temperature Period*).

Table 8: Constant Maximum Temperature Period

Sustained Concrete Temperature	Constant Maximum Temperature Period	Compressive Strength
120°F ≤ °F ≤ 158°F	6 hrs ≤ Time ≤ 48 hrs	≥ 80% f'_c

ITEM 995.01 (Continued)

(d) Temperature Decrease Period.

After the constant maximum temperature period is complete, the concrete temperature shall be cured in a moist environment at a controlled and reduced rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the curing enclosure.

R. Release.

The Fabricator shall not release strands or handle the Prestressed Concrete Beam until Quality Control compressive strength cylinders attain a minimum compressive strength of 80% Design Strength (f'_c) or the specified detensioning compression strength as indicated on the approved shop drawings has been achieved. All exposed concrete surfaces shall continue to be cured in conformance with the *Final Curing Methods* sections until completion.

S. Handling and Storage of Prestressed Concrete Beams.

Prestressed Concrete Beams may be exposed to temperatures below freezing (32°F) when the chosen curing cycle has been completed, provided that the following conditions are met:

(a) Prestressed Concrete Beams are protected from precipitation with polyethylene curing covers until 100% f'_c is attained
(b) Prestressed Concrete Beams maintain a minimum concrete temperature of 40°F until 100% f'_c is attained

Prestressed Concrete Beams damaged during handling and storage will be repaired or replaced at MassDOT's direction at no cost to MassDOT. Prestressed Concrete Beams shall be lifted at the designated points by approved lifting devices embedded in the concrete and in accordance with proper lifting and handling procedures. Storage areas shall be smooth and well compacted to prevent damage due to differential settlement. Prestressed Concrete Beams shall be supported on the ground by means of continuous blocking, in accordance with the approved dunnage plan.

Prestressed Concrete Beams shall be loaded on a trailer with blocking as described above, in accordance with the approved dunnage plan. Shock-absorbing cushioning material shall be used at all bearing points during transportation of the Prestressed Concrete Beams. Blocking shall be provided at all locations of tie-down straps. Prestressed Concrete Beams stored prior to shipment shall be inspected by the Contractor prior to being delivered to the site to identify damage that would be cause for repair or rejection.

T. Repairs and Replacement.

In the event defects are identified, they shall be classified in the following categories and a non-conformance report (NCR) shall be filed if required. The NCR shall be submitted to MassDOT for review. Defects in all categories shall be documented by plant Quality Control personnel and made available to MassDOT upon request. Any required repairs shall utilize materials listed on the MassDOT QCML.

Where noted, defects shall be repaired according to the PCI Northeast Region Guidelines for Resolution of Non-Conformances in Prestressed Concrete Beams, Report Number PCINE-18-RNPCBE. Please note that reference to PCINE-18-RNPCBE is made for repair details only. In the case of conflicts with this Special Provision, this Special Provision shall govern.

ITEM 995.01 (Continued)

1. Category 1, Surface Defects.

Category 1 defects do not need to be repaired, and an NCR does not need to be filed. Surface defects are defined as the following:

(a) Surface voids or bug holes that are less than 5/8-inch in diameter and less than ¼-inch deep, except when classified as Category 4
(b) Cracks less than or equal to 0.006 inches wide
(c) Cracks less than or equal to 0.125 inches wide on surfaces that will receive a concrete overlay or spray-applied membrane waterproofing

2. Category 2, Minor Defects.

Category 2 defects shall be repaired, but an NCR does not need to be filed. Minor defects are defined as the following:

(a) Spalls, honeycombing, surface voids that are less than 2 inches deep and have no dimension greater than 12 inches
(b) Cracks less than or equal to 0.016 inches that will not receive a concrete overlay or spray-applied membrane waterproofing
(c) Broken or spalled corners that will be covered by field-cast concrete

Minor defects shall be repaired according to PCINE-18-RNPCBE. Cracks shall be sealed according to the PCI Repair Procedure #14 in PCINE-18-RNPCBE.

3. Category 3, Major Defects.

For Category 3 defects, the Fabricator shall prepare an NCR that documents the defect and describes the proposed repair procedure. The NCR shall be submitted to MassDOT for approval prior to performing the repair. Major defects are defined as the following:

(a) Spalls, honeycombing and surface voids that are deeper than 2 inches or have any dimension greater than 12 inches, when measured along a straight line
(b) Concentrated area of defects consisting of four or more Category 2 Defects within a 4-square foot area
(c) Exposed reinforcing steel
(d) Cracks greater than 0.016 inches and less than or equal to 0.060 inches in width that will not receive a concrete overlay or spray-applied membrane waterproofing
(e) Bearing area spalls with dimensions not exceeding 3 inches
(f) Cracks, spalls and honeycombing that will be encased in cast in place concrete need not be repaired, but the limits and location of the defects shall be documented with an NCR

Upon MassDOT approval, defects and cracks shall be repaired according to PCINE-18-RNPCBE and this specification. All repairs shall be completed at the expense of the Contractor.

ITEM 995.01 (Continued)

4. Category 4, Rejectable Defects.

Rejectable defects as determined by the MassDOT Inspector, RMS, and Engineer may be cause for rejection. Fabricator may submit an NCR with a proposed repair procedure, requesting approval. Some rejectable defects are defined as the following:

(a) Surface defects on more than 5% of the surface area which will be exposed to view after installation
(b) Minor defects that in total make up more than 5% of the surface area of the unit
(c) Cracks greater than 0.060 inches in width except as noted in Category 1
(d) Elements fabricated outside of the specified tolerances
(e) MassDOT compressive strength testing that does not meet the specified Design Strength, f'_c

U. Loading.

Prior to the Fabricator loading the Precast Bridge Element on to the truck for shipping, the Fabricator shall provide the MassDOT Plant Inspector and RMS a minimum seven (7) days' notice of the Fabricator's intent to load the Precast Bridge Element. Inspection by the MassDOT Plant Inspector shall take place while the element is still on dunnage in the yard. The element shall not be loaded onto the truck until the MassDOT Plant Inspector has performed the inspection.

V. Shipping.

Prior to shipment, the Fabricator shall perform the following actions and provide the required documentation to the MassDOT Plant Inspector:

(a) Prestressed Concrete Beams shall remain at the Fabricator's plant for a minimum of 7 days after cast date.
(b) QC Inspection Reports shall be signed by the Quality Control Manager and provided to the MassDOT Plant Inspector.
(c) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Prestressed Concrete Beam's representative sublot shall be generated by the Fabricator and provided to the MassDOT Plant Inspector.
(d) Certificate of Compliance shall be generated by the Fabricator as described under the Fabricator Quality Control section and provided to the MassDOT Plant Inspector.
(e) All MassDOT RMS approved Corrective Actions submitted on the Non-Conformance Reports (NCR), shall be verified to have been completed by the MassDOT Plant Inspector and Quality Control Manager.
(f) All NCRs shall be signed off by the Quality Control Manager, MassDOT Inspector and MassDOT RMS.

ITEM 995.01 (Continued)

W. Delivery.

Upon Delivery, the following documentation shall be provided to the MassDOT Resident Engineer or designee:

(a) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Prestressed Concrete Beam's representative sublot.
(b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
(c) QC Inspection Reports signed by the Quality Control Manager.

The Contractor shall inspect the Prestressed Concrete Beams upon receipt at the site. Prestressed Concrete Beams damaged during delivery shall be repaired or replaced at MassDOT's direction at no cost to MassDOT.

CONSTRUCTION METHODS – FIELD CONSTRUCTION

A. General.

All of the Contractor's field personnel involved in the erection and assembly of the Prestressed Concrete Beams shall have knowledge of and follow the approved Erection Procedure and Quality Control Plan for Prestressed Concrete Beam Assembly.

Prior to installation, the following documentation shall be reviewed and confirmed by the MassDOT Resident Engineer or designee:

(a) QC Compressive Strength Test Report Forms attaining Design Strength, f'_c for the Prestressed Concrete Beam's representative sublot.
(b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
(c) QC Inspection Reports signed by the Quality Control Manager.

Field construction staff shall verify that the Resident Engineer has accepted all Prestressed Concrete Beams prior to installation.

B. Erection Procedure and Quality Control Plan for Prestressed Concrete Beam Assembly.

Prior to the erection, the Contractor shall submit an Erection Procedure and a Quality Control Plan for Prestressed Concrete Beam Assembly for approval by the Engineer. This submittal shall include computations and drawings for the transport, hoisting, erection and handling of the Prestressed Concrete Beams. The Erection Procedure and Quality Control Plan for Prestressed Concrete Beam Assembly shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the bridge. The Erection Procedure and Quality Control Plan for Prestressed Concrete Beam Assembly shall, at a minimum, include the following:

ITEM 995.01 (Continued)

1. Erection Procedure

The Erection Procedure shall be prepared to conform to the requirements of 960.61, Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (seventh edition) for handling, erection, and bracing requirements. At a minimum, the Erection Procedure shall provide:

(a) Steel reinforcing details, and location and details of lifting devices
(b) Minimum concrete compressive strength for handling the Prestressed Concrete Beams.
(c) Concrete stresses stresses during handling, transport, and erection.
(d) Crane capacities, pick radii, sling geometry, and lifting hardware.
(e) Verification that the equipment can handle all pick loads and weights with the required factor of safety.
(f) Evaluation of construction sequence and evaluation of any geometric conflicts in the lifting of the Prestressed Concrete Beams and setting them on the abutments and piers.
(g) Design of crane supports including verification of subgrade for support.
(h) Location and design of all temporary bracing that will be required during erection.

2. Quality Control Plan for Prestressed Concrete Beam Assembly

The Quality Control Plan for Prestressed Concrete Beam Assembly is a document prepared and submitted by the Contractor prior to the start of work which requires the Contractor to identify and detail the sequence of construction in accordance with the project schedule and which clearly identifies all stages of field construction. The assembly procedures for the Prestressed Concrete Beams shall be submitted on full size 24”x36” sheets. This document will be treated as a Construction Procedure and will be reviewed by both the Designer and the District Construction Office.

At a minimum, the Quality Control Plan for Prestressed Concrete Beam Assembly shall include the following:

(a) Listing of the equipment, materials, and personnel including their assigned responsibilities that will be used to erect and assemble the Prestressed Concrete Beams on site.
(b) Documentation of all preparatory work necessary for moving personnel, equipment, supplies, and incidentals to the project site before beginning work.
(c) Detailed schedule showing the sequence of operations that the Contractor will follow to complete the field construction from setting working points and working lines to the casting of closure pours and the curing of the closure pour concrete, as described below and as called for on the plans.
(d) For NEDBT and NEXT D beams, Contractor’s means for ensuring that the Prestressed Concrete Beam shall align to the roadway profile and cross slope and means for adjusting the final deck slab elevation.
(e) Timeline and descriptions of Quality Control activities to be followed throughout the field construction operations including methods and procedures for controlling tolerance limits both horizontally and vertically.

ITEM 995.01 (Continued)

C. Survey and Layout.

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. MassDOT reserves the right to perform additional independent survey. If discrepancies are found, the Contractor may be required to verify previous survey data.

D. Prestressed Spread Deck or Box Beams.

1. Beam Layout and Erection.

Prestressed concrete beams shall be installed to the line and grade shown on the plans in accordance with the Contractor's approved Erection Procedure and Assembly Plan.

As the beams are being erected, the Contractor shall monitor the width of the closure pours and the out-to-out width of the beams top flanges so that, after all beams are erected, the actual overall width of the bridge deck shall not deviate from the dimension shown on the plans beyond a tolerance of +0 inches and -1 inches. In order to achieve this, the Contractor may vary the width of the closure pours within the tolerances specified on the plans.

2. Concrete Deck Slab Placement.

Prior to casting the deck, the abutments and piers shall be prepared for the placement of the deck concrete as called for on the plans and the Contractor shall cut the lifting devices off below the top of the beam.

The top of the beam shall be clean and free of all laitance. Deck concrete shall be placed against the beam concrete without the use of any bonding agents.

After the formwork has been removed, all threaded inserts that have been cast into the beams for support of the formwork shall be plugged with a grout of the same color as that of the precast

COMPENSATION

A. Basis of Payment.

The furnishing, fabricating, and erecting of all Prestressed Concrete Deck Beams shall be paid for at the Contract unit price per Foot under the Lump Sum 995.01, complete in place.

LAMINATED ELASTOMERIC BEARING W/O ANCHOR BOLTS

DESCRIPTION OF WORK

The work to be performed under this item shall conform to the relevant provisions of Section M9.14.5 and the following:

ITEM 995.01 (Continued)

SUBMITTALS

The Contractor shall submit to the Engineer for approval the following documents:

1. Prior to fabrication:
    a. Written notification in accordance with M9.14.5
    b. Shop drawings for approval in accordance with Section 5.02 of MassDOT's Supplemental Specifications to the Standard Specifications for Highways and Bridges.
        i. Fabrication shall not begin until the Contractor receives written approval from the Department that the submitted shop drawings have been received.
2. Upon delivery of the bearing pads:
    a. A Certificate of Compliance certifying that the elastomeric bearing pads meet the requirements of the contract specifications.
        i. A Mill certificate and certificate of compliance for the steel laminates shall accompany the bearing pads.
    b. Independent testing results as required below.
    c. Additional elastomeric bearing pads for MassDOT Acceptance testing as required below.

MATERIALS

Elastomer: The elastomeric compound shall be composed of 100% low temperature Grade 3 virgin crystallization resistant polychloroprene (neoprene).

Steel Laminates: The steel laminates shall meet the requirements of AASHTO M 251.

Internal Load Plates: The internal load plates shall conform to AASHTO M 270 Grade 36 or Grade 50.

FABRICATORS

The National Transportation Product Evaluation Program (NTPEP) shall find the bearing pad fabrication plant to be in compliance with the Elastomeric Bridge Bearing Pad Technical Committee Work Plan. Approved fabricators are listed on the MassDOT QCML.

FABRICATION

Bearing pads shall be fabricated in conformance with the "Method B" design method outlined in the AASHTO LRFD Bridge Design Specifications.

The bearing dimensions, including elastomer thickness and edge cover, number and thickness of steel reinforcing laminates, dimensions of load plates (if any), and the design shear modulus of the elastomer shall be as shown on the Plans.

The tolerances on the overall dimensions for the bearings shall be according to Table 2 of AASHTO M 251, except that the tolerance on the overall vertical dimension shall be limited to -0, +1/8" regardless of the design thickness.

ITEM 995.01 (Continued)

SAMPLING

Sampling of bearing pads for testing shall be random and performed on a lot basis. Lots shall be divided into sublots of 10 bearings. Acceptance samples shall be independently tested as outlined below. For Verification samples taken by the Engineer at the project, the sampling rate shall be one randomly selected full size bearing pad of each size and type in accordance with Subsection M9.14.5. A lot shall be defined as the smallest number of bearings determined by the following criteria:

1. A lot shall not exceed a single contract quantity.
2. A lot shall consist of bearings of the same size and configuration.
3. A lot shall consist of bearings produced in a continuous manner from the same batch of elastomer and cured under the same conditions.

All pads required for testing purposes in accordance with Subsection M9.14.5 of the Standard Specifications shall be considered as incidental to this item. The quantities listed in the Schedule of Basis for Partial Payment only include the number of bearings required for construction and do not include the additional bearings required for conformance and destructive testing as outlined herein.

INDEPENDENT TESTING

Independent testing shall be performed by a nationally recognized testing laboratory approved by the Engineer which shall provide certified test results. Each Lot of bearings as defined above shall be randomly sampled and tested at the frequency specified under Section 8.5 of AASHTO M 251. The minimum testing shall be in conformance with Sections 8 and 9 of M 251 as specified below:

1. Materials shall meet Section 4 of M 251.
2. Dimensions per Section 8.4 of M 251.
3. Elastomer per Section 8.6 of M 251.
4. Compressive Strain at maximum dead and live load (service) per Section 8.8.1 of M 251.
    a. The compressive deflection of each bearing shall not exceed 10% of the design effective rubber thickness at a compressive load equal to the maximum design load.
5. Short Duration Compression Test per Section 8.8.2 of M 251.
6. Shear Modulus of the Elastomer per Section 8.9.1 of M 251.
    a. The shear modulus shall be between 0.136 and 0.184 ksi.
7. Tensile Strength, Ultimate Elongation per ASTM D412.
8. Shear Bond Strength per ASTM D429.
9. Heat Resistance per ASTM D573.
10. Compression Set per ASTM D395.
11. Low Temperature Brittleness per ASTM D746 for Elastomer Grades 3.

ITEM 995.01 (Continued)

PACKAGING, HANDLING, AND STORAGE

The bearing pads shall be packaged, handled and stored in accordance with Section 18.1.3 of the AASHTO LRFD Bridge Construction Specifications. On the top of each completed bearing it shall be clearly identified and marked in accordance with M 251 Section 7. In addition, a 1/32" deep direction arrow shall be inscribed into the bearing which will allow the bearing to be aligned with the up-station direction. All marks shall be permanent and be visible after the bearing is installed.

INSTALLATION

The bearing pads and bridge seat bearing areas shall conform to Section 901.65A(3).

ACCEPTANCE

Requirements for providing notification to the Department prior to the start of bearing pad production as well as the provisions for random sampling of the bearings by the Department at the job site for additional destructive testing shall be in accordance with M9.14.5 and this specification. The Department shall use the results of the Independent testing as well as their own testing in the Acceptance of the bearing pads.

STRUCTURAL STEEL – COATED STEEL

General

The work under this sub heading shall conform to the relevant provisions of Subsections 960 and 995 and shall include the supply, fabrication, and installation of galvanized utility supports and as shown on the Plans. All structural steel shall conform to the requirements of AASHTO M270 Grade 50 as indicated on the plans. Structural steel shall be fabricated and erected in accordance with Subsection 961.61 of the Specifications. Bolts shall be ASTM F3125 HS Type 1 bolts and shall be galvanized per ASTM A153 or B695 Class 50.

Material

Steel plates and shapes shall conform to AASHTO designation M270 Grade 50, as indicated on the plans.

All bolts shall be high strength bolts meeting the requirements of ASTM F3125 and ASTM A563 of the appropriate diameters and installed in accordance with the Specifications. Nuts shall conform to ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts. Washers shall conform to ASTM F436 Standard Specification for Hardened Steel Washers.

Welding shall be performed in accordance with AASHTO/AWS/ANSI D1.5.

ITEM 995.01 (Continued)

Galvanizing

This section shall apply to the coating of all utility supports which shall be galvanized after fabrication in accordance with the relevant provisions of Section 960.64 and M7.10.0. The color of the finish coat of the utility supports after galvanizing shall be Federal Standard 595B Color #10045, dark bronze. Utility supports shall be fabricated and drilled prior to galvanizing.

Bolts, washers and nuts shall be hot dipped galvanized in accordance with AASHTO M232.

METAL BRIDGE RAIL (3 RAIL), STEEL (TYPE S3-TL4)

The work to be done under this heading shall conform to the relevant provisions of Subsection 975 of the Supplemental Specifications and the following:

The S3-TL4 railing shall be as detailed on the plans. The work under this heading shall include the railings at the east and west fascias of the bridge in Hadley. The color of the finish coat of the S3-TL4 rail after galvanizing shall be Federal Standard 595B Color #10045, dark bronze.

BASIS FOR PARTIAL PAYMENT

Within ten (10) days after the Notice to Proceed, the Contractor shall submit, in duplicate, for the approval of the Engineer, a schedule of quantities and unit prices for the major components of the bridge structure as listed below. The bridge structure Lump Sum breakdown quantities provided below are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the lump sum contract price regardless of the accuracy of the quantities furnished by the Engineer for the individual bridge components. The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Item 995.1 and no further compensation will be allowed:

ITEM 995.01 (Continued)

Item 995.01 - Bridge Structure No. H-01-005 (C1H)

Sub-Item	Description	Quantity	Unit	Unit Price	Total
153.1	Controlled Density Fill – Non-Excavatable	6	CY		
901	4000 PSI – 1½ Inch – 565 Cement Concrete	140	CY		
904.3	5000 PSI – ¾ Inch – 685 HP Cement Concrete	35	CY		
904.31	Precast Highway Guardrail Transitions	4	EA		
904.4	4000 PSI – ¾ Inch – 585 HP Cement Concrete	265	CY		
910	Steel Reinforcement for Structures - Uncoated	11,800	LB		
910.1	Steel Reinforcement for Structures - Epoxy Coated	80,000	LB		
930.303	Prestressed Concrete Deck Beams (S36-18)	640	FT		
930.307	Prestressed Concrete Deck Beams (S48-18)	260	FT		
922	Laminated Elastomeric Bearing Pad without Anchor Bolts	56	EA		
960.1	Structural Steel - Coated	3,000	LB		
965	Membrane Waterproofing for Bridge Decks - Spray Applied	4,500	SF		
970	Damp-proofing	220	SY		
971	Asphaltic Bridge Joint System	70	FT		
975.1	Metal Bridge Rail (3 Rail), Steel (Type S3-TL4)	292	FT		
				Total Cost of Item 995.01 =	

The above schedule applies only to Bridge Structure No. H-01-005. Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item.

Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

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DETAIL SHEETS

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PROJECT NO. 608460

THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS HIGHWAY DEPARTMENT
TEN PARK PLAZA, BOSTON, MA

-ESTIMATE OF QUANTITIES - DETAIL SHEET-

CITY/TOWN:	Hadley	YEAR:	FFY 2025
CLASS:	Urban Principal Arterial	ROAD:	Bay Road (Route 47)
TYPE OF PROJECT:	Bridge Replacement	DATE:	May 30, 2024

Earth Excavation	150 CY	Gravel Borrow	590 CY
Pavement Fine Milling	340 SY	Sand Borrow	80 CY
Gravel Borrow for	74 CY	Loam Borrow	255 CY
Backfilling Structures and Pipes		Ordinary Borrow	740 CY
Class A Rock Excavation	3 CY	Class B Trench Excavation	100 CY
Test Pit for Exploration	10 CY	Class B Rock Excavation	5 CY
Crushed Stone	45 TON		

PAVEMENT NOTES

PROPOSED FULL DEPTH CONSTRUCTION WITH RECLAIMED BASE

AREA = 1828 SY

SURFACE:	1-1/2" SUPERPAVE BRIDGE SURFACE COURSE – 9.5 (SSC-B-9.5) OVER
INTERMEDIATE:	2” SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC-12.5) OVER
BASE:	4-1/2” SUPERPAVE BASE COURSE – 37.5 (SBC-37.5) OVER
SUBBASE:	VARIES (8” MIN.) RECLAIMED PAVEMENT SUPPLEMENTED WITH GRAVEL BORROW (TYPE b) AS REQUIRED

PROPOSED FINE MILLING AND OVERLAY

AREA = 340 SY

SURFACE:	1-1/2” SUPERPAVE BRIDGE SURFACE COURSE – 9.5 (SSC-B-9.5) OVER
PREPARATION:	1-1/2” PAVEMENT MICROMILLING

PAVEMENT NOTES (CONT'D)

PROPOSED HMA WEARING SURFACE FOR BRIDGE

AREA = 476 SY

SURFACE:	1-1/2" SUPERPAVE BRIDGE SURFACE COURSE – 9.5 (SSC-B-9.5) OVER
	RS-1H ASPHALT EMULSION FOR TACK COAT OVER
PROTECTIVE:	1-1/2" SUPERPAVE BRIDGE PROTECTIVE COURSE – 9.5 (SPC-B-9.5) OVER
	POLYMER MODIFIED TACK COAT OVER
	SPRAY APPLIED MEMBRANE WATERPROOFING

PROPOSED HMA FOR DRIVEWAYS

AREA = 39 SY

SURFACE:	1-1/2" SUPERPAVE SURFACE COURSE – 9.5 (SSC-9.5) OVER
INTERMEDIATE:	2-1/2" SUPERPAVE SURFACE COURSE – 12.5 (SSC-12.5) OVER
SUBBASE:	8" GRAVEL BORROW (TYPE b)

PROPOSED CEMENT CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS

AREA = 28 SY

SURFACE:	4" (AIR-ENTRAINED, 4000 PSI, ¾", 610) CEMENT CONC.
	POURED IN ONE COURSE
SUBBASE:	8" GRAVEL BORROW (TYPE b)

ALL ITEMS NOT COMPLETELY DESCRIBED AND LOCATED ON THE PLANS ARE TO BE DETAILED AS SHOWN BELOW:

The following shall define the limits between the Bridge Lump Sum items (i.e. Bridge Excavation) and Highway items (i.e. Earth Excavation):

South Approach Sta. 05+36
North Approach Sta. 06+96

ITEM 101. CLEARING AND GRUBBING

This item shall be used for the following:

- Where shown on the Construction Plans
- Where brush and shrubs are to be removed for proposed slope work along both sides of the bridge
- Contractor access along the west side of the bridge
- Installation of riprap

Elsewhere as required by the Engineer.

ITEM 102.1 TREE TRIMMING

Required for the relocation of UP 4B/74 and UP 61 and accompanying overhead wires.

Station	Offset	To	Station	Offset
04+92 ±	LT		07+22 ±	LT

Elsewhere for work around tree line, as determined by the Engineer.

ITEM 102.511 TREE PROTECTION – ARMORING AND PRUNING

To be used as a contingency item for the protection of trees, as required by the Engineer.

ITEM 102.521 TREE AND PLANT PROTECTION FENCE

Station	Offset
07+50 ±	LT

Elsewhere along the treeline as required by the Engineer.

ITEM 120. EARTH EXCAVATION

This item includes:

- Areas of cuts from cross sections
- Remove existing pavement and loam in areas of fill, prior to filling
- Remove and discard all highway guard not designated to be removed and stacked

This item does not include:

- Cuts as a result of reclaimed pavement for base course operation

ITEM 121. CLASS A ROCK EXCAVATION

To be used as a contingency item.

ITEM 141.1 TEST PIT FOR EXPLORATION

Use to locate underground facilities throughout the project, where directed by the Engineer.

ITEM 146. DRAINAGE STRUCTURE REMOVED

Structure Name	Station	Offset
CB	05+36	LT

If required by the Engineer, use for the removal of temporary drainage.

ITEM 151. GRAVEL BORROW

Use for the following work:

- As shown in the Pavement Notes
- Temporary pavement transitions, as shown in the Temporary Traffic Control Plans
- Backfill of drainage and water piping trenches if unsuitable material is encountered, as determined by the Engineer

Elsewhere as directed.

ITEM 154. SAND BORROW

Use for bedding under all proposed water main.

ITEM 156. CRUSHED STONE

Use for bedding under proposed drainage pipes and structures if unsuitable subgrade is encountered, as determined by the Engineer.

ITEM 201. CATCH BASIN

Structure Name	Station	Offset
CBCI-1	05+06	LT
CBCI -2	07+58	LT

ITEM 202. MANHOLE

Structure Name	Station	Offset
DMH-2	05+09	RT

ITEM 208. DROP INLET, TYPE C

For use as temporary drainage during construction.

Structure Name	Station	Offset
TEMP CBCI	05+06	LT

ITEM 221. FRAME AND COVER

For use with all new manholes. Refer to Item 202.

ITEM 222.1 FRAME AND GRATE – MASSDOT CASCADE TYPE

For use with all new catch basins. Refer to Item 201.

ITEM 222.2 FRAME AND GRATE – MASSDOT DROP INLET

For use with all new drop inlets. Refer to Item 208.

ITEM 223.1 FRAME AND GRATE (OR COVER) REMOVED AND STACKED

For use with all existing and temporary drainage structures to be removed. Refer to Item 146.

ITEM 227.3 REMOVAL OF DRAINAGE STRUCTURE SEDIMENT

Use for removal of sediment in existing catch basin structure at Sta 02+89 LT.

ITEM 227.31 REMOVAL OF DRAINAGE PIPE SEDIMENT

Use for removal of sediment in pipes connecting to existing catch basin structure at Sta 02+89 LT.

ITEM 230.12 12 INCH CORRUGATED METAL PIPE

From	To	Length (FT)	
DMH-1	Outfall	44	

ITEM 241.12 12 INCH REINFORCED CONCRETE PIPE

From	To	Length (FT)	
CBCI-1	DMH-1	40	
CBCI-2	Outfall	12	
TEMP. CBCI	DMH-1	43	For use as temporary drainage during construction.

ITEM 258. STONE FOR PIPE ENDS

For use at drainage outfall.

Station	Offset	Area (SY)
05+54 ±	RT	5
07+58	LT	5

ITEM 302.12 12 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)

Station	Offset	To	Station	Offset
03+84	RT		04+37	RT
03+93	RT		03+95	RT
04+37	RT		05+95	LT
04+95	LT		05+20	LT
07+16	LT		07+67	LT
07+67	LT		07+75	LT
07+75	LT		07+89	LT
07+87	LT		07+86	LT

ITEM 303.12 12 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)

Station	Offset	To	Station	Offset
05+20	RT		07+16	LT

ITEM 309. DUCTILE IRON FITTINGS FOR WATER PIPE

Station	Offset	Fitting
03+94 ±	RT	12” Tee
03+95 ±	RT	12”- 8” Reducer
04+05 ±	RT	8” Cap
04+37 ±	RT	12”- 45 degree
04+95 ±	LT	12”- 45 degree
05+22 ±	LT	12”- 45 degree
05+31 ±	LT	12”- 45 degree
07+06 ±	LT	12”- 45 degree
07+20 ±	LT	12”- 45 degree
07+67 ±	LT	12”- 45 degree
07+75 ±	LT	12”- 45 degree
07+80 ±	LT	8” Cap
07+87 ±	LT	12” Tee

ITEM 315.08 8 INCH WATER MAIN REMOVED AND STACKED

Station	Offset	To	Station	Offset
04+00	RT		07+80	RT

ITEM 350.12 12 INCH GATE AND GATE BOX

For use at existing 12” water gates where both the gate and gate box are to be replaced.

ITEM 357.08 8 INCH GATE BOX

For use at existing 8” water gates where only the gate box is to be replaced.

ITEM 357.12 12 INCH GATE BOX

For use at existing 12” water gates where only the gate box is to be replaced.

ITEM 371.12 12 INCH COUPLING

1 expansion coupling required at each bridge abutment.

ITEM 373.12 12 INCH WATER PIPE INSULATION

Required for above ground section of water main at bridge crossing.

Station	Offset	To	Station	Offset
05+20	LT		07+16	LT

ITEM 379.075 3/4 INCH AIR RELEASE VALVE

1 required at high point of water main bridge crossing.

ITEM 472. TEMPORARY ASPHALT PATCHING

For use as temporary HMA trench patching for water main and drainage pipe installation prior to full depth construction.

Elsewhere as required for miscellaneous ramping, as determined by the Engineer.

ITEM 504. GRANITE CURB TYPE VA4 – STRAIGHT

Station	Offset	To	Station	Offset
02+90	LT		05+03	LT
05+09	LT		05+33	LT
05+10	RT		05+28	RT
06+99	LT		07+55	LT
07+11	RT		07+50	RT

ITEM 504.2 GRANITE CURB TYPE VA4 – SPLAYED END

Required at each corner of bridge to match bridge curb.

Station	Offset	To	Station	Offset
05+33	LT		05+39	LT
05+46	RT		05+51	RT
06+81	RT		06+86	RT
06+93	LT		06+99	LT

ITEM 509. GRANITE TRANSITION CURB FOR WHEELCHAIR RAMPS – STRAIGHT

WCR#	High-Side Transition (FT)	Low-Side Transition (FT)
N/A	10	-
N/A	10	-
1	6.5	6.5
2	14	6.5
N/A	6	-
N/A	6	-

ITEM 514. GRANITE CURB INLET - STRAIGHT

Structure Name	Station	Side
CBCI-1	05+06	LT
CBCI-2	07+58	LT

ITEM 594. CURB REMOVED AND DISCARDED

Contingency item, use if existing curb is encountered within project limits during construction.

ITEM 595. CURB INLET REMOVED AND DISCARDED

Use where existing catch basins are to be removed. Refer to Item 146.

ITEM 620.13 GUARDRAIL, TL-3 (SINGLE FACED)

Station	Offset	To	Station	Offset
02+92	LT		05+06	LT
04+81	RT		05+06	RT
07+25	LT		07+67	LT
08+38	LT		09+64	LT
07+25	RT		09+60	RT

ITEM 627.83 GUARDRAIL TANGENT END TREATMENT, TL-3

Station From	Offset
02+80	LT
04+69	RT
07+79	LT
08+26	LT
09+72	RT
09+76	LT

ITEM 628.24 TRANSITION TO BRIDGE RAIL

Station From	Offset
05+40	LT
05+40	RT
06+91	LT
06+91	RT

ITEM 630.1 HIGHWAY GUARD REMOVED AND STACKED

Station	Offset	To	Station	Offset
02+80 ±	LT		05+26 ±	LT
06+80 ±	LT		07+58 ±	LT

ITEM 657. TEMPORARY FENCE

For use as required during construction to protect the public from the work zone, as shown on the Temporary Traffic Control Plans and as determined by the Engineer.

ITEM 657.5 TEMPORARY FENCE REMOVED AND RESET

Temporary fence shall be removed and reset between each stage of construction, as shown on the Temporary Traffic Control Plans.

ITEM 751.7 COMPOST BLANKET

To be used in wetland mitigation areas.

ITEM 765.555 WETLAND MIX – PART SHADE

To be used in wetland mitigation areas.

ITEM 901. 4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE

Use for the following work:

- Drainage outflow headwall, in accordance with MassDOT Construction Standards E206.4.0 and E206.4.1
- Thrust blocks at bends and pipe ends in water pipe

ITEM 910. STEEL REINFORCEMENT FOR STRUCTURES

For use in drainage outflow headwall in accordance with MassDOT Construction Standards E206.4.0 and E206.4.1

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GEOTECHNICAL REPORT

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GEOTECHNICAL ENGINEERING REPORT

Bay Road (Route 47) over Fort River
(Bridge No. H-01-005 BIN 12J)
Hadley, Massachusetts

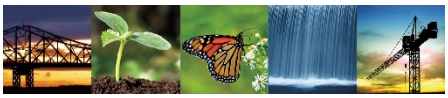
July 28, 2020
File No. 01.073284.00

PREPARED FOR:
Alfred Benesch & Company
50 Redfield Street
Boston, Massachusetts 02122

PREPARED BY:

GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue | Norwood, MA, 02062
800-789-5848

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July 28, 2020
(Supersedes March 28, 2018 and December 19, 2019)
File No. 01.0173284.00

Matt Card, P.E.
Alfred Benesch & Company
50 Redfield Street
Boston, Massachusetts 02122

Re: Geotechnical Engineering Report
Bay Road (Route 47) over Fort River (Bridge No. H-01-005 BIN 12J)
Hadley, Massachusetts

Dear Mr. Card:

In accordance with our agreement dated May 24, 2017, GZA GeoEnvironmental, Inc. (GZA) is pleased to submit this geotechnical engineering report for the proposed replacement of the existing Bay Road (Route 47) over Fort River Bridge (Bridge No. H-01-005) in Hadley, Massachusetts. The purpose of this report is to provide geotechnical design and construction recommendations for the replacement bridge. The recommendations of this report are subject to the limitations contained in **Appendix A**.

This report supersedes our previous reports dated March 28, 2019 and December 19, 2019. The report reflects updates to the structural design and construction staging and revised foundation loads.

Elevations indicated in this report are in feet and are referenced to the North American Vertical Datum of 1988 (NAVD 88).

BACKGROUND

Our understanding of the original and proposed replacement bridge is based on:

- Existing bridge plans (Sheets 1 and 2), entitled "The Commonwealth of Massachusetts Proposed Bridge, Hadley, Bay Road, Station 205+10 over Fort River," prepared by The Department of Public Works, Boston, MA, dated August 1935;
- Bridge Inventory Photos of the existing bridge, dated December 2009;
- A Bridge Type Selection Worksheet entitled "MassDOT Project #608460, Bay Road (ST 47) over Fort River, Hadley, MA 01035," prepared by Benesch, dated October 2, 2017;
- Addendum 1 - Bridge Type Selection Worksheet entitled "MassDOT Project #608460, Bay Road (ST 47) over Fort River, Hadley, MA 01035," prepared by Benesch, dated January 18, 2018;
- A Hydraulic Study Report entitled "Bay Road (ST 47) Over Fort River, Hadley, Massachusetts, Hampshire County – District 1, Bridge No. H-01-005(12J)," prepared by MassDOT, dated February 27, 2018;
- In-Progress Structural Bridge Plans, Sheet Nos. 1 through 34, prepared by Benesch, dated April 2, 2020;
- Structural loads provided by Benesch on March 16, 2020 and May 29, 2020.
- Discussions with Benesch; and
- Readily available published topographic and geologic maps and aerial photographs.

EXISTING CONDITIONS

The existing bridge was constructed in 1935 and consists of an eight-span, continuous reinforced concrete slab superstructure measuring approximately 126 feet long and 38 feet wide. The existing bridge substructure consists of reinforced concrete abutments and seven open bent intermediate piers. The abutments and piers are supported on 12-inch diameter timber piles, with center-to-center pier spacing of 15'-6". The bridge carries one lane of vehicular traffic in each direction with a 5'-0" wide sidewalk on the east side of the bridge.



Photo 1: View of the existing bridge from upstream along the Fort River.

Interior pier bents (Nos. 2 through 6) are reinforced with timber cross bracing, and many of the timber piles have been reinforced with 18-inch diameter concrete jackets over a portion of their length above the mudline. The first row of interior bents (Nos. 1 and 7) are partially embedded by a rip-rap slope (1-1/2H:1V) that extends up to the abutments. The piles and the cross bracing are creosote-treated yellow pine. The outer pile of each bent is battered outward from the bridge at a slope of 1-inch per foot. The original design capacity of the existing timber piles is not provided in the available existing bridge plans. A view of the bridge along Fort River is shown in **Photo 1**.

The Fort River flows in a westerly direction with a channel width that varies between approximately 58 and 70 feet at the existing bridge crossing. The river in the vicinity of the bridge is approximately 5 feet deep during average flows and is channelized mostly under existing Spans 3 through 6 (spans counted from south to north). Based on the Hydraulic Study Report, the 100-year flood level of the Fort River at the bridge site is El. 123.10. Stone foundations of the former Bay Road Bridge are located approximately 75 feet upstream (north) of the existing bridge.

Existing utilities on the existing bridge include an 8-inch diameter water main supported below the bridge sidewalk on the eastern portion of the bridge. Overhead electric wires run along the east facia, immediately upstream of the bridge. In addition, approximately 40 feet south of the bridge, there is an abandoned Verizon utility pole with evidence of a buried utility which may run below the river parallel to the bridge.

PROPOSED CONSTRUCTION

The proposed project includes complete removal and replacement of the superstructure and substructure of the existing Bay Road (Rt. 47) Bridge. Based on the Bridge Type Selection Worksheet (BTSW) and Addendum 1 of the BTSW, four bridge replacement alternatives were considered. We understand that the MassDOT Highway Division approved Alternate IV, which consists of complete replacement of the existing superstructure and substructure with a three-span precast deck beam superstructure supported by integral abutments and two pile bent piers. The integral abutment piles are proposed to be HP12x84 steel H-piles and the intermediate pier piles are proposed to be 24-inch diameter, closed-end, steel pipe piles.

The bridge will be approximately 126 feet in length and 42'-6" in width, which includes two 12' wide traffic lanes in each direction, two 5' wide shoulders in each direction with one 5'-6" wide sidewalk along the east side of the bridge. To accommodate the bridge replacement, a raise in grade of 15 inches will be required at the approaches to maintain the existing vertical clearance of approximately 22 feet beneath the bridge. Construction will be staged to maintain one active lane of traffic (11 foot wide minimum) and pedestrian access on the bridge during construction.

Factored structural design loads provided by Benesch for the replacement bridge foundations are summarized in **Table A**.

Table A: Structural Design Loads

Foundation Location	Foundation Type	Factored Axial Load per Pile		Factored Moment per Pile	
		Service I	Strength I	Service I	Strength I
North Abutment	H-Piles	108 kips	153 kips	72 kip-ft	103 kip-ft
Piers 1 & 2	Pipe Piles	225 kips	305 kips	60 kip-ft	55 kip-ft
South Abutment	H-Piles	108 kips	153 kips	72 kip-ft	103 kip-ft

Note:
1. Loads per pile provided by Benesch on March 16, 2020 (for the piers) and May 29, 2020 (for the abutments).

SUBSURFACE EXPLORATIONS

Six borings were performed in 1935 as part of the original design of the existing bridge. To acquire additional subsurface information at the proposed location of the replacement bridge and to confirm the subsurface conditions as part of this current study, three additional test borings were performed between October 30 and November 8, 2017. Locations and boring information for the previous explorations are provided on the design plans included in **Appendix B**. Locations of the previous and recent explorations are shown on **Figure 2** and boring logs for the recent borings are provided in **Appendix C**.

PREVIOUS (1935) BORINGS

Six borings (designated as Nos. 1 through 6) were performed in 1935 as part of the original bridge design. The borings were advanced to depths ranging from about 30 to 40 feet below circa-1935 existing grade. Sampling techniques are not known, however, the boring data shows blows per foot on spoon samples using a 250 pound hammer. While these blows likely do not represent ASTM testing and sampling methods used today, they provide an indication of relative density of the overburden soils. Rock coring was not performed in any of the borings.

Due to the sampling techniques used and the relatively shallow depth of the borings for a new structure supported on deep foundations, these logs were not considered adequate for use in the current bridge foundation design.

RECENT (2017) BORINGS

Three bridge borings (designated as BB-1 through BB-3) were performed by Seaboard Drilling, Inc. between October 30 and November 8, 2017. Timing of the drilling was closely coordinated with MassDOT to avoid disruption and conflict with on-going structural repair of the timber pile foundations of the existing bridge.

Borings were advanced from the existing roadway behind each abutment (BB-1 and BB-3), and through the existing bridge deck (BB-2). The borings were performed using rotary wash, cased drilling methods. Standard Penetration Tests (SPTs) and split spoon samples were performed continuously through the abutment fill, and were generally performed at 5-foot intervals thereafter. The borings were advanced to depths ranging from 46 to 66 feet below the existing ground surface or mudline, corresponding to elevations ranging from approximately 59 to 66 feet. Bridge borings BB-1 and BB-3 were backfilled with drill cuttings and the ground surface was restored with cold patch asphalt.

The reinforced concrete bridge deck and the bridge deck surface was patched with concrete upon completion of boring BB-2.

GZA personnel coordinated and observed the test borings. The elevations were determined from design drawings provided by Benesch. Boring locations were approximately determined by tape measurements from existing site features. Therefore, the boring locations and elevations should be considered accurate only to the degree implied by the method used.

LABORATORY TESTING

GEOTECHNICAL TESTING

Geotechnical laboratory testing included a total of five gradation analyses on select soil samples collected from the borings to confirm visual field classifications and to evaluate engineering properties of the soil and possible soil reuse. Testing was performed by Thielsch Engineering, Inc. of Cranston, Rhode Island.

Geotechnical laboratory testing results are included in **Appendix D.**

ENVIRONMENTAL/SEDIMENT TESTING

River sediment samples were collected for environmental testing required for completing the Water Quality Certificate (WQC) permit application (by Benesch), to evaluate potential off-site soil disposal issues, and to provide parameters for a hydraulic study (by MassDOT). The sediment samples were obtained from the mudline to a depth of about 2 feet. Samples were submitted to Eurofins Spectrum Analytical, Inc. in Agawam, Massachusetts under chain-of-custody procedures for testing. Testing included:

- grain size,
- volatile solids,
- Total Petroleum Hydrocarbons (TPH),
- Extractable Petroleum Hydrocarbons (EPH),
- Method 8260 Volatile Organic Compounds (VOCs),
- Method 8270 Semi-Volatile Organic Compounds (SVOCs),
- Method 8082 polychlorinated biphenyls (PCBs),
- Total Organic Carbon
- RCRA-8 metals,
- pesticides and herbicides,
- reactive sulfide and cyanide, and
- conductivity and flashpoint.

GZA previously prepared and submitted a memorandum to Benesch dated January 11, 2018 summarizing the results of the sediment sampling and laboratory testing. Refer to the attached **Table 3** for a summary of the environmental laboratory test results and **Appendix G** for the environmental analytical results.

SUBSURFACE CONDITIONS

The soil and groundwater conditions discussed herein for the bridge are primarily based on conditions observed in the 2017 borings. Previous borings were compared to the 2017 borings for general consistency with previous descriptions of soil types and stratification.

A general description of the subsurface conditions encountered from the existing ground surface or mudline of the Fort River is summarized below. Refer to the existing bridge design plans from 1935 included in **Appendix B** for the previous borings (attached for reference only), and **Appendix C** which contain the 2017 boring logs for more detailed descriptions of subsurface conditions. A generalized longitudinal subsurface profile along the proposed bridge is attached as **Figure 3**.

LOCAL GEOLOGY

Geologic information in the area of the site is available on the MassGIS online database. Based on the available geologic information, the surficial geology and bedrock lithology in the area of the bridge consist predominantly sand and gravel deposits overlying siltstone and sandstone bedrock with the depth to bedrock expected to be more than 100 feet below existing grade.

GENERALIZED SUBSURFACE CONDITIONS

Based on the results of the previous and current subsurface explorations, subsurface conditions generally include a predominantly granular fill layer (at the abutments) overlying natural granular soils. A general description of the subsurface conditions encountered from the ground surface down is summarized below. Refer to the boring logs in **Appendix C** for specific conditions in each of the recent borings and attached **Table 1** for a summary of subsurface conditions.

Soil

Fill – Fill was encountered in borings performed behind the bridge abutments (BB-1 north abutment and BB-3 south abutment). The fill ranged in thickness from about 16 to 17 feet and consisted of very loose to very dense, brown/gray, fine to medium sand with up to 50 percent silt and up to 20 percent gravel. The field SPT N-values ranged from 2 to greater than 100 blows per foot (bpf) but were generally between 5 to 20 bpf.

Sand & Gravel – A layer of sand and gravel was encountered in each boring consisting of loose to dense brown/red-brown, fine to coarse sand with up to 50 percent gravel and up to 35 percent silt. Probable layers of gravel were observed based on drilling characteristics during advancement of the drill rods during drilling at several depths within this layer as indicated on the boring logs in **Appendix C**. The thickness of the layer ranged from approximately 26 to 37 feet, with field SPT N-values ranging from 7 to 30 bpf.

Dense to Very Dense Sand and Gravel – A dense to very dense sand and gravel layer was encountered below the sand and gravel layer in each boring consisting of brown/red fine to coarse sand with up to 50 percent gravel and up to 20 percent silt, or gravel with up to 50 percent sand and up to 20 percent silt. The borings were terminated after penetrating 13 to 17 feet into this stratum. Field SPT N-values ranged from 29 to 73 bpf. All of the borings were terminated in this stratum.

It is noted that the historic 1935 borings noted clayey sand and clayey gravel within this layer. The soil samples retrieved from the current borings did not contain clay.

Groundwater/River Level

Groundwater was measured at the end of drilling (after a stabilization time of about 18 hours) in boring BB-1 at a depth of approximately 16.5 ft below ground surface, and in boring BB-3 (after a stabilization time of about 20 hours) at a depth of approximately 15 feet below ground surface, corresponding to El. 108.5 and El. 111, respectively. Due to the proximity to the Fort River, groundwater elevations at the bridge abutments are expected to be impacted by and be at

or above the river elevation under normal conditions. The 100-year flood elevation of the river is El. 123.10, and the ordinary high-water elevation of the river is El. 107.

Note that fluctuations in groundwater/river levels will occur due to variations in season, precipitation, temperature, river level, construction, and other factors different from those existing at the time the measurements were made.

Table 5-5 of the Hydraulic Study Report, entitled Hydraulic Design Data (Proposed Alternative – 04) indicates the following information relative to scour at the bridge:

Design Flood Scour Frequency	100 years
Design Flood Abutment Scour Depth	11.9 ft
Design Flood Pier Scour Depth	2.6 ft
Check Flood Scour Frequency	200 years
Check Flood Abutment Scour Depth	13.2 ft
Check Flood Pier Scour Depth	2.6 ft

GEOTECHNICAL CONSIDERATIONS

The primary geotechnical issues associated with foundation design and construction of the proposed bridge replacement are:

- The presence of existing pile foundations at both abutments.
- Control of groundwater/river water during construction.
- Scour at the intermediate piers and abutments.

Presence of Existing Foundations at Abutments

The existing abutments are supported on one row of nine timber piles. Current plans are to cut the tops of the piles off below the bottom of the new reinforced concrete abutment and leave the remaining portion of the piles in-place. Therefore, the proposed integral abutment piles will need to be located to avoid conflicts with the existing foundations. The existing piles should be cutoff and not completely removed to limit disturbance of soil in general, since the new abutment piles are required to support lateral loads for the new bridge.

Control of Groundwater/River Water During Construction

Groundwater is expected to be below the depth of excavation for demolition of the existing abutment foundations and installation of new abutment foundation elements. However, in the area of the existing and new piers, the normal river water depth is typically about 5 feet. Therefore, temporary cofferdams and dewatering will be required during construction of the new pier foundations and during demolition of the existing piers.

Scour at the Intermediate Piers and Abutments

Based on a hydraulic study was performed by MassDOT, the design flood scour depth is 2.6 feet at the piers and 11.9 feet at the abutments. Scour protection measures consisting of riprap are being provided at the abutments to mitigate scour. Within the river channel, no scour protection is proposed, therefore the piles need to be evaluated considering the design scour depth for both axial and lateral loading combinations.

DESIGN RECOMMENDATIONS

The geotechnical recommendations presented below are based on our evaluation of the available subsurface data, existing bridge and the proposed structural design information. As previously indicated, our recommendations for the replacement bridge are provided specifically for Alternative IV of the Bridge Type Selection Worksheet and loads provided by Benesch.

The design recommendations provided herein are based on calculations performed according to the 2017 AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, the 2011 AASHTO Guide Specifications for LRFD Seismic Bridge Design (with interim revisions through 2015), and the 2013 MassDOT LRFD Bridge Manual.

1. Bridge Foundations - General

   It is recommended that the new bridge be supported on deep foundations consisting of driven piles that extend into the dense to very dense sand and gravel layer and derive their resistance through a combination of skin friction and end-bearing. The existing fill is not considered suitable for foundation support.

   The foundations currently proposed for support of the new abutments are driven H-piles and pipe piles for the piers. Drilled shafts are also feasible but are expected to be less economical compared to the pile alternatives. Furthermore, there is a greater likelihood that drilled shafts would conflict with the existing abutment pile foundations. Therefore, piles are recommended.

2. Integral Abutment Foundations – H-Piles

   Based on the structural plans prepared by Benesch, the integral abutments will be supported on a single row of seven vertical H-piles. The web of the piles should be oriented parallel to the centerline of the abutment. Pile layout should consider the location of the existing timber piles that support the existing bridge abutment. Timber piles that are in conflict with the proposed piles should be removed and the resulting void should be filled with 3/8-inch Crushed Stone (M2.01.6). Otherwise, the top of the existing timber piles should be cut off and remain in place to limit disturbance to the existing abutment soils.

   Based on the anticipated factored axial load per pile at the abutments (maximum factored load of 153 kips) and the potential for driving through gravel layers and into the dense to very dense sand and gravel layer, we recommend that HP12x84 piles be used to support the design loads. The piles should develop their resistance through side friction in the sand and gravel and the dense to very dense sand and gravel layers and end bearing in the dense to very dense sand and gravel. We recommend that heavy duty pile driving shoes be installed to limit damage to the pile tips during driving.

   Pile axial resistance was estimated using procedures from NAVFAC Design Manual 7.02 Foundations & Earth Structures. Recommended pile lengths and corresponding tip elevations are presented in **Table B,** which are based on limiting the effective stress to 20D into the natural sand and gravel stratum. To account for the potential variability of the depth to the dense to very dense sand and gravel layer, the pile lengths were estimated assuming that the piles do not penetrate into the dense to very dense sand and gravel layer.

   The abutment H-pile lengths are based on a resistance factor of 0.80, which assumes that both a static load test and a dynamic load test are performed using a pile driving analyzer (PDA). We recommend that the static load test be performed on a sacrificial H-pile near boring BB-1 at the north abutment. Dynamic testing should include one test on the static load test pile and one test on one production pile at each abutment (a total of 3 dynamic tests for the abutment H-piles). The resulting minimum required nominal geotechnical axial pile resistance is approximately 192 kips, which is the basis for the pile tip elevations presented on **Table B**.

Actual tip elevations of the piles at the abutments will be determined based on penetration criteria developed from the dynamic pile analyses of the selected pile driving hammer system and the static load test results and are expected to vary due to variations in the density of the granular soil layer. Note that the Structural Engineer should evaluate the Factored Structural Resistance of the pile relative to the combined axial load and bending moment.

Table B: Estimated H-Pile Lengths and Pile Tip Elevations

Abutment	Estimated Pile Length Below Pile Cut-off (ft)	Estimated Pile Tip Elevations[1,2] (ft)
South (Boring BB-3)	58 (See note 3)	El. 60
North (Boring BB-1)	58 (See notes 3 and 4)	El. 59

Notes:

1. Actual pile tip elevations will vary. Pile lengths should be confirmed based on the results of both dynamic and static load testing on a sacrificial test pile prior to the start of production pile installation.
2. Pile resistance should be neglected in fill stratum.
3. Pile lengths are referenced to a pile cut-off elevation of El. 117 for the north abutment and El. 118 for the south abutment.
4. Estimated pile lengths assume no embedment into dense to very dense sand and gravel. Depth to dense to very dense sand and gravel varies.

Settlement of piles driven into the sand and gravel stratum is expected to be less than 1 inch. The recommended pile size accounts for 1/16-inch of sacrificial steel loss for corrosion protection on the exterior of the pile surface and 50 ksi steel.

The recommended pile size herein is based on the axial load and drivability considerations. Lateral analyses based on the actual layout and spacing of the piles at the abutments will be evaluated by the Structural Engineer.

Piles should be spaced such that the center-to-center dimension is at least 2.5 times the width of the pile with a maximum spacing of no greater than 10 feet on-center. The minimum distance required from the edge of pile cap to the center of pile should not be less than 9 inches.

3. Intermediate Pier Foundations – Closed-End Pile Piles

Based on the structural plans dated April 2020, the intermediate piers will be supported on a single row of six, 24-inch diameter steel, closed-end pipe piles. Based on the anticipated factored axial load per pile at the piers (maximum factored load of 305 kips), we recommend that 24-inch diameter, closed-end steel pipe piles with a minimum wall thickness of ½-inch be used to support the design loads. The piles should develop their resistance through side friction in the sand and gravel and the dense to very dense sand and gravel layers and end bearing in the dense to very dense sand and gravel.

Closed-end pipe piles are recommended to increase the side friction and end-bearing resistance of the piles, as compared to open-end pipe piles. Due to the presence of the dense to very dense sand and gravel stratum, we recommend that heavy duty conical point pile driving shoes be installed to limit damage to the pile tips during driving. After pile butts are cut at the cut-off elevations, the piles should be filled with concrete (5,000 psi HP cement concrete).

Pile axial resistance was estimated using procedures from NAVFAC Design Manual 7.02 Foundations & Earth Structures. Recommended pile lengths, and corresponding estimated pile tip elevations are presented in **Table C,** which are based on limiting the effective stress to 20D into the natural sand and gravel and the dense to very dense sand and gravel strata. The unit side friction was also limited to 0.75 ksf in the natural sand and gravel, and 1.0 ksf in the dense to very dense sand and gravel strata based on previous experience on projects in Massachusetts involving driven piles in cohesionless soils.

The pipe pile lengths consider a resistance factor of 0.65, which assumes that dynamic load testing is performed using a pile driving analyzer (PDA) on a minimum of one pile per pier and no less than 2% of all production piles (i.e. one dynamic test at each intermediate pier for a total of 2 dynamic tests on pier piles). Static axial load testing is not recommended to be performed for the intermediate pier pipe piles due to logistics of the piers being located over water. The resulting minimum required nominal geotechnical axial pile resistance is approximately 470 kips, which is the basis for the pile tip elevations presented on **Table C**. Based on lateral analyses performed by Benesch, we understand the required pile tip elevation is El. 55, which is 5 feet below the point of fixity. Therefore, the pile embedment depth is governed by lateral loading demands rather than axial load demands.

Table C: Estimated Pipe Pile Lengths and Pile Tip Elevations for Axial Design

Intermediate Pier	Estimated Pile Length Below Scoured Mudline for Axial Geotechnical Resistance (ft)	Estimated Pile Tip Elevation for Axial Geotechnical Resistance[1,2,4] (ft)
South (Boring BB-2)	37.5 (See notes 2, 3 and 4)	El. 62
North (Boring BB-2)	37.5 (See notes 2, 3 and 4)	El. 62

Notes:
1. Actual pile tip elevations will vary. Pile lengths should be confirmed based on the results of dynamic load testing on the first pile to be driven at each pier.
2. Mudline elevation assumed to be El. 102. Pile tip length and pile tip elevation account for 2.5 feet of scour and therefore, pile tip elevation is referenced to an assumed scoured mud line elevation at El. 99.5.
3. Add length of pile above scoured mudline to proposed cut-off elevation for overall pile length.
4. Piles should be driven deeper (to El. 55) to obtain lateral fixity based on the results of lateral pile analyses performed by Benesch.

Settlement of piles driven into the dense to very dense sand and gravel stratum is expected to be less than 1 inch. The recommended pile size accounts for 1/16-inch of sacrificial steel loss for corrosion protection on the exterior of the pile surface and 50 ksi steel. For additional corrosion protection, we recommend the pile be coated with coal tar epoxy to a minimum depth of at least 10 feet below the mudline.

The recommended pile size herein is based on the axial load and drivability considerations. Lateral analyses based on the actual layout and spacing of the piles at the abutments will be evaluated by the Structural Engineer.

Piles should be spaced such that the center-to-center dimension is at least 2.5 times the width of the pile with a maximum spacing of no greater than 10 feet on-center. The minimum distance required from the edge of pile cap to the center of pile should not be less than 9 inches.

4. Lateral Load Analysis and Parameters

The lateral load resistance of piles to be used to support the integral abutments and intermediate piers will be evaluated by Benesch. We recommend that a computer program (e.g. LPILE) be used for the lateral pile analyses (as opposed to using MassDOT's simplified design method procedure). Recommended soil parameters for use in the lateral pile analysis are presented on attached **Table 2**. Lateral pile analyses of the intermediate piers should consider scour based on the results of the hydraulic study performed by MassDOT. Also, installation of batter piles may help resist lateral loads at the intermediate piers.

Upon completion of the lateral pile analyses for the integral abutment piles, the depth of piles need to be checked to verify that the pile embedment satisfies both the needs of axial geotechnical factored resistance as well as depth to fixity, defined as the depth along the pile to the second point of zero lateral deflection.

5. Bridge Abutments

The following parameters are recommended for evaluating the lateral load resistance of the integral abutments:

- horizontal spring coefficient (K): 3 to 4 kips/inch per square foot of abutment wall
- maximum passive resistance in kips per foot of wall: $0.14H^2$ (where H is the height of the stub abutment in feet). This maximum passive resistance incorporates a factor of safety of 1.5 on the passive earth pressure coefficient Kp.

These values are based on the degree of compaction of the fill behind the abutment of at least 95%, a friction angle of 34 degrees, and a minimum unit weight of backfill (free-draining Gravel Borrow) of 120 pcf.

Additional lateral pressures due to highway traffic surcharge and seismic loads should be used as required by 2017 AASHTO LRFD Bridge Design Specifications and the 2013 MassDOT LRFD Bridge Design Manual. However, based on Section 3.3.1.3 of the 2013 MassDOT LRFD Bridge Manual, if approach slabs are used, the AASHTO live load surcharge load on the abutment can be ignored.

Abutment walls above the water table should be backfilled with free-draining Gravel Borrow (M1.03.0, Type b) and provisions made for weep holes in the walls. Gravel Borrow should be in accordance with Section M of the MassDOT Standard Specifications for Highways and Bridges.

6. Approach Slabs

Approach slabs are recommended for construction of the new bridge abutments. The approach slabs should be free to rotate about the abutment. The intent is to avoid abrupt differential settlement between the abutments and the approach embankment backfill.

7. Seismic Design

Seismic Site Class

The subsurface profile at this site is representative of Site Class D. This site class is based on SPT N-values obtained from the recent borings evaluated in accordance with Section 3.4.2.1 of AASHTO Guide Specifications for LRFD Seismic Bridge Design. In accordance with Section 3.4.2 of the MassDOT LRFD Bridge Manual and 3.4.1 of 2011 AASHTO Guide Specifications for Seismic Design Manual, for Site Class D, we recommend the design response spectra for the bridge be constructed using the following parameters:

As = 0.094g SD_S = 0.209g SD_1 = 0.093g

where: As is the response spectral acceleration based on Site Class D
SD_S is the design spectral acceleration coefficient at 0.2-second period
SD_1 is the design spectral acceleration coefficient at 1.0-second period

In accordance with Table 3.5-1 of the 2011 AASHTO Guide Specifications for LRFD Seismic Bridge Design, and based on an SD_1 less than 0.15g, the Seismic Design Category (SDC) for the site is SDC A. Refer to **Appendix F** for the Seismic Site Class Analysis.

Liquefaction Analysis

In accordance with the 2011 AASHTO Guide Specifications for LRFD Seismic Bridge Design, a liquefaction analysis is not required for SDC A bridges. However, based on relatively low SPT N-values noted in bridge boring BB-2 within the sand and gravel layer, GZA performed a level-ground liquefaction assessment using the methodology described by Idriss and Boulanger, 2008. An acceleration value of 0.052g was used to perform the analyses which were based on the site class evaluation previously described.

The results of the liquefaction analysis indicate that, for the design earthquake, the site soils have a low potential for liquefaction (FS greater than 1.4). Therefore, soils at the site are not judged susceptible to liquefaction.

CONSTRUCTION

1. Pile Load Testing and Production Pile Installation

As noted in Design Item 2 above, a static load test should be performed on one sacrificial H-pile to confirm the design parameters used for side friction and end bearing. The static load test should be performed on a sacrificial H-pile near boring BB-1 at the north abutment prior to the start of construction and prior to ordering any production piles for the project to verify pile lengths. After loading the load test pile to the nominal axial geotechnical resistance, the load test pile should be reloaded to “failure” or to 150 percent of the nominal geotechnical resistance, whichever occurs first. The final location of the test pile should be selected by the Contractor in agreement with the Engineer but should be as close as possible to the existing bridge abutments.

Dynamic load testing (PDA) on the test pile and on driven piles during production installation will be required. We recommend that dynamic load testing (with signal matching) be performed on the sacrificial test pile and at the first pile to be driven at each substructure (for a minimum total of at least 5 piles, including the test pile plus one production pile at each abutment and intermediate pier). Dynamic testing should be performed during initial pile driving, and also, 48 hours after the end of initial driving in order to evaluate possible relaxation at the pile tip.

Preliminary Wave Equation Analyses (WEAP) have been performed to evaluate the driving resistances and stresses induced on the abutment and intermediate pier piles during pile driving based on anticipated subsurface conditions. Since the actual type of pile driving hammer has not yet been selected, the WEAP were performed assuming commonly available diesel hammers. The results indicate that the estimated driving stresses for the piles are anticipated to be within the allowable limits (0.9 times the yield strength of steel, Fy). WEAP will need to be performed by the Contractor based on the actual pile driving hammer selected by the Contractor. The results of the preliminary WEAP are provided in **Appendix H**.

Prior to installation and testing of piles, the Contractor should be required to submit, for review and acceptance by the Engineer, preliminary pile driving criteria for each pile type to be installed and tested based on WEAP performed by the Contractor for the Contractor’s proposed driving system. The final driving criteria for abutment

production piles will be selected by the Contractor based on the results of dynamic and static load testing. The final driving criteria for intermediate pier production piles will be selected by the Contractor based on the results of dynamic load testing. Installation of piles and static pile load testing should be observed by experienced geotechnical personnel.

2. Obstructions

During driven pile installation for foundations and/or sheet piling installation for cofferdams, there is the potential for encountering obstructions in the overburden soils, such as gravel layers, possible cobbles and boulders, as well as the existing pile foundations. It is possible that some timber piles from the existing bridge foundations may need to be removed to avoid conflict with the proposed piles.

The project specifications should make the Contractor aware of these conditions and Contractor's submittals should include means and methods for penetrating and/or removing potential obstructions when encountered during construction. Obstruction removal should not start without prior notification to and acceptance by the Engineer.

3. Construction Dewatering and Temporary Excavation Support

Temporary earth support and water control are anticipated during construction. Earth support and groundwater/surface water control measures are anticipated to consist of:

- Temporary earth support behind the existing abutments to allow for staged construction. Excavations up to about 15 feet below existing grade will be required for construction of the new bridge abutments. Feasible earth support systems include, but are not limited to, sheet piles, drilled micropiles and/or driven soldier piles with lagging. Use of a combination of either temporary tiebacks, deadman and/or internal bracing are likely to be required for portions of the temporary earth support. The temporary earth support will need to be designed for both roadway and where applicable, construction surcharges (e.g. excavator and crane loads).
- Sandbag cofferdams around the existing and new proposed intermediate piers for river water control. Installation of the cofferdams will need to consider access and potential headroom constraints due to staged construction.
- Dewatering within the intermediate pier cofferdams and bridge abutment excavations. The method of dewatering will depend on the type of cofferdam or earth support system, size of the open excavation, the length of time the excavation is left open, and the time of year, particularly with regard to river flow velocity and level.

The cofferdam/earth support and dewatering designs are integral with one another and should be submitted as a single submittal for review by the Engineer. Cofferdam, temporary earth support and dewatering systems should be selected by the Contractor and designed by an experienced registered Professional Engineer in the Commonwealth of Massachusetts and retained by the Contractor.

Dewatering efforts must satisfy requirements of local, state, and federal environmental and conservation authorities.

4. Protection of Existing Bridge and Structures

We recommend monitoring of vertical and lateral movement using survey reference points be performed for the existing bridge since the driven piles and sheeting for cofferdams will likely involve the use of vibratory and impact driving methods and also, since the eastern half the existing bridge will remain in service to allow for phased construction. Requirements for monitoring and limiting criteria should be included in the special provisions. In

addition, the need for temporary lateral bracing to stabilize the existing bridge bents should also be evaluated and included in the contract drawings and/or special provisions, if required.

5. Contract Documents and Construction Monitoring

We recommend that GZA be retained to provide geotechnical review and monitoring services during construction. Services may include observation of driven pile installation; review of wave equation analyses and review of static and dynamic load testing of piles, review of deformation survey monitoring data; and in general, observation for compliance with recommendations in this report and the contract documents. This construction oversight is considered an important part of obtaining quality site improvements.

CLOSING

We trust the information presented herein is sufficient for your use. We look forward to our continued involvement with this project as it moves towards construction. Please contact us if you have any questions.

Very truly yours,
GZA GEOENVIRONMENTAL, INC.

Michael P. Smith, P.E.
Senior Project Manager

Andrew R. Blaisdell, P.E.
Consultant/Reviewer

Terese M. Kwiatkowski, P.E.
Senior Principal

ATTACHMENTS

TABLES

Table 1 – Summary Table of Subsurface Conditions
Table 2 – Summary Table of Subsurface Conditions
Table 3 – Summary Table of Environmental Testing Results

FIGURES

Figure 1 – Site Locus Plan
Figure 2 – Exploration Location Plans
Figure 3 – Subsurface Profile A–A'

APPENDICES

Appendix A – Limitations
Appendix B – Available Existing Bridge Drawings
Appendix C – Recent Boring Logs
Appendix D – Geotechnical Laboratory Test Results
Appendix E – Calculations
Appendix F – Seismic Design Parameters
Appendix G – Environmental Laboratory Test Results
Appendix H – Preliminary Wave Equation Analysis Results

TABLES

TABLE 1

Bay Road (Route 47) over Fort River River, Hadley, Massachusetts
Summary of Subsurface Conditions

Boring No.	Bridge Structure	Top of Stratum Elevation (ft)					Approximate Stratum Thickness (ft)			Groundwater Elevation (ft)	Depth to Bottom of Exploration (ft)
		Approx. Ground Surface/ Mud Line El.	Fill	Sand and Gravel	Dense to Very Dense Sand and Gravel	Bottom of Exploration	Fill	Sand and Gravel	Dense to Very Dense Sand and Gravel		
Recent Borings											
BB-1	North Abutment	125	125	109	72	59	16	37	13	109	66
BB-2	Intermediate Piers	105	NE	105	72	59	NE	33	13	See Note 3	46
BB-3	South Abutment	126	126	109	83	66	17	26	17	111	60
Previous (1935) Borings											
No.1	South Abutment	109	NE	109	79	75	NE	30	4	NR	34
No.2	South Abutment	110	NE	110	80	78	NE	30	2	NR	32
No.3	Intermediate Piers	107	NE	107	82	75	NE	25	7	NR	32
No.4	Intermediate Piers	110	NE	110	80	75	NE	30	5	NR	35
No.5	North Abutment	108	NE	108	73	70	NE	35	3	NR	38
No.6	North Abutment	108	NE	108	73	71	NE	35	2	NR	37

NE - Not Encountered; NR - Data not reported

Notes:

1) Depths shown are below existing ground surface for borings BB-1 and BB-3, and below mudline for BB-2.
2) Ground surface elevation estimated based on available GIS data from a drawing entitled "Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA" prepared by GZA, dated August 24, 2017.
3) Boring BB-2 was drilled through the bridge deck, water in casing was approximately at the river level at the end of drilling.
4) Refer to the boring logs in Appendices B and C for additional information.

TABLE 2
RECOMMENDED LATERAL ANALYSIS DESIGN PROFILES & PARAMETERS
BAY ROAD OVER FORT RIVER BRIDGE, HADLEY, MA

Table 2A
Recommended Soil Design Profiles (Depths Below Ground Surface) & Design Groundwater (Elevation)

Boring (Location)	Fill (Layer A)	Sand & Gravel (Layer B)	Dense to Very Dense Sand & Gravel (Layer C)	Design Groundwater Elevation
BB-1 (North Abutment	0 to 16	16 to 53	53 to 66	El. 107 ft
BB-2 (Center Pier)	--	0 to 33	33 to 46	
BB-3 (South Abutment)	0 to 17	17 to 43	43 to 60	

Notes:

1. Depths shown are below existing ground surface for borings BB-1 and BB-3, and below mudline for BB-2.
2. For preliminary design, use a groundwater elevation equal to the Fort River ordinary high water elevation of El. 107 ft (NAVD 88).
3. Refer to the boring logs in Appendix C for additional information.

Table 2B
Recommended Lateral Analysis Design Parameters

	Layer A	Layer B	Layer C
Soil Type	Fill	Sand & Gravel	Dense to Very Dense Sand & Gravel
Soil Type for p-y Curve Criteria	Sand (Reese et al, 1974)	Sand (Reese et al, 1974)	Sand (Reese et al, 1974)
Elevation	See Table 2A	See Table 2A	See Table 2A
Ø (degrees)	30	32	34
k (pci)	45 (above gwt) 35 (below gwt)	-- 55 (below gwt)	-- 90 (below gwt)
ϒ' (pcf)	120 (above gwt) 57 (below gwt)	-- 62 (below gwt)	-- 67 (below gwt)

Notes:

1. Parameters are recommended for use in the computer program LPile or Group to estimate lateral pile resistance and deformation.
2. Recommended parameters are based on data from borings and geotechnical laboratory data from samples collected during the 2017 exploration program at the site.
3. Abbreviations:

ϒ' = effective unit weight

Ø = angle of internal friction

e_{50} = strain (at 50% maximum principal stress difference)

UCS = uniaxial compressive strength

pcf = pounds per cubic foot, psf = pounds per square foot, pci = pounds per cubic inch

File No.: 01.0173284.00

TABLE 3

Summary Table of Environmental Testing Results

BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

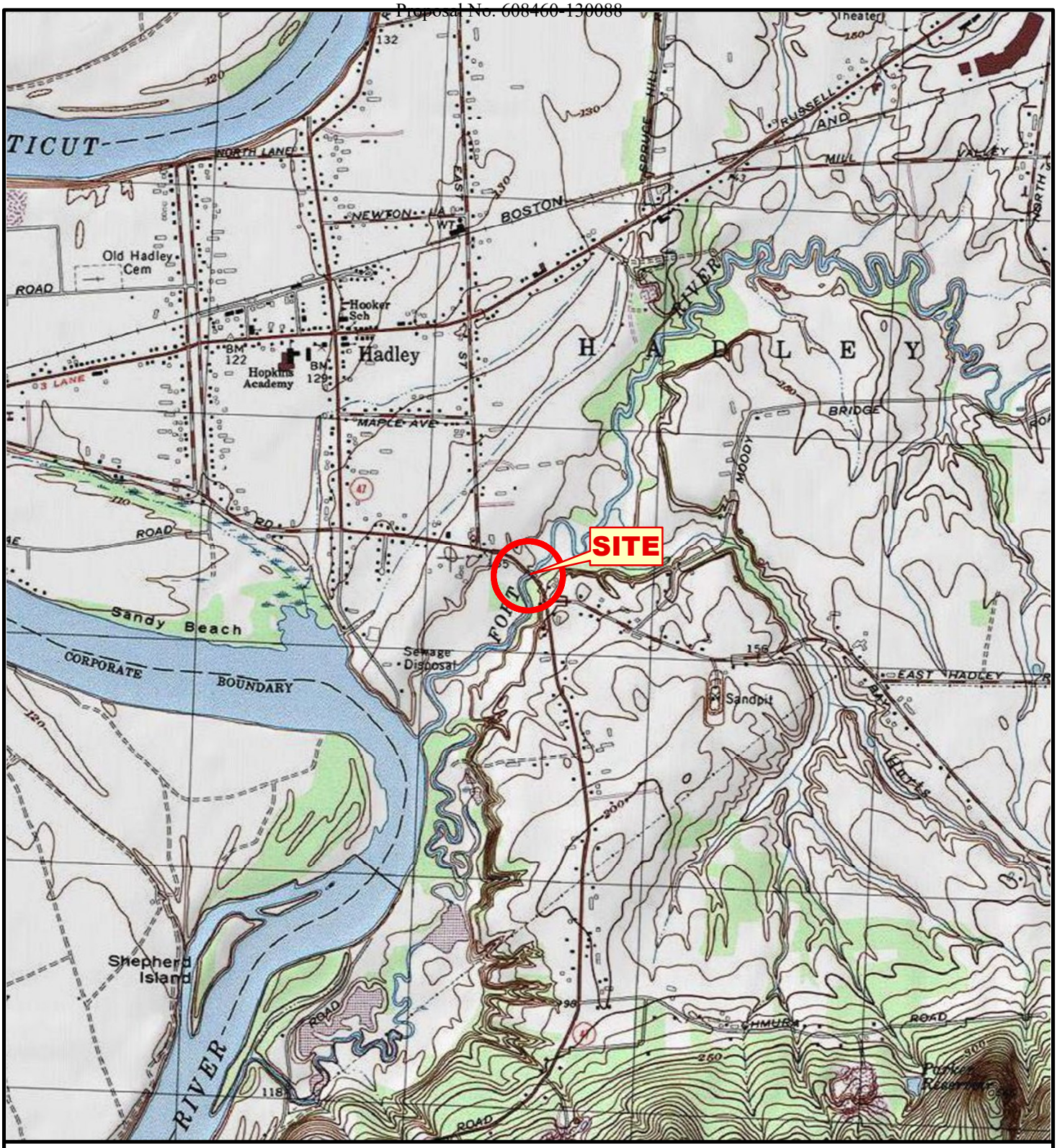
BRIDGE NO. H-01-005

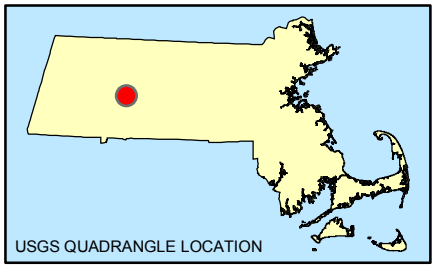
Sample Name:	BRP2	BRP3	BRP4	BRUS-A	BRUS-B	BRUS-C	BRD5	REPORTABLE / DISPOSAL CRITERIA: MA COMM 97 Lined	MA COMM 97 Unlined	MA RCS1
Volatile Organic Compounds (VOCs) EPA Method 8260C (µg/kg dry)										
Naphthalene	**11.7**	< 3.62	33.4	< 4.34	< 5.53	< 6.53	< 5.13	100000	100000	4000
Total VOCs	11.70	0.00	33.400	0.00	0.00	0.00	0.00			
Semi-Volatile Organics EPA Method 8270D (µg/kg dry)										
Anthracene	**103.00**	**87**	**232**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	1000000
Benzo(a)Anthracene	**149.00**	**125**	**146**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	7000
Benzo(a)Pyrene	**80.30**	< 73.1	< 84.8	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	2000
Benzo(b)Fluoranthene	**98.50**	< 73.1	**97**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	7000
Benzo(k)Fluoranthene	**95.50**	< 73.1	< 84.8	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	70000
Chrysene	**147.00**	**111**	**147**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	70000
Fluoranthene	**404.00**	**314**	**498**	< 75.3	< 83.1	< 89.9	86.1	100000	100000	1000000
Phenanthrene	**216.00**	**192**	**431**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	10000
Pyrene	**335.00**	**255**	**396**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	1000000
Total SVOCs	95.50									
Semi-Volatile Organics MADEP EPH 5/2004 R (mg/kg dry)										
Unadjusted C11-C22 Aromatic Hydroca	**15.40**	< 10.9	**13**	< 11.2	< 12.3	< 13.4	< 11.9			
Phenanthrene	**216.00**	**192.00**	**431**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	10000
Fluoranthene	**404.00**	**314.00**	**498**	< 75.3	< 83.1	< 89.9	**86.1**	100000	100000	1000000
Pyrene	**335.00**	**255.00**	**396**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	1000000
Chrysene	**147.00**	**111.00**	**147**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	70000
Total SVOCs	2841.200	1955.500	*3431.400*	0.00	0.00	0.00	*172.200*		100	100
Organochlorine Peticides EPA Method 8081B (ug/Kg)										
4,4'-DDD	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			8000
4,4'-DDE	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			6000
4,4'-DDT[2C]	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			6000
a-BHC	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			50000
Alachlor	< 5.74	< 5.50	< 6.31	< 7.5	< 8.4	< 8.7	< 7.9			100000
Aldrin	< 5.74	< 5.50	< 6.31	< 3.8	< 4.2	< 4.4	< 4.0			80
b-BHC	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			10000
Chlordane	< 23.0	< 22.0	< 25.2	< 38	< 42	< 44	< 40			5000
d-BHC	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			10000
Dieldrin	< 5.74	< 5.50	< 6.31	< 3.8	< 4.2	< 4.4	< 4.0			80
Endosulfan I	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			500
Endosulfan II	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			500
Endosulfan sulfate	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			
Endrin	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			10000
Endrin aldehyde	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			10000
Endrin ketone	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			
g-BHC	< 3.44	< 3.30	< 3.78	< 1.5	< 1.7	< 1.7	< 1.6			3
Heptachlor	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			300
Heptachlor epoxide	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			100
Hexachlorobenzene	NT	NT	NT	< 3.8	< 4.2	< 4.4	< 4.0			
Methoxychlor	< 9.18	< 8.80	< 10.1	< 38	< 42	< 44	< 40			200000
Toxaphene	< 115	< 110	< 126	< 150	< 170	< 170	< 160			10000
Organochlorine Peticides EPA Method 8081B (µg/kg dry)										
alpha-Chlordane	< 5.74	< 5.50	< 6.31	NT	NT	NT	NT			10000
gamma-Chlordane	< 5.74	< 5.50	< 6.31	NT	NT	NT	NT			
Chlorinated Herbicides EPA Method 8151A (ug/Kg)										
2,4,5-T	< 94	< 97	< 100	< 94	< 110	< 110	< 98			100000
2,4,5-TP (Silvex)	< 94	< 97	< 100	< 94	< 110	< 110	< 98			100000
2,4-DB	< 190	< 190	< 200	< 190	< 220	< 220	< 200			100000
2,4-DB	< 190	< 190	< 200	< 190	< 220	< 220	< 200			100000
Dalapon	< 94	< 97	< 100	< 94	< 110	< 110	< 98			1000000
Dicamba	< 94	< 97	< 100	< 94	< 110	< 110	< 98			500000
Dichloroprop	< 140	< 140	< 150	< 140	< 160	< 160	< 150			
Dinoseb	< 94	< 97	< 100	< 94	< 110	< 110	< 98			500000
MCPA	< 28000	< 29000	< 30000	< 28000	< 32000	< 33000	< 29000			100000
MCPP	< 28000	< 29000	< 30000	< 28000	< 32000	< 33000	< 29000			
Metals EPA Method 6010C (mg/kg dry)										
Arsenic	**2.45**	**1.6**	**2.4**	**2**	**1**	**3**	**2.9**	40	40	20
Cadmium	< 0.559	< 0.505	< 0.595	< 0.40	< 0.38	< 0.43	< 0.37	80	30	70
Chromium	**6.44**	**4.8**	**6.6**	**12**	**6**	**24**	**4.5**	1000	1000	100
Copper	**8.5**	**4.3**	**5.9**	**10**	**3**	**18**	**3.7**			1000
Lead	**8.81**	**5.8**	**6.6**	**9**	**7**	**15**	**2.9**	2000	1000	200
Nickel	**5.84**	**3.6**	**6.1**	**10**	**5**	**17**	**4.1**			600
Zinc	**25.9**	**19.6**	**57.5**	**46**	**23**	**82**	**20.9**			1000
Metals EPA Method 7471B (mg/kg dry)										
Mercury	< 0.0322	< 0.0316	< 0.0351	< 0.03	0.09	< 0.03	**0.1**	10	10	20
Reactivity EPA Ch. 7.3 (mg/kg dry)										
Reactive Cyanide	< 24.4	< 24.8	< 24.4	< 24.5	< 24.9	< 22.9	< 23.3			30
Reactive Sulfide	< 48.8	< 49.5	< 48.7	< 48.9	< 49.8	< 45.8	< 46.5			
Conductivity (uS/cm) EPA 9050A										
Specific Conductance (EC)	**150**	**96.8**	**174**	**35.1**	**46.5**	**38.8**	**67.1**			
Total Organic Carbon EPA Method 9060A/L. Kahn (mg/kg)	**5300**	**2400**	**3800**	**6900**	**8100**	**10000**	**2100**			
Percent Solid	**88.00**	**85.0**	**82.0**	**88.00**	**77.00**	**75.00**	**84.0**			
Date of Sample Collection	8/21/2017	8/21/2017	8/21/2017	9/25/2017	9/25/2017	9/25/2017	9/25/2017			

Notes:

1. Environmental samples were collected by GZA personnel. Analyses were performed by Eurofins Laboratory in Agawam, Massachusetts.
2. Bold text indicates that the reported concentration exceeds the RDL.
3. Where RCS-1 and MA Landfills columns are blank, no limiting criteria has been established.
4. VOC and SVOC constituents that were not detected were omitted from this table.
5. NT indicates analyte Not Tested;
6. <# (e.g.<94) indicates the analyte was not detected over the reportable detection limit (RDL).
7. Reportable Disposable limits in µg/kg or in mg/kg

FIGURES





SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

Data Supplied by : esri

0 1,000 2,000 4,000 6,000

SCALE IN FEET

N W E S

PROJ. MGR.: STS
DESIGNED BY: STS
REVIEWED BY: TMK
OPERATOR: ADP

DATE: 12-04-2017

LOCUS PLAN

JOB NO. 01.0173284.00

MASSDOT PROJ. NO. 608460 - BRIDGE NO. H-01-005
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

FIGURE NO. 1

© 2017 - GZA GeoEnvironmental, Inc., J:\170,000-179,999\173284\173284-00.STS\FIGURES\GIS\MXD\173284_SiteLocus_FIG1.mxd, 12/4/2017, 2:01:40 PM, anthony.pungitore



No.1 Previous Borings

LEGEND

BR-P2 SCOUR SAMPLE LOCATION

BB-1 BRIDGE BORING

SUBSURFACE PROFILE A–A'

NOTES:

1. THE BING AERIAL BACKGROUND WAS PROVIDED BY MICROSOFT CORPORATION ON JULY 3, 2017.
2. THE LEVEL 3 ASSESSORS' PARCEL MAPPING DATA SET WAS DEVELOPED THROUGH COMPETITIVE PROCUREMENT FUNDED BY MASSGIS. THE SPECIFICATION FOR THIS WORK WAS LEVEL 3 OF THE MASSGIS DIGITAL PARCEL STANDARD. THIS DATA WAS DISTRIBUTED BY MASSGIS ON APRIL 28, 2017.
3. BRIDGE BORINGS BB–1, BB–2, AND BB–3 PERFORMED BY SEABOARD DRILLING, INC. BETWEEN OCTOBER 30, 2017 AND NOVEMBER 1, 2017 AND OBSERVED BY GZA.
4. LOCATION OF PREVIOUS BORINGS OBTAINED FROM EXISTING BRIDGE DESIGN DRAWINGS ENTITLED "PROPOSED BRIDGE, HADLEY, BAY ROAD, STATION 205+10 OVER FORT RIVER"
5. BORING LOCATIONS BASED ON TAPED MEASUREMENTS AND/OR LINE OF SIGHT FROM EXISTING SITE FEATURES. EXPLORATION LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. BORING LOCATIONS SHOWN HEREIN SHOULD BE CONSIDERED APPROXIMATE.
6. BRIDGE BORINGS (BB SERIES) WERE PERFORMED FROM THE BAY ROAD BRIDGE DECK (BB–2), AND FROM THE ROADWAY (BB–1, BB–3).
7. THE GROUND SURFACE CONTOURS AND EDGE OF WATER WERE GENERATED FROM THE MASSGIS DIGITAL TERRAIN MODEL (DTM) FILES. THIS DATA IS MAINTAINED BY MASS GIS AND WAS LAST UPDATED ON APRIL 9, 2013.

0 20 50 100

SCALE: 1" = 20'

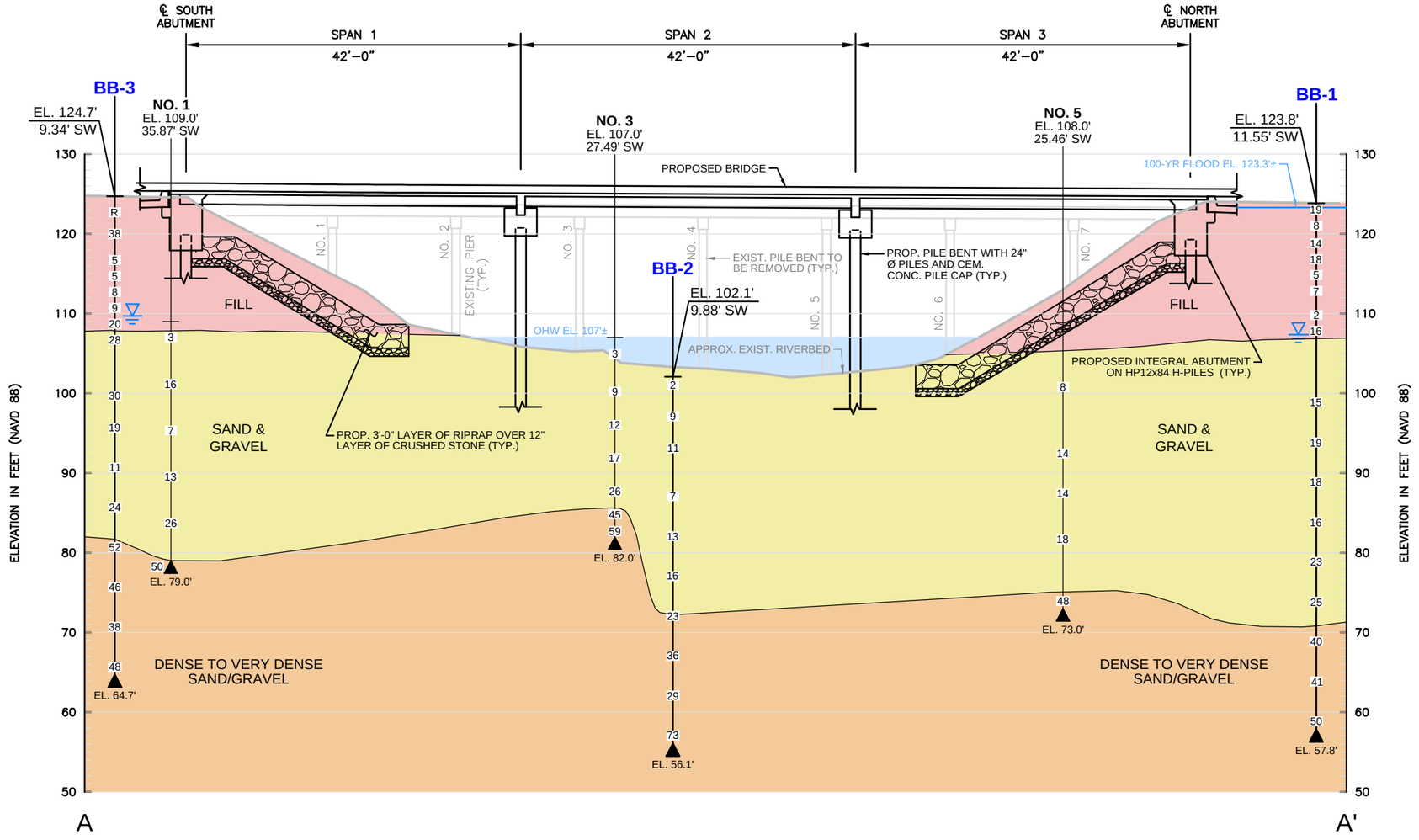
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

PROPOSED BRIDGE
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

EXPLORATION LOCATION PLAN

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		benesch	
PROJ MGR: STS	REVIEWED BY: STS	CHECKED BY: TMK	FIGURE 2
DESIGNED BY: STS	DRAWN BY: ADP	SCALE: 1" = 20 FEET	
DATE: 03-22-2018	PROJECT NO. 01.0173284.00	REVISION NO.	

© 2013 – GZA GeoEnvironmental, Inc. G:\ZA–1\170,000–179,999\173284\173284–00.STS\FIGURES\CAD\DWG\608460_BR1–2(H01005).dwg [Sheet1_GZA–TB] March 22, 2018 – 2:59pm anthony.pungitore



LEGEND

- BB-3 — BORING NO.
- EL. 124.7' / 9.34' SW — ELEVATION AT BORING / OFFSET DISTANCE FROM PROFILE LINE
- GROUND SURFACE OR MUDLINE
- 48 — STANDARD PENETRATION RESISTANCE (SEE NOTE 6)
- GROUNDWATER ELEVATION (FT)
- R — REFUSAL
- EL. 64.7' — BOTTOM OF BORING (ELEVATION)

LITHOLOGY KEY

- WATER
- FILL
- SAND / GRAVEL
- DENSE TO VERY DENSE SAND / GRAVEL

VERTICAL SCALE IN FEET
0 8 16 32
0 8 16 32
HORIZONTAL SCALE IN FEET

NOTES:

1. REFER TO FIGURE 2 FOR THE LOCATION OF PROFILE LINE A-A'.
2. EXISTING AND PROPOSED BRIDGE PROFILES BASED ON AN ELECTRONIC DRAWING ENTITLED "608460_BR04-09_ELEV&XSECT.DWG," PREPARED BY ALFRED BENESCH AND COMPANY, DATED SEPTEMBER 29, 2017.
3. STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND ARE BASED ON CONDITIONS OBSERVED BY GZA'S FIELD REPRESENTATIVE. ACTUAL CONDITIONS MAY VARY.
4. SUBSURFACE INFORMATION BASED ON BORINGS PERFORMED BY SEABOARD DRILLING INC. BETWEEN OCTOBER 30, 2017 THROUGH NOVEMBER 8, 2017 AND BORINGS PERFORMED FOR THE EXISTING BRIDGE DATED 1935.
5. WATER SURFACE MEASUREMENTS WERE MADE UNDER CONDITIONS STATED ON THE BORING LOGS. THIS DATA HAS BEEN REVIEWED AND INTERPRETATIONS ARE MADE IN THE TEXT OF THIS REPORT. FLUCTUATIONS OF THE WATER SURFACE MAY OCCUR.
6. METHOD USED TO PERFORM HISTORIC BORINGS WAS NOT NOTED ON THE1935 DRAWINGS. BLOW COUNT VALUES INDICATE " BLOWS PER FOOT ON SPOON" USING A 250lb HAMMER.

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

PROPOSED BRIDGE
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

SUBSURFACE PROFILE A-A'
(EAST SIDE OF BRIDGE)

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: benesch	
PROJ MGR: STS	REVIEWED BY: STS	CHECKED BY: TMK	FIGURE 3
DESIGNED BY: STS	DRAWN BY: ADP	SCALE: AS SHOWN	
DATE: 03/22/2018	PROJECT NO. 01.0173284.00	REVISION NO.	

© 2018 – GZA GeoEnvironmental, Inc. GZA–J:\170,000–179,999\173284\173284–00.STS\FIGURES\CAD\DWG\GZA_608460_BR04–09_Elev&XSect_v2.dwg [PROFILE_16SCALE] March 26, 2018 – 11:11am anthony.pungitore

APPENDIX A

REPORT LIMITATIONS

GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of Alfred Benesch & Company for the stated purpose(s) and location(s) identified in the Proposal for Services and/or report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

4. The generalized soil profile(s) provided in our report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.

5. In preparing this report, GZA relied on certain information provided by Alfred Benesch & Company state and local officials, and/or other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

6. Groundwater levels have been based on observations at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The groundwater levels encountered in the course of the work may differ from that indicated in the report.

7. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

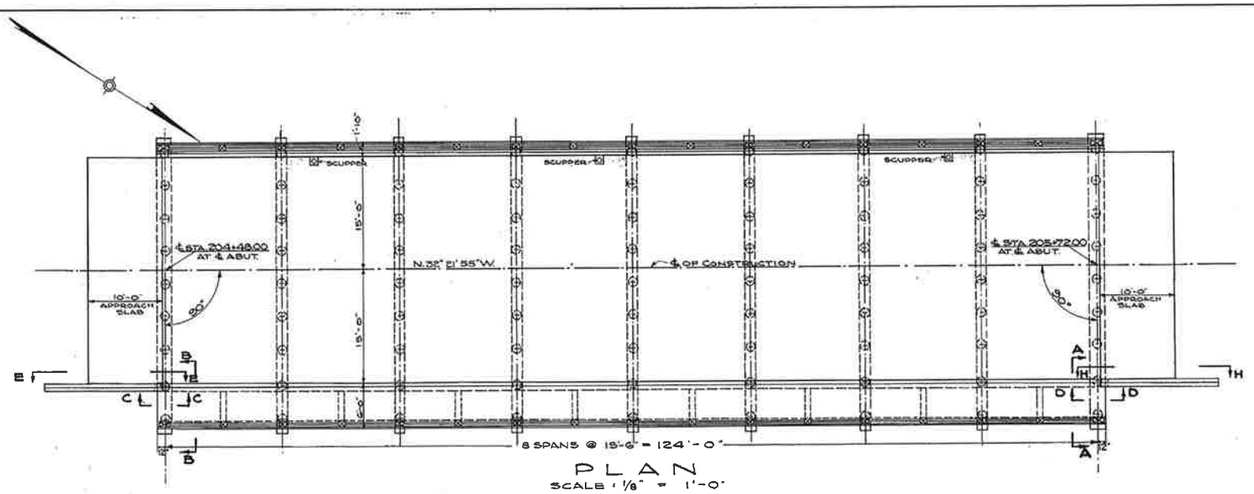
8. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

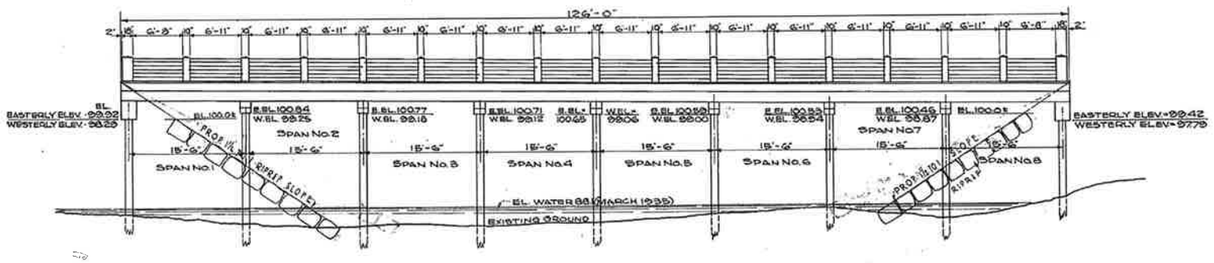
9. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B

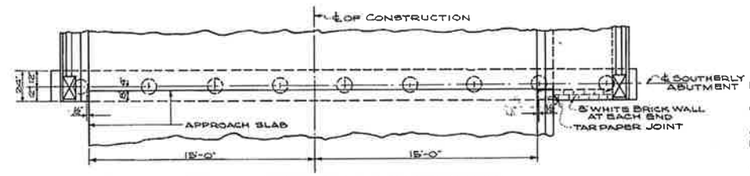
EXISTING BRIDGE PLANS



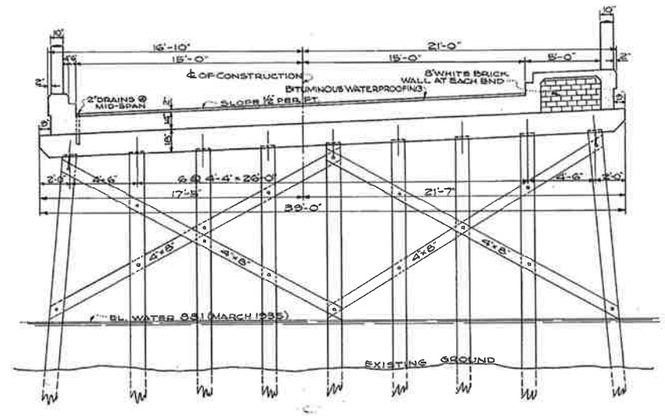
PLAN
SCALE: 1/8" = 1'-0"



EASTERLY ELEVATION
SCALE: 1/8" = 1'-0"



PLAN AT SOUTHERLY ABUTMENT
NORTHERLY ABUTMENT OPPOSITE HAND
SCALE: 1/4" = 1'-0"



TYPICAL CROSS SECTION
SHOWING TRANSVERSE BRACING
(BRACING OCCURS AT BENTS 2,3,4,5, & 6 ONLY)
SCALE: 1/4" = 1'-0"

QUANTITIES

EXCAVATION (LEDGE)	5 CU. YDS.
EXCAVATION (CHANNEL)	1100 CU. YDS.
CONCRETE (1:2:4) REINFORCED)	264 CU. YDS.
CONCRETE (1:2:4) REINF.-FENCES)	72 CU. YDS.
RIPRAP	470 CU. YDS.
PILES (CREOSOTED) YELLOW PINE)	3000 LIN. FT.
LUMBER (CREOSOTED) YELLOW PINE)	230 M. BD. FT.
TESTING PILE	1 PILE
WATERPROOFING (BITUMINOUS)	415 SQ. YDS.
STEEL (REINFORCING)	62,000 LBS.
SURFACING (TYPE E) BITUMINOUS)	52 TONS
SCUPPERS	5 EACH

GENERAL NOTES

FINISH: ALL EXPOSED SURFACES TO BE RUBBED SMOOTH WITH CORUNDUM BRICK AND LEFT FREE FROM ALL FORM MARKS AND IMPERFECTIONS.

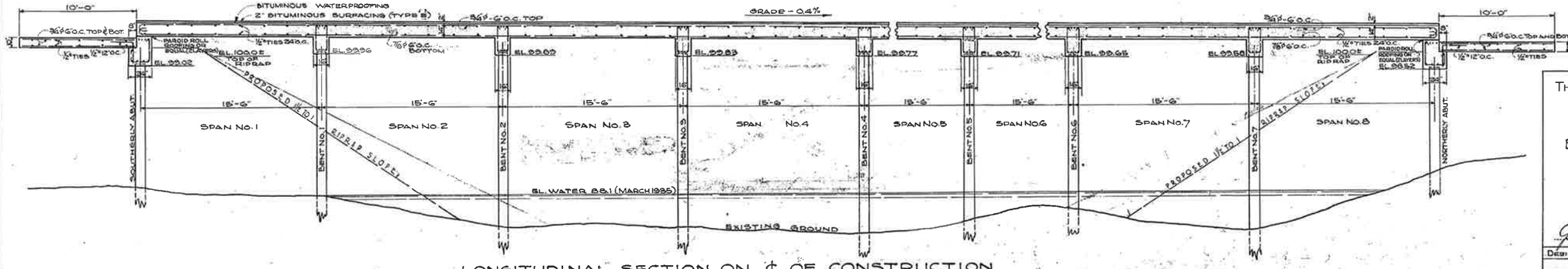
DATE: TO BE PLACED IN CENTER OF INSIDE FACE OF NORTHWESTERLY AND SOUTHEASTERLY END POSTS. FOR SIZE AND CHARACTER OF NUMERALS SEE DETAILS ON ANOTHER SHEET.

STEEL: ALL REINFORCEMENT TO BE DEFORMED BARS

BENCH MARK: BENT 3PK. 48" MAPLE STA. 203+25 RT. ELEV. = 109.07 NOT U.S.C. & G.S.

TIMBER FASTENING: ALL FASTENINGS SHALL BE ⅞" GALVANIZED SCREW BOLTS WITH 3"x3"x⅜" WASHERS, AT LEAST ONE BOLT TO BE USED AT EACH INTERSECTION.

DESIGN LOADING: REVIEW OF DESIGN SHOWS BRIDGE GOOD FOR A LOADING OF H-20.



LONGITUDINAL SECTION ON ℄ OF CONSTRUCTION
SCALE: 1/4" = 1'-0"

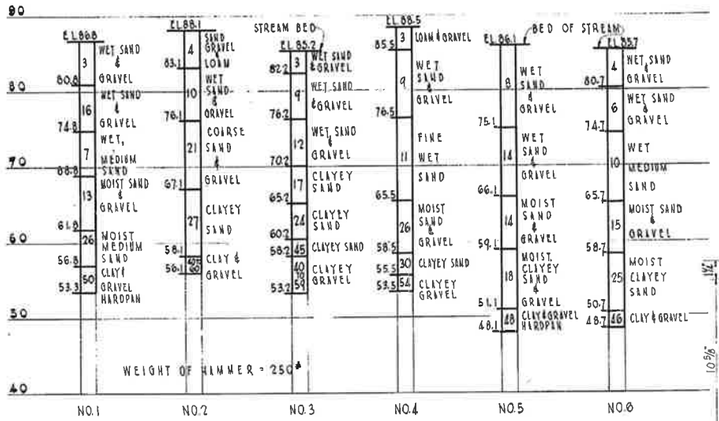
THE COMMONWEALTH OF MASSACHUSETTS
PROPOSED BRIDGE
HADLEY
BAY ROAD · STATION 205+10
OVER FORT RIVER
SCALES AS NOTED
OFFICE OF
DEPARTMENT OF PUBLIC WORKS
100 NASHUA ST. — BOSTON MASS.
AUGUST 1935

BRIDGE ENGINEER ..... CHIEF ENGINEER

DESIGNED BY L.H.Q. TRACED BY A.S.B. CHECKED BY A.R.M.

DATE OF ISSUE				
ADVERTISING	CONSTRUCTION			

SHEET 1 OF 2 SHEETS BRIDGE NO. H-I-5



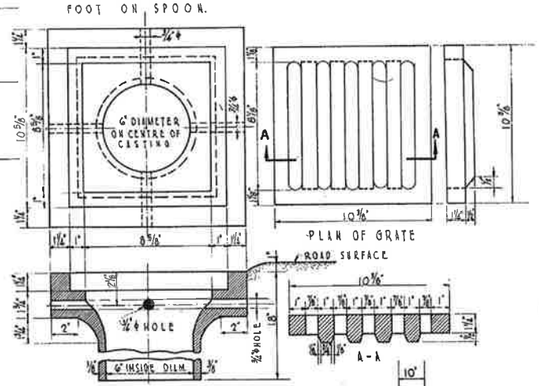
BORING DATA
BORINGS TAKEN JULY 1935 SCALE 1"=8'-0"

BORING NOTES

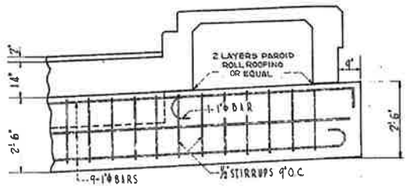
LOCATION OF BORINGS SHOWN ON KEY PLAN, THUS: ● NO.5

BORINGS TAKEN FOR PURPOSE OF DESIGN, AND INDICATE CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW NATURE OF MATERIAL TO BE ENCOUNTERED IN CONNECTION WITH THE CONSTRUCTION OF THE BRIDGE.

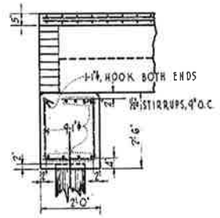
FIGURES IN COLUMNS INDICATE BLOWS PER FOOT ON SPOON.



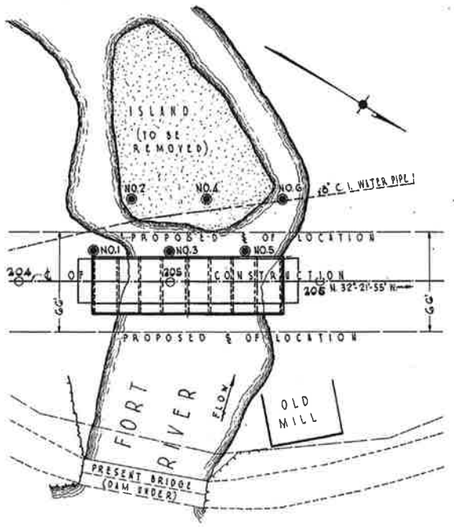
DETAIL OF CAST IRON SCUPPER & GRATE
3 REQUIRED
SCALE 3"=1'-0"



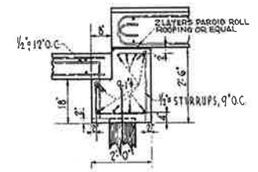
SECTION A-A
(SECTION B-B, OPPOSITE HAND)
SCALE ½"=1'-0"



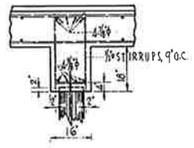
SECTION CC
(SECTION D-D OPPOSITE HAND)
SCALE ½"=1'-0"



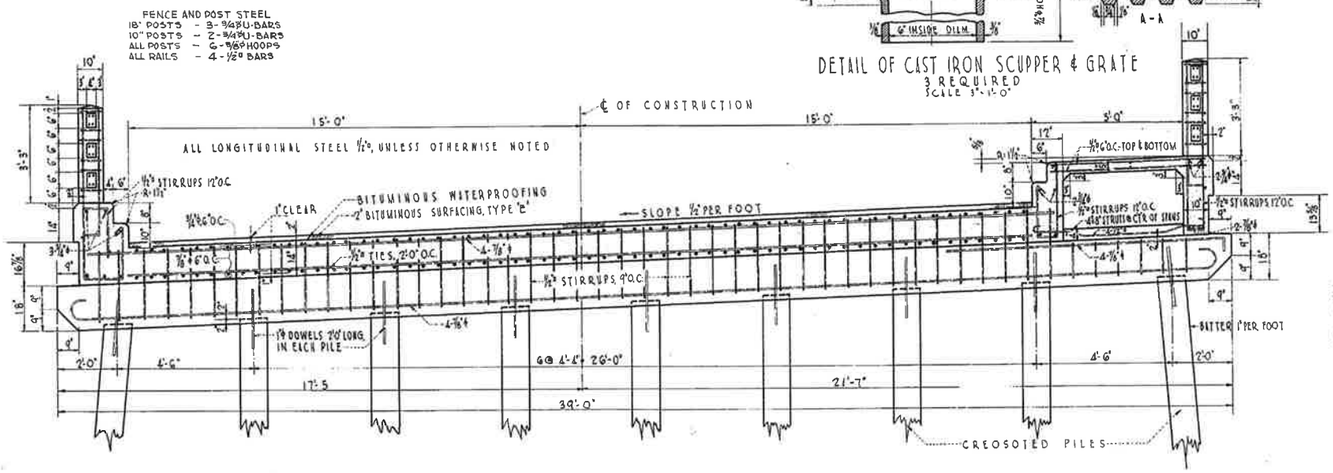
KEY PLAN
SCALE 1"=40'-0"



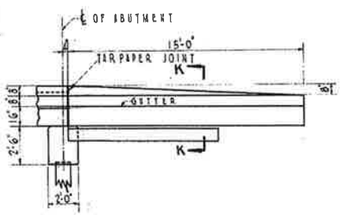
SECTION THRU PILE CAP
AT SOUTH ABUTMENT
(NORTH ABUTMENT SIMILAR)
SCALE ½"=1'-0"



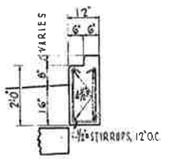
SECTION THRU PILE CAP
(TYPICAL FOR ALL BENTS)
SCALE ½"=1'-0"



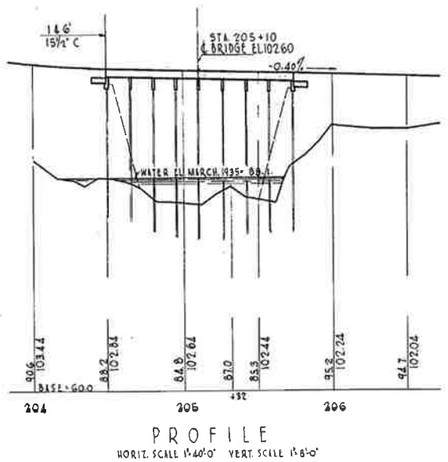
PILE CAP AND SUPERSTRUCTURE DETAIL
TYPICAL FOR ALL BENTS
SCALE ½"=1'-0"



SECTION E-E
(SECTION H-H OPPOSITE HAND)
SCALE ½"=1'-0"



SECTION K-K
SCALE ½"=1'-0"



PROFILE
HORIZ. SCALE 1"=40'-0" VERT. SCALE 1"=8'-0"

APPENDIX C

BORING LOGS

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-1
SHEET: 1 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Drilling Co.: Seaboard Drilling	**Type of Rig:** Truck Mounted	**Boring Location:** See Plan	**H. Datum:** NAD 88
Foreman: Jeff Nitsch	**Rig Model:** Mobile B-47	**Ground Surface Elev. (ft.):** 125	
Logged By: Max Rolandi	**Drilling Method:** Drive & Wash	**Final Boring Depth (ft.):** 66	**V. Datum:** NAVD 88
		Date Start - Finish: 10/31/2017 - 11/1/2017	

Auger/Casing Type: HW	**Sampler Type:** Split Spoon		
I.D/O.D.(in): 4.25/4.5	**I.D./O.D. (in.):** 1.375/2		
Hammer Weight (lb.): 300	**Sampler Hmr Wt (lb):** 140		
Hammer Fall (in.): 30	**Sampler Hmr Fall (in):** 30		
Other:	**Other:** Automatic Hammer		

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
11/1/17	0844	16.5	41	18 hrs.

Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											0.75'	PAVEMENT	124.3'
		S-1	0.8-2.8	24	12	10 11 8 8	19	S-1: Medium dense, brown, fine SAND, little Silt.	1				
		S-2	2.8-4.8	24	12	6 4 4 3	8	S-2: Loose, light brown, fine to medium SAND, some Silt, trace fine Gravel.	2				
5		S-3	5-7	24	7	6 5 9 9	14	S-3: Medium dense, brown, fine to medium SAND, little Silt, trace Gravel.					
		S-4	7-9	24	6	8 9 9 11	18	S-4: Medium dense, brown/gray, fine SAND, little Silt.				FILL	
10		S-5	9-11	24	6	6 3 2 3	5	S-5: Loose, light brown, fine SAND, some Silt.					
		S-6	11-13	24	5	4 4 3 5	7	S-6: Loose, light brown/gray, fine SAND, some Silt.					
15		S-7	14-16	24	9	3 1 1 3	2	S-7: Very loose, gray/brown, fine to medium SAND and SILT.			16'		109.0'
		S-8	16-18	24	11	4 5 11 12	16	S-8: Medium dense, gray, fine to medium SAND, little fine Gravel, trace Silt.				SAND	
									3		18'		107.0'
20												GRAVEL	
											22.5'		102.5'
25		S-9	24-26	24	10	7 8 7 7	15	S-9: Medium dense, reddish brown, fine to coarse SAND, little fine Gravel, trace Silt.				SAND	
											28'		97.0'
									4		29'	GRAVEL	96.0'
30		S-10	29-31	24	10	10 9 10 11	19	S-10: Medium dense, gray/red, fine to medium SAND, trace Silt, trace Gravel.					
												SAND	
35		S-11	34-36	24	9	9 9	18	S-11: Medium dense, gray/red, fine to medium SAND,					

REMARKS

1. Ground surface elevation estimated based on available GIS data from a drawing entitled " Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA" dated August 24, 2017.
2. Boring offsets: 6.5 feet northeast and 14 feet north of the northeast bridge guard rail inside edge.
3. Rig bouncing/chattering at 18 to 22.5 ft bgs during borehole washout indicating probable gravel layer.
4. Rig bouncing/grinding at 28 to 29 ft bgs during borehole washout indicating a probable gravel layer.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-1

173284.00 BAY ROAD OVER FORT RIVER HADLEY MA.GPJ; STRATUM ONLY; 3/22/2018

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-1
SHEET: 2 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
						9 11		trace Silt.					
												SAND	
											38'		87.0'
									5		39'	GRAVEL	86.0'
40		S-12	39-41	24	6	10 8 8 5	16	S-12: Medium dense, light brown/gray, fine to medium SAND, someSilt, trace fine Gravel.					
45		S-13	44-46	24	6	6 10 13 12	23	S-13: Medium dense, gray, fine to coarse SAND and GRAVEL, trace Silt.				SAND	
50		S-14	49-51	24	10	13 11 14 16	25	S-14: Medium dense, gray, fine to coarse SAND, little Silt.	6				
											53'		72.0'
									7				
55		S-15	54-56	24	10	30 21 19 25	40	S-15: Dense, gray, fine to coarse SAND and GRAVEL, little Silt.					
60		S-16	59-61	24	9	21 21 20 23	41	S-16: Dense, gray, fine to coarse SAND, some fine Gravel, little Silt.				SAND AND GRAVEL	
65		S-17	64-66	24	9	24 21 29 20	50	S-17: Very dense, gray, fine to coarse SAND and GRAVEL, trace Silt.					
											66'		59.0'
								Bottom of boring at 66 feet.	8				
70													
75													

REMARKS

5. Rig bouncing/grinding at 38 to 39 ft bgs during borehole washout indicating a probable gravel layer.
6. Two inches of silt and sand in spoon tip of sample S-14.
7. Rig bouncing/grinding from 53 ft bgs to the bottom of the borehole during borehole washout indicating probable gravel layer.
8. Upon completion, borehole backfilled with cuttings.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-1

173284.00 BAY ROAD OVER FORT RIVER HADLEY MA.GPJ; STRATUM ONLY; 3/22/2018

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-2
SHEET: 1 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Drilling Co.: Seaboard Drilling	**Type of Rig:** Truck Mounted	**Boring Location:** See Plan	**H. Datum:** NAD 88
Foreman: Doug Feeley	**Rig Model:** Mobile B-47	**Ground Surface Elev. (ft.):** 105.2	
Logged By: Max Rolandi	**Drilling Method:** Drive & Wash	**Final Boring Depth (ft.):** 46	**V. Datum:** NAVD 88
		Date Start - Finish: 11/8/2017 - 11/8/2017	

Auger/Casing Type: HW	**Sampler Type:** Split Spoon		
I.D/O.D.(in): 4.25/4.5	**I.D./O.D. (in.):** 1.375/2		
Hammer Weight (lb.): 300	**Sampler Hmr Wt (lb):** 140		
Hammer Fall (in.): 30	**Sampler Hmr Fall (in):** 30		
Other:	**Other:** Automatic Hammer		

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
	See	Note	7	

Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	8	6 1 1 2	2	S-1: Very loose, brown, fine to coarse SAND, some fine Gravel, little Silt.	1 2 3			SAND	
5		S-2	4-6	24	4	3 4 5 6	9	S-2: Loose, red/brown, fine to coarse SAND, little fine Gravel, trace Silt.			7'		98.2'
									4		8'	GRAVEL	97.2'
		S-3	8-10	24	5	3 6 5 7	11	S-3: Medium dense, brown, fine to coarse SAND, little fine Gravel, trace Silt.					
10													
15		S-4	14-16	24	4	3 3 4 4	7	S-4: Loose, brown, fine to coarse SAND, little Silt, trace fine Gravel.					
20		S-5	19-21	24	10	3 6 7 9	13	S-5: Medium dense, reddish brown, fine to medium SAND, little Silt.				SAND	
25		S-6	24-26	24	12	5 6 10 10	16	S-6: Top 4" gray, fine to coarse SAND, little Silt. Middle 3" gray, fine SAND and SILT. Bottom 5" gray, fine to coarse SAND, little Silt.	5				
30		S-7	29-31	24	10	7 7 16 20	23	S-7: Medium dense, gray, fine SAND and SILT.			30'		75.2'
												SAND AND SILT	
									6		33'		72.2'
35		S-8	34-36	24	7	14 16	36	S-8: Dense, brown, fine to coarse SAND and fine to	7			SAND AND GRAVEL	

REMARKS

1. Ground surface elevation estimated based on available GIS data from a drawing entitled " Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA," dated August 24, 2017.
2. Driller cored through bridge deck prior to starting. Cored deck included 2 inches of asphalt plus 15 inches of reinforced concrete. Mudline was measured 20.3 feet below top of bridge deck. Sample depths are intended to be below the mudline.
3. Boring offsets: 70.5 feet north and 7 feet east of the south west bridge guard rail inside edge.
4. Rig bouncing from 7 to 8 feet below mudline indicating probable gravel layer.
5. 3-inch thick silt layer interbedded in S-6 between approximately 25.5 and 25.75 feet below mudline.
6. Rig bouncing/grinding at 33 feet below mudline. Fine sand and silt in wash water from 25 to 33 feet below mudline.
7. Boring drilled through the bridge deck, water in casing was approximately at the river level at the end of drilling.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-2

173284.00 BAY ROAD OVER FORT RIVER HADLEY MA.GPJ; STRATUM ONLY; 3/22/2018

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-2
SHEET: 2 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
						20 16		coarse GRAVEL, trace Silt.					
40		S-9	39-41	24	7	10 16 13 17	29	S-9: Medium dense, gray, fine to coarse SAND and GRAVEL, little Silt.				SAND AND GRAVEL	
45		S-10	44-46	24	2	61 44 29 10	73	S-10: Very dense, red, fine GRAVEL and fine to coarse SAND, trace Silt.			46'		59.2'
								Bottom of boring at 46 feet.	8				
50													
55													
60													
65													
70													
75													

REMARKS

8. Upon completion, borehole backfilled with cuttings.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-2

173284.00 BAY ROAD OVER FORT RIVER HADLEY MA.GPJ; STRATUM ONLY; 3/22/2018

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-3
SHEET: 1 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Drilling Co.: Seaboard Drilling	**Type of Rig:** Truck Mounted	**Boring Location:** See Plan	**H. Datum:** NAD 88
Foreman: Jeff Nitsch	**Rig Model:** Mobile B-47	**Ground Surface Elev. (ft.):** 126	
Logged By: Max Rolandi	**Drilling Method:** Drive & Wash	**Final Boring Depth (ft.):** 60	
		Date Start - Finish: 10/30/2017 - 10/31/2017	**V. Datum:** NAVD 88

Auger/Casing Type: HW	**Sampler Type:** Split Spoon		
I.D/O.D.(in): 4.25/4.5	**I.D./O.D. (in.):** 1.375/2		
Hammer Weight (lb.): 300	**Sampler Hmr Wt (lb):** 140		
Hammer Fall (in.): 30	**Sampler Hmr Fall (in):** 30		
Other:	**Other:** Automatic Hammer		

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
11/1/17	0830	15	50	20 hrs.

Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											1'	ASPHALT AND BASE	125.0'
		S-1	1-3	24	3	37 77 38 30	R	S-1: Very dense, brown, fine to medium SAND, some Gravel, trace Silt.	1 2				
5		S-2	3-5	24	4	22 20 18 14	38	S-2: Dense, fine to medium SAND, little Silt, trace fine Gravel.	3				
		S-3	7-9	24	0	3 3 2 2	5	S-3: No recovery. (Gravel in tip of splitspoon)					
10		S-4	9-11	24	6	3 2 3 3	5	S-4: Loose, brown, fine SAND, little Silt, trace fine Gravel.				FILL	
		S-5	11-13	24	6	3 4 4 4	8	S-5: Loose, brown, fine SAND, little Silt, trace fine Gravel.					
		S-6	13-15	24	8	4 4 5 6	9	S-6: Loose, brown, fine SAND, little Silt, trace fine Gravel.					
15		S-7	15-17	24	8	5 8 12 20	20	S-7: Medium dense, brown, fine SAND, little Silt, little fine Gravel.	5		16.9'		109.1'
		S-8	17-19	24	6	12 11 17 30	28	S-8: Medium dense, brown/gray, fine to coarse SAND and GRAVEL, trace Sit.					
20									6				
25		S-9	24-26	24	2	19 15 15 12	30	S-9: Dense, brown/gray, fine to coarse GRAVEL, some fine to coarse Sand, trace Silt.	7			SAND AND GRAVEL	
30		S-10	28-30	24	8	37 10 9 9	19	S-10: Medium dense, gray/brown, fine to coarse SAND and fine GRAVEL, trace Silt.					
35		S-11	33-35	24	2	5 4 7 8	11	S-11: Medium dense, gray, fine to medium SAND, some Silt.			33'	SAND	93.0'

REMARKS

1. Ground surface elevation estimated based on available GIS data from a drawing entitled " Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA" dated August 24, 2017.
2. Boring offsets: 7.9 feet east and 10.5 feet southeast of the south west bridge guardrail inside edge.
3. Piece of gravel caught between casing and rollerbit. Casing spinning during boring cleanout. Driller cleaned borehole down to 7 feet below ground surface (ft bgs) to clear the stuck gravel particles.
5. Bottom two inches of S-7 was sand and gravel.
6. Rig bouncing/grinding during wash from 20 to 24 ft bgs indicating a probable gravel layer.
7. Rig bouncing/grinding during wash from 24 to 28 ft bgs indicating a probable gravel layer.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-3

173284.00 BAY ROAD OVER FORT RIVER HADLEY MA.GPJ; STRATUM ONLY; 3/22/2018

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-3
SHEET: 2 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
40		S-12	38-40	24	11	14 11 13 14	24	S-12: Medium dense, reddish gray, fine to medium SAND, trace Silt.				SAND	
											43'		83.0'
45		S-13	43-45	24	13	21 25 27 24	52	S-13: Top 6": reddish gray, fine SAND and SILT. Bottom 7": reddish gray, fine to coarse SAND and GRAVEL, little Silt.				SAND AND GRAVEL	
											47'		79.0'
									8		48'	GRAVEL	78.0'
50		S-14	48-50	24	10	51 24 22 21	46	S-14: Dense, reddish gray, fine to coarse SAND and GRAVEL, little Silt.	9				
55		S-15	53-55	24	3	39 19 19 20	38	S-15: Dense, brown/gray, fine to coarse GRAVEL and SAND, trace Silt.				SAND AND GRAVEL	
60		S-16	58-60	24	7	32 30 18 10	48	S-16: Dense, red, fine to medium SAND, some fine Gravel, little Silt.			60'		66.0'
								Bottom of boring at 60 feet.	10				
65													
70													
75													

REMARKS

8. Rig bouncing/grinding during wash from 47 to 48 ft bgs indicating a probable gravel layer.
9. Driller stopped on 10/30/17 at 50 ft bgs. Casing driving flush with ground surface. Drilling resumed on 10/31/17.
10. Upon completion, borehole backfilled with cuttings.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-3

173284.00 BAY ROAD OVER FORT RIVER HADLEY MA.GPJ; STRATUM ONLY; 3/22/2018

APPENDIX D

GEOTECHNICAL LABORATORY TEST RESULTS

THIELSCH ENGINEERING
195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
http://www.thielsch.com
Let's Build a Solid Foundation

Client Information:
GZA GeoEnvironmental
Norwood, MA
PM: Steve Spink, P.E.
Assigned By: Steve Spink
Collected By: Max Rolandi

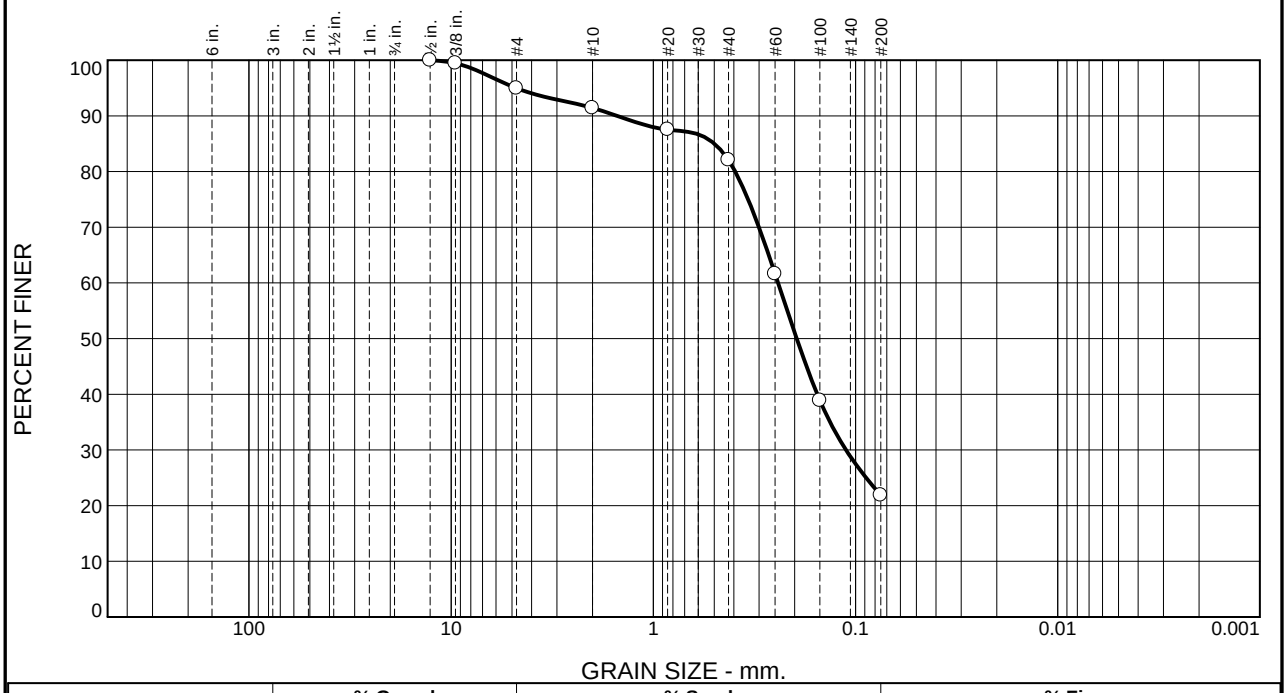
Project Information:
MassDOT Bay Road (RT 47) Port River
Hadley, MA
GZA Project Number: 01.0173284.00
Summary Page: 1 of 1
Report Date: 03.07.18

LABORATORY TESTING DATA SHEET

Boring ID / Source	Sample No. / Material	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	Test Water Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Perme-ability cm/sec	
BB-1	S-12	39-41	S-10				5.0	73.1	21.9											Reddish Brown f-m SAND, some Silt, trace fine Gravel
BB-1	S-2	2.8-4.8	S-11				0.3	76.1	23.6											Brown f-m SAND, some Silt, trace fine Gravel
BB-2	S-8	34-36	S-12				43.9	48.5	7.6											Brown f-c SAND and f-c GRAVEL, trace Silt
BB-3	S-4	9-11	S-13				7.1	73.4	19.5											Brown fine SAND, little Silt, trace fine Gravel
BB-3	S-12	38-40	S-14				0.0	92.2	7.8											Reddish Brown f-m SAND, trace Silt

Reviewed By _____ Date Reviewed 03.08.18

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.0	3.6	9.4	60.1	21.9	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5"	100.0		
0.375"	99.5		
#4	95.0		
#10	91.4		
#20	87.5		
#40	82.0		
#60	61.6		
#100	38.9		
#200	21.9		

* (no specification provided)

Material Description

Reddish Brown f-m SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 1.5118 D_{85}= 0.4984 D_{60}= 0.2415
D_{50}= 0.1954 D_{30}= 0.1116 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample contained standing water.

Date Received: 03.02.18 **Date Tested:** 03.07.18

Tested By: MN / RR

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

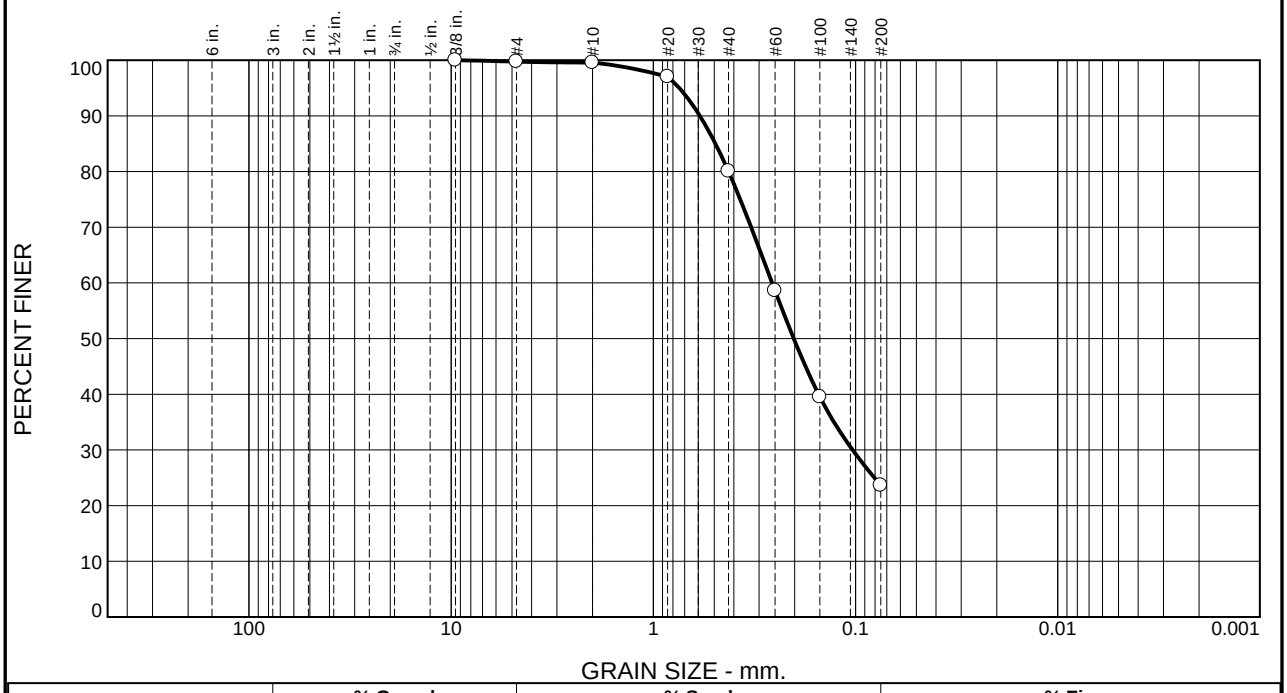
Source of Sample: Borings **Depth:** 39-41' **Date Sampled:**
Sample Number: BB-1 / S-12

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental / Benesch
Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA
Project No: 01.0173284.00 **Figure** S-10

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.1	19.6	56.4	23.6	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	99.7		
#10	99.6		
#20	97.0		
#40	80.0		
#60	58.6		
#100	39.5		
#200	23.6		

* (no specification provided)

Material Description

Brown f-m SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.5884 D_{85}= 0.4930 D_{60}= 0.2587
D_{50}= 0.2022 D_{30}= 0.1035 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 03.02.18 **Date Tested:** 03.06.18

Tested By: MN / RR

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

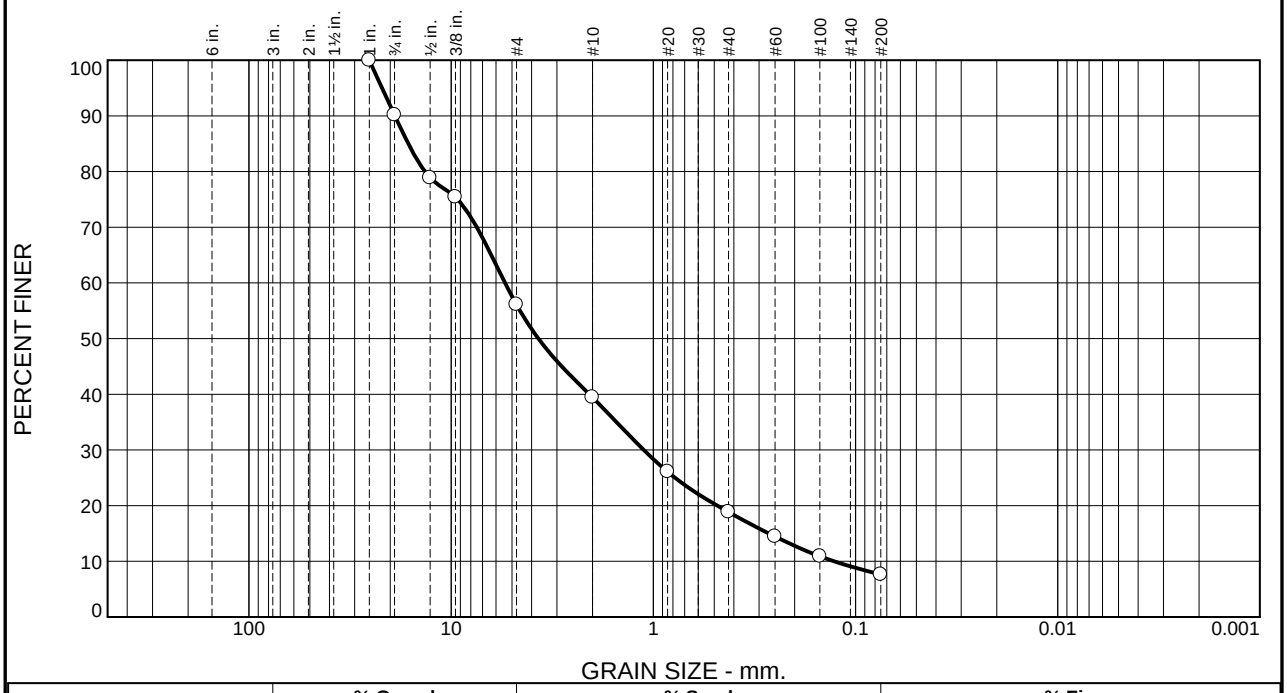
Source of Sample: Borings **Depth:** 2.8-4.8' **Date Sampled:**
Sample Number: BB-1 / S-2

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental / Benesch
Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA
Project No: 01.0173284.00 **Figure** S-11

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.9	34.0	16.7	20.5	11.3	7.6	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	90.1		
0.5"	78.9		
0.375"	75.4		
#4	56.1		
#10	39.4		
#20	26.1		
#40	18.9		
#60	14.4		
#100	10.9		
#200	7.6		

* (no specification provided)

Material Description

Brown f-c SAND and f-c GRAVEL, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 18.9689 D_{85}= 16.2855 D_{60}= 5.4099
D_{50}= 3.7053 D_{30}= 1.1155 D_{15}= 0.2685
D_{10}= 0.1278 C_u= 42.34 C_c= 1.80

Remarks

Date Received: 03.02.18 **Date Tested:** 03.07.18

Tested By: MN / RR

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 34-46' **Date Sampled:**

Sample Number: BB-2 / S-8

Thielsch Engineering Inc.

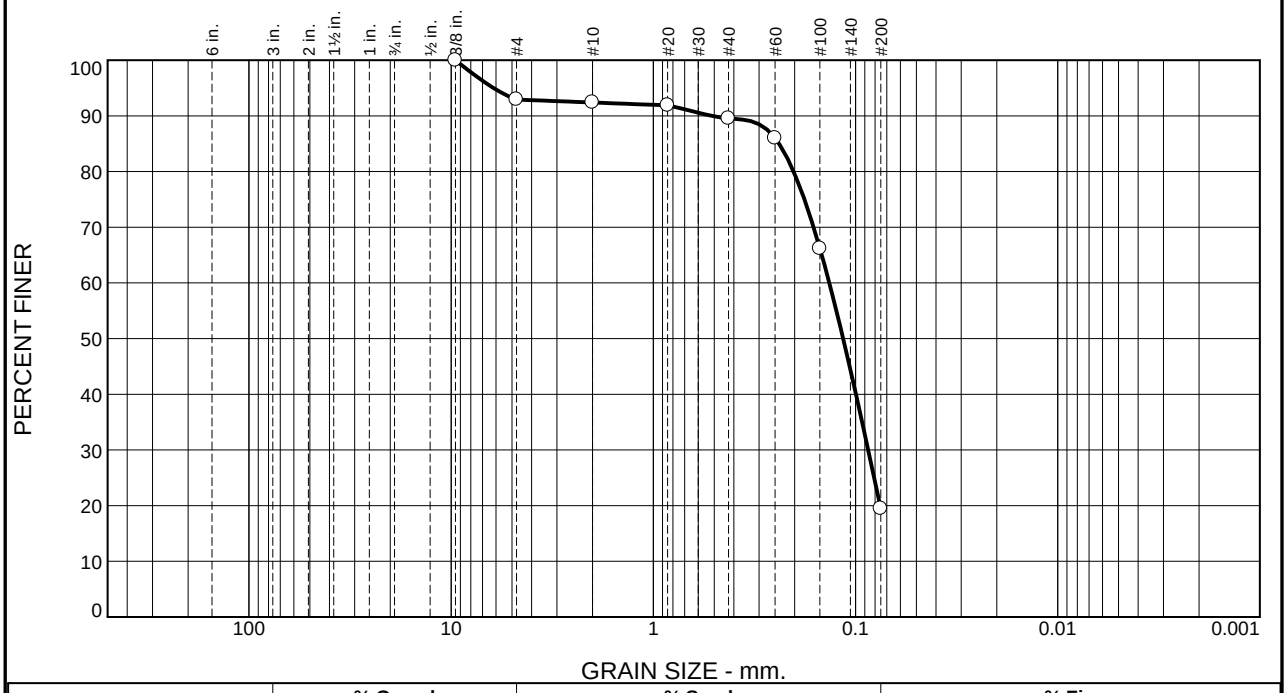
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-12

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.1	0.5	2.9	70.0	19.5	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	92.9		
#10	92.4		
#20	91.9		
#40	89.5		
#60	86.0		
#100	66.2		
#200	19.5		

* (no specification provided)

Material Description

Brown fine SAND, little Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.5127 D_{85}= 0.2388 D_{60}= 0.1348
D_{50}= 0.1152 D_{30}= 0.0866 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 03.02.18 **Date Tested:** 03.07.18

Tested By: MN / RR

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

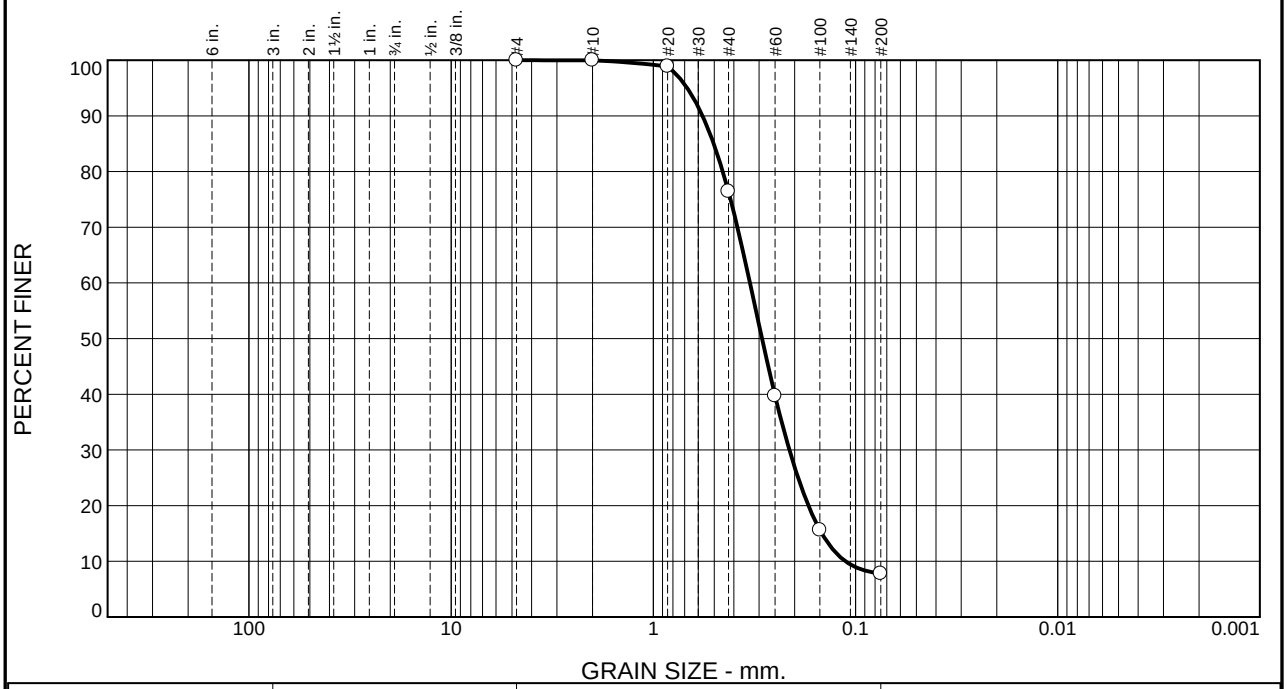
Source of Sample: Borings **Depth:** 9-11' **Date Sampled:**
Sample Number: BB-3 / S-4

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental / Benesch
Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA
Project No: 01.0173284.00 **Figure** S-13

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	23.6	68.6	7.8	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	100.0		
#20	98.9		
#40	76.4		
#60	39.7		
#100	15.6		
#200	7.8		

* (no specification provided)

Material Description

Reddish Brown f-m SAND, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.5709 D_{85}= 0.5026 D_{60}= 0.3329
D_{50}= 0.2901 D_{30}= 0.2125 D_{15}= 0.1469
D_{10}= 0.1123 C_u= 2.97 C_c= 1.21

Remarks

Sample contained standing water.

Date Received: 03.02.18 **Date Tested:** 03.02.18

Tested By: MN / RR

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 38-40' **Date Sampled:**

Sample Number: BB-3 / S-12

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-14

APPENDIX E

CALCULATIONS

Pile Axial Resistance Calculations

Project:	Bay Road (Route 47) Bridge over Fort River				
Location:	Hadley, Massachusetts			**Project No:**	173284.00
Calculated By:	JBH	**Checked By:**	STS/TMK	**Date:**	3/28/2018
Revised By:	JBH	**Checked By:**	MPS/TMK	**Date:**	12/11/2019
Revised By:	MPS	**Checked By:**	TMK	**Date:**	3/17/2020
Revised By:	JBH	**Checked By:**	MPS	**Date:**	6/2/2020

Purpose: Evaluate the geotechnical nominal and factored axial resistance of steel HP 12x84 piles proposed for the north and south abutments and steel 24-inch outside diameter (OD) closed-end pipe piles proposed for Pier 1 and Pier 2 of the new Bay Road Bridge over Fort River.

Revisions: 12/11/2019 Revise calculation on 12/11/2019 to update the resistance factors to reflect static & dynamic load testing performed for abutment foundations and dynamic testing only for intermediate pier foundations.

Revisions: 3/17/2020 Revise calculation on 3/17/2020 to update the calculations to reflect updated factored design loads for abutment foundations and pier foundations provided by Benesch on 3/16/20. Also, pile size at intermediate piers changed from 16-inch diameter to 24-inch diameter.

Revisions: 6/2/20 Revise calculation on 6/2/20 to reflect updated loads for the north and south abutment piles. Updated loads provided by Benesch on 5/29/20.

References:
1) AASHTO LRFD Bridge Design Specifications, 8th Edition, 2017.
2) Publication No. FHWA-NHI-16-009, "Design and Construction of Driven Pile Foundations".
3) NAVFAC Design Manual 7-02, "Foundations and Earth Structures."
4) Drawing entitled: "Alternate IV - Elevation and Cross Section Bridge No. H-01-005" dated September 9, 2017;
5) Bridge Borings BB-1, BB-2 and BB-3 performed by Seaboard Drilling, Inc. between October 30, 2017 and on November 8, 2017 and observed by GZA.
6) "Bridge Type Selection Worksheet-MassDOT Project 608460, Bay Road (ST47) over Fort River" prepared by Benesch, dated October 2, 2017.
7) Existing bridge drawings entitled "Proposed Bridge, Hadley, Bay Road, Station 205+10 Over Fort River" dated November 1935.
8) Progress Drawings, entitled "MassDOT, Proposed Bridge Replacement, Hadley, Bay Road (Route 47) over Fort River", prepared by Benesch, dated March 12, 2020 and April 2, 2020.
9) Loads provided by Benesch in an electronic email dated March 16, 2020 and May 29, 2020. The loads are summarized in the table below:

Summary of Loads from Benesch

Foundation Location	Foundation Type	Factored Axial Load per Pile		Resistance Factor (see assumpt-ions 8&9)	Required Nominal Geotech. Resistance (Strength I)	Factored Moment per Pile	
		Service I	Strength I			Service I	Strength I
North Abutment	H-Piles	107.5 kips	153.2 kips	0.80	192 kips	72.3 kip-ft	102.7 kip-ft
Piers 1 & 2	Pipe Piles	225 kips	305 kips	0.65	469 kips	60 kip-ft	55 kip-ft
South Abutment	H-Piles	107.5 kips	153.2 kips	0.80	192 kips	72.3 kip-ft	102.7 kip-ft

Assumptions:
1) Subsurface conditions based on interpolation of data from the recent bridge borings BB-1 through BB-3.
2) Elevations based on NAVD88 datum.
3) Groundwater (river level) at the intermediate piers and at the abutments was assumed to be ordinary high water (El.107) for calculation purposes.
4) Neglect pile resistance in the fill stratum in the pile axial resistance evaluation.
5) A 1/16" corrosion section loss was assumed along the outside walls of the pipe piles and along the perimeter of the H-Piles.
6) Pipe pile wall thickness before corrosion was assumed to be 0.5 inches. H-pile web/flange thickness before corrosion was assumed to be 0.685 inches.
7) Pipe piles used for support of the intermediate piers assumed to be closed-end.
8) A static load test and dynamic testing using a pile driving analyzer (PDA) with signal matching will be performed on one sacrificial abutment H-Pile (resistance factor = 0.80).
9) Dynamic testing using a pile driving analyzer (PDA) with signal matching will be performed on the intermediate pier pipe piles (resistance factor = 0.65).
10) Scour protection is being provided at the abutments, therefore scour was not considered for the axial H-pile calculations at the abutments. No scour protection is proposed at intermediate piers, therefore assume 2.5 feet of design scour for purpose of calculations and per MassDOT Hydraulic Study Report, dated February 27, 2018.

Pile Axial Resistance Calculations

Project:	Bay Road (Route 47) Bridge over Fort River				
Location:	Hadley, Massachusetts			**Project No:**	173284.00
Calculated By:	JBH	**Checked By:**	STS/TMK	**Date:**	3/28/2018
Revised By:	JBH	**Checked By:**	MPS/TMK	**Date:**	12/11/2019
Revised By:	MPS	**Checked By:**	TMK	**Date:**	3/17/2020
Revised By:	JBH	**Checked By:**	MPS	**Date:**	6/2/2020

Analysis: 1) Evaluate the soil stratigraphy based on the recent bridge borings. A profile showing the stratigraphy at the Bay Road Bridge is included in Attachment 2.

2) Evaluate soil properties based on the available SPT blow counts from the recent bridge borings BB-1 through BB-3. A table summarizing the subsurface conditions and the soil properties used in the geotechnical axial resistance evaluation is presented below and is included in Attachment 2.

3) Perform axial calculations using methodology from NAVFAC DM7. Evaluate lengths considering limiting effective stress at depths of 30D and 20D.

4) Also evaluate required pile lengths limiting nominal side friction to 0.75 ksf in Sand & Gravel and 1.0 ksf in Dense Sand & Gravel.

Summary of Soil Stratigraphy and Soil Parameters Used in the Axial Resistance Evaluation

Soil Stratum	Top of Layer Elevation (ft)						
	North Abutment	Pier 2 - North Int. Pier	Pier 1 - South Int. Pier	South Abutment	Average $N_{1,60}$ (bpf)	Unit Weight (pcf)	Friction Angle ϕ' (deg)
Fill	124	NE	NE	125	15	120	30
S&G	107	102	106	108	16	125	32
D-S&G	71	69	74	82	34	130	34

Notes:

1) Subsurface conditions based on interpolation of data from the recent bridge borings BB-1 through BB-3.

2) Elevations based on NAVD88 datum.

Results: - Results of the analyses are summarized on Table 1.

- Abutment pile lengths must be verified by performing static and dynamic load testing on a sacrificial H-pile prior to ordering piles.
- Intermediate pier pile lengths must be verified by performing dynamic testing.
- Pile lengths must consider lateral loading. Piles should be installed to depths that satisfy both axial resistance and point of fixity for lateral stability. Lateral analysis to be performed by the Structural Engineer.

Attachments: 1) Table 1 - Summary of Calculations for Geotechnical Axial Pile Resistance

2) Proposed Bridge Elevation and Cross Section.

3) Soil Profile & Geotechnical Design Parameters.

4) Single Pile Axial Geotechnical Resistance Calculations.

Bay Road (Route 47) Bridge over Fort River
Hadley, Massachusetts
Summary of Calculations - Nominal Geotechnical Axial Pile Resistance
TABLE 1

Substructure	Resistance Factor	Avg. Pile Cutoff Elevation	Ground Surface El. at Abutment/ Scoured Mudline El. at Pier	Pile Length below Ground Surface/Mudline and Pile Tip Elevation						Top of Dense to V. Dense Sand and Gravel El. (ft)	Recommended Pile Length (ft) (from GS @ abutments) (from scoured ML @ piers)	Recommended Pile Tip Elevation (ft)
				Limit EB + SF to 30D		Limit EB + SF to 20D		EB at 20D, SF=0.75/1.0ksf				
				Pile length (ft) [1]	Pile Tip El (ft).	Pile length (ft) [2]	Pile Tip El (ft)	Pile length (ft) [3]	Pile Tip El (ft)			
North Abutment	0.80	117.0	124	52	72	65	59	57	67	72	65 [7, 9]	59
South Abutment	0.80	118.0	125	52	73	65	60	57	68	83	65 [7, 9]	60
Pier 2 (north int. pier)	0.65	120.3	99.5	42	58	44	56	38	62	72	38 [8, 9]	62
Pier 1 (south int. pier)	0.65	120.5	99.5	42	58	44	56	38	62	72	38 [8, 9]	62
						Develop H-Pile Length/Tip El. recommendation from 20D calculation result (see note 7)		Develop Pipe Pile Length/Tip El. Recommendations from 20D, SF=0.75/1.0ksf calculation result				

Notes:

1. Nominal End-Bearing Resistance and unit skin friction based on limiting effective stress to a maximum depth of 30D.
2. Nominal End-Bearing Resistance and unit skin friction based on limiting effective stress to a maximum depth of 20D.
3. Nominal End-Bearing Resistance based on limiting effective stress to a maximum depth of 20D. Skin friction assumed as 0.75ksf in S&G, 1.0ksf in Dense S&G.

4. Top of ground surface/mudline elevation based on interpolated soil profile (Figure 3). Average pile cutoff elevations are based on in-progress structural plans received 3/20/2020 & 4/2/2020.
5. Top of dense to v. dense sand and gravel elevation based on borings BB-1 to BB-3.
6. Calculations are based on equation for axial pile resistance adapted from NAVFAC DM 7.02 (see p. 7.2-193). Limiting end bearing values are within the ranges for medium dense to dense sands from API (Dec 2000) and limiting side friction values are from recent experience for driven steel piles in sand.
7. Depth to very dense sand & gravel strata is variable based on historic and recent borings. Recommend minimum pile length based on the depth required to obtain the required geotechnical resistance without encountering the dense to very dense sand & gravel stratum (approximately 65-feet). Final pile lengths will be based on dynamic testing and a static axial load test on a sacrificial test pile and dynamic testing on production piles.
8. Final pile lengths will be based on dynamic testing on the first production pile at each pier. Additional length from referenced mudline elevation to design pile cut off should be added as required.
9. Recommended pile lengths are based on axial loads only. Pile length should be increased as necessary if lateral capacity controls embedment depth of pile.

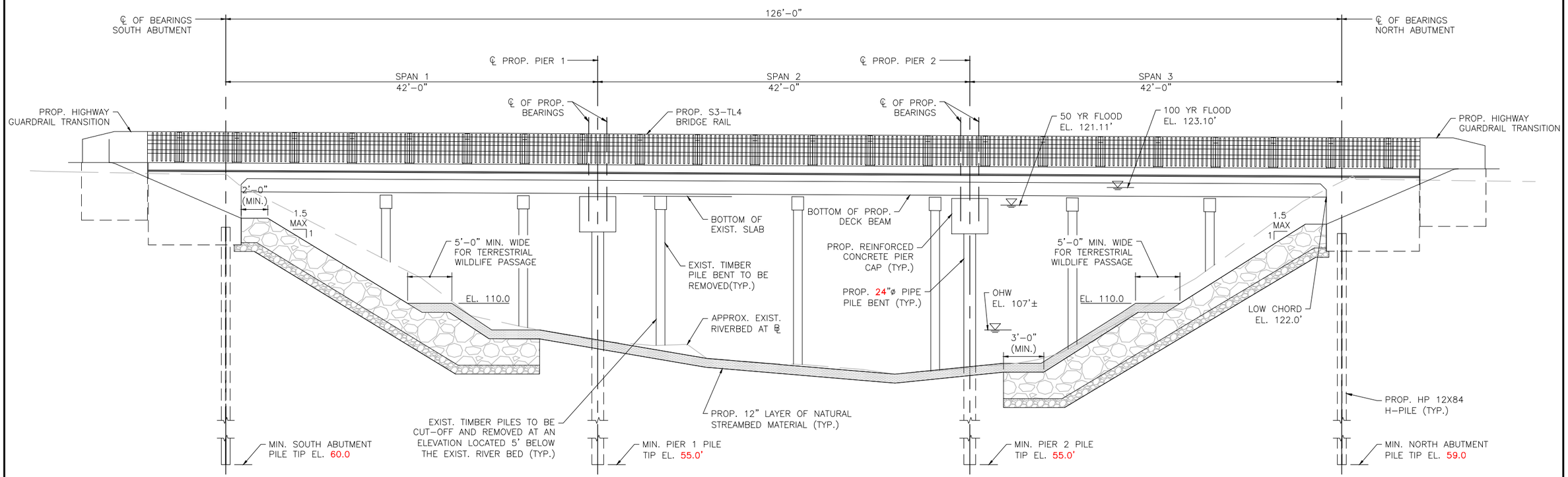
ATTACHMENT 2

Proposed Bridge Elevation & Cross-Section

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–		XX
PROJECT FILE NO. 608460			

GENERAL ELEVATION



EAST ELEVATION
SCALE: $\frac{3}{16}$" = 1'–0"

DRAWING PLOTTED HALF SIZE

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 6 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

608460_BR06 (H-01-005)_GENERAL ELEVATION.DWG Plotted on 12-Mar-2020 12:29 PM

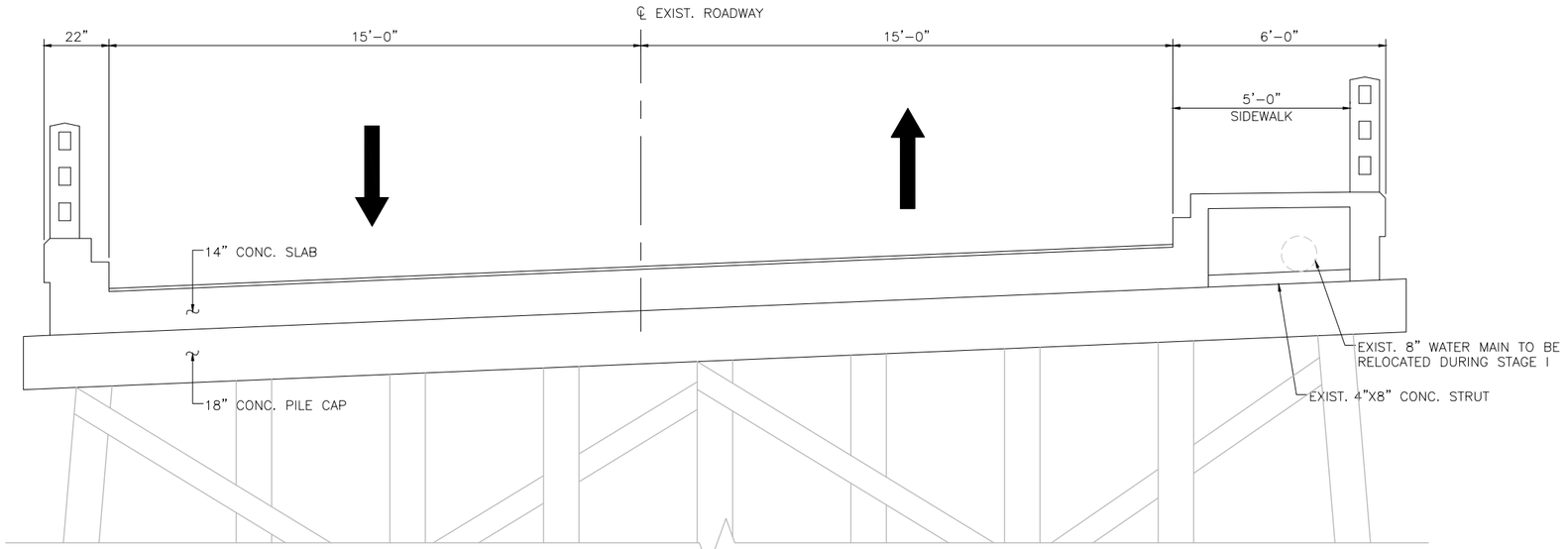
608460 Bridge Sketch Plans () XX-April-2018

A00804 - 50

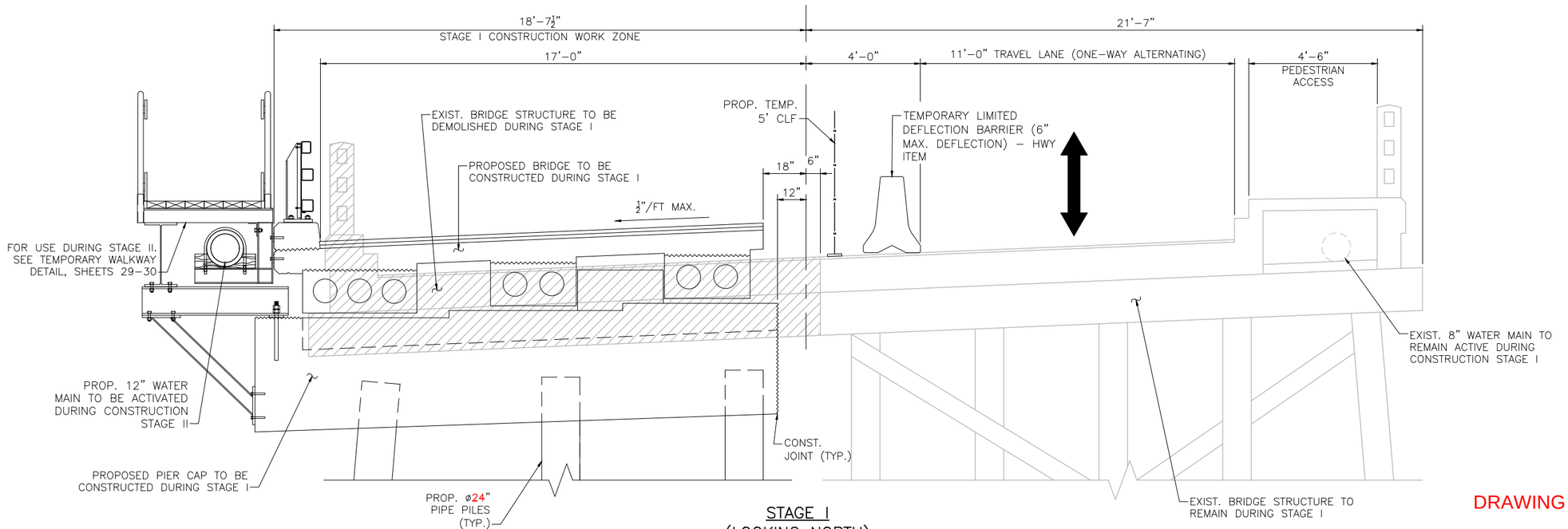
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–		XX
PROJECT FILE NO. 608460			

SEQUENCE OF BRIDGE CONSTRUCTION I



EXISTING BRIDGE CROSS SECTION
(LOOKING NORTH)
SCALE: ½" = 1'–0"



STAGE I
(LOOKING NORTH)
SCALE: ½" = 1'–0"

DRAWING PLOTTED HALF SIZE

DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 7 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

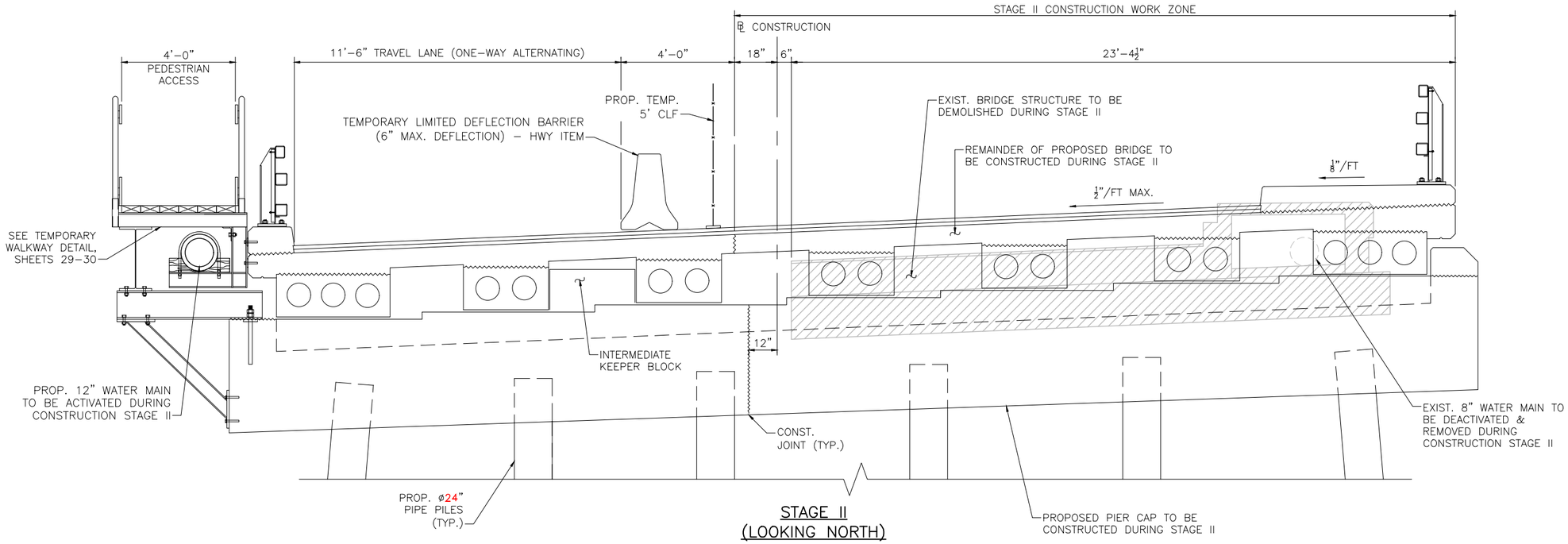
608460_BR07-08 (H-01-005)_SEQUENCE OF CONST.DWG Plotted on 12-Mar-2020 12:29 PM

608460 Bridge Sketch Plans () XX-April-2018

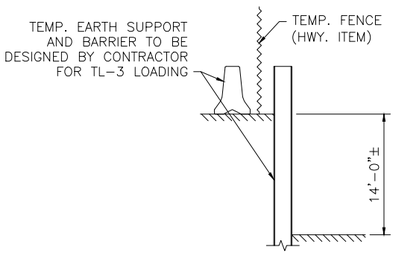
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–		XX
PROJECT FILE NO. 608460			

SEQUENCE OF BRIDGE CONSTRUCTION II



STAGE II
(LOOKING NORTH)
SCALE: ½" = 1'–0"



TEMP. EARTH SUPPORT DETAIL
AT ABUTMENTS
NOT TO SCALE

DRAWING PLOTTED HALF SIZE

DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 8 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

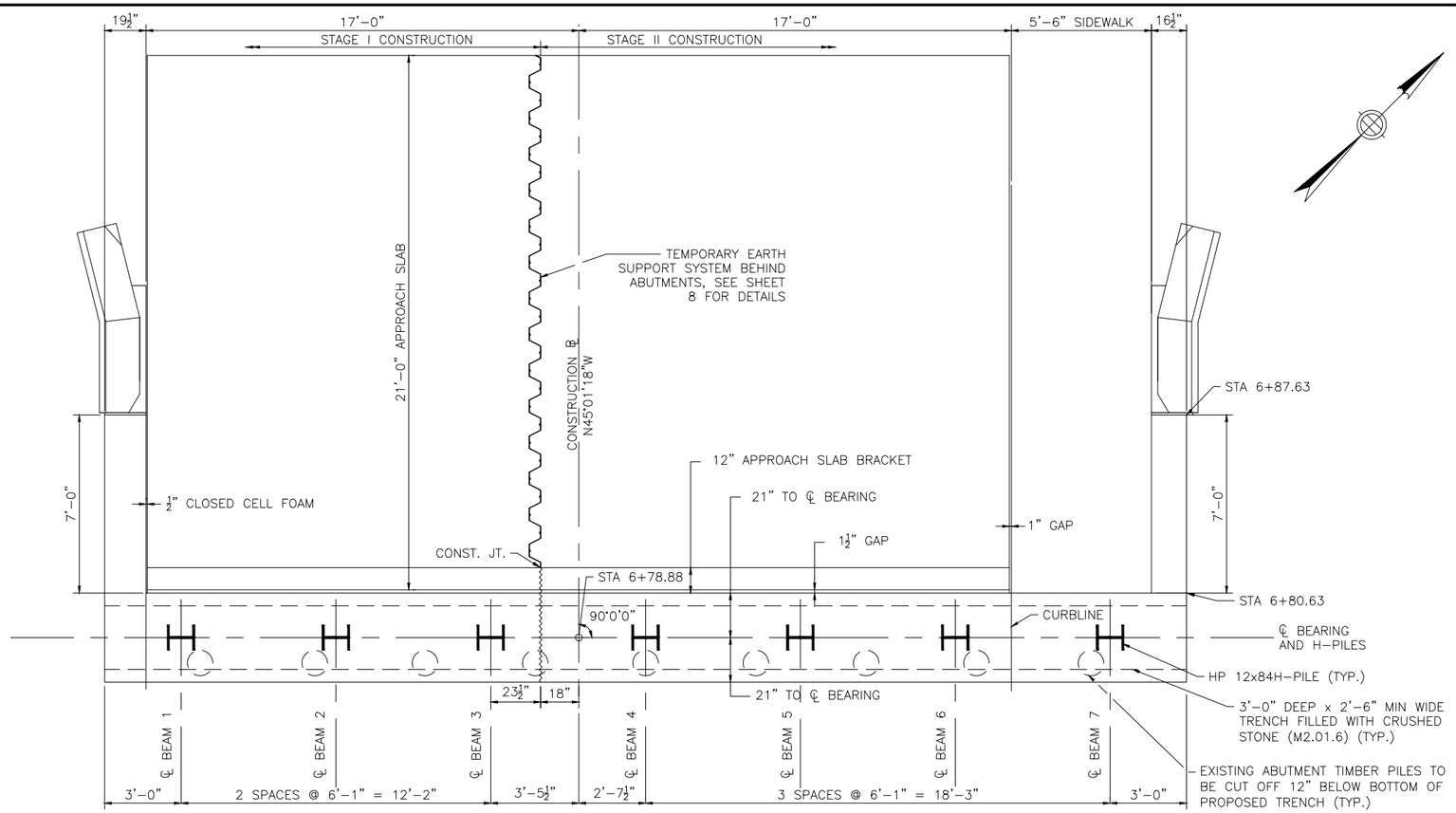
608460_BR07-08 (H-01-005)_SEQUENCE OF CONST.DWG Plotted on 12-Mar-2020 12:29 PM

608460 Bridge Sketch Plans () XX-April-2018

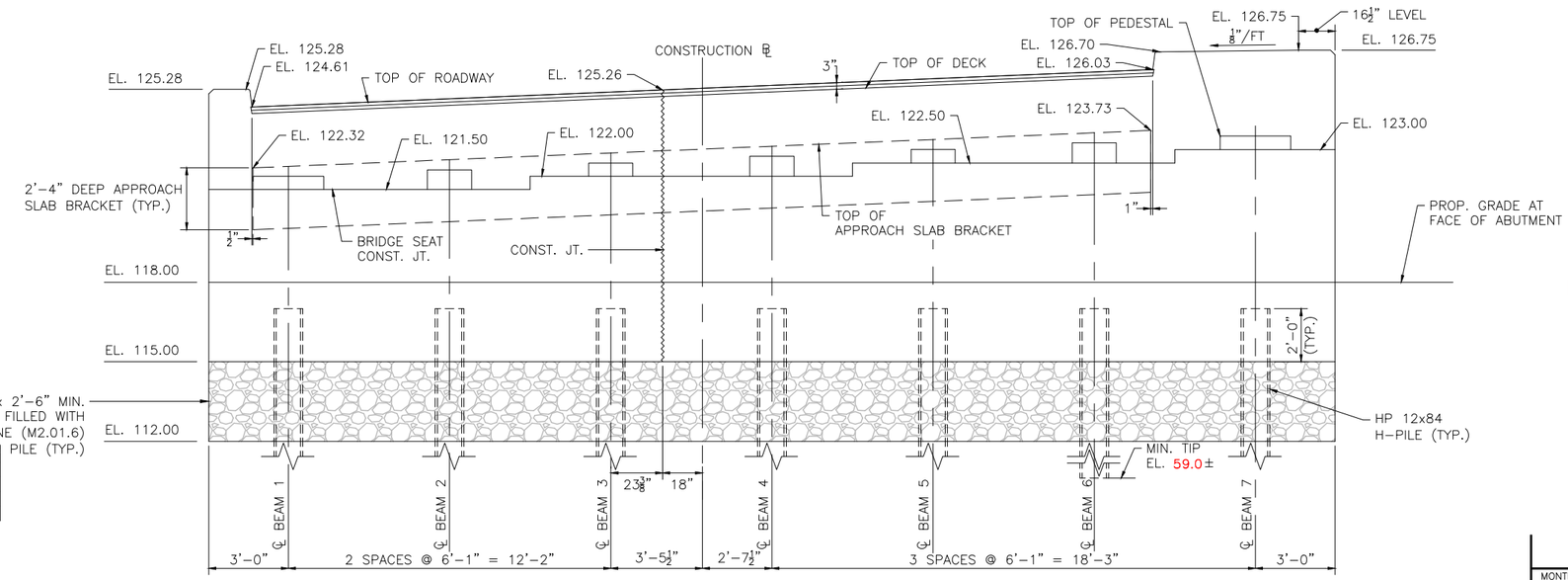
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–		XX
PROJECT FILE NO. 608460			

NORTH ABUTMENT
PLAN AND ELEVATION



NORTH ABUTMENT PLAN
SCALE: ⅜" = 1'–0"



NORTH ABUTMENT ELEVATION
SCALE: ⅜" = 1'–0"

TOP OF PEDESTAL ELEVATIONS			
BM. #1	122.00	BM. #5	123.01
BM. #2	122.24	BM. #6	123.26
BM. #3	122.50	BM. #7	123.52
BM. #4	122.75		

NOTE:

ELEVATIONS DO NOT INCLUDE ERECTION PAD THICKNESS.

DRAWING PLOTTED HALF SIZE

NOTES:

1. ALL ELEVATIONS ARE SHOWN AT ABUTMENT CENTERLINE
2. DETAILS ABOVE DECK LEVEL AND INDEPENDENT WINGWALLS OMITTED FOR CLARITY

DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 11 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

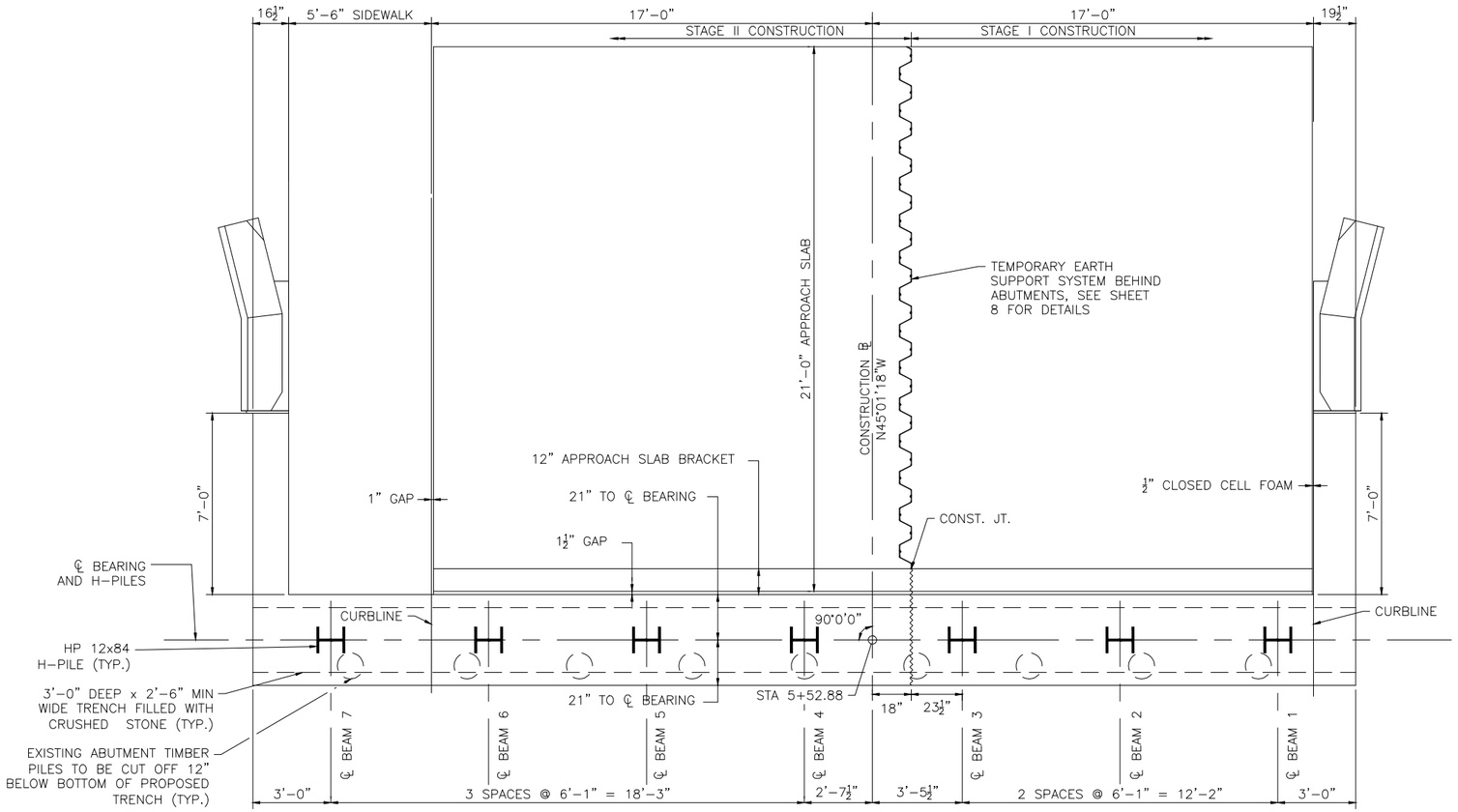
608460_BR11-14 (H-01-005)_ABUTMENTS.DWG Plotted on 12-Mar-2020 12:30 PM

608460 Bridge Sketch Plans () XX-Apr#-2018

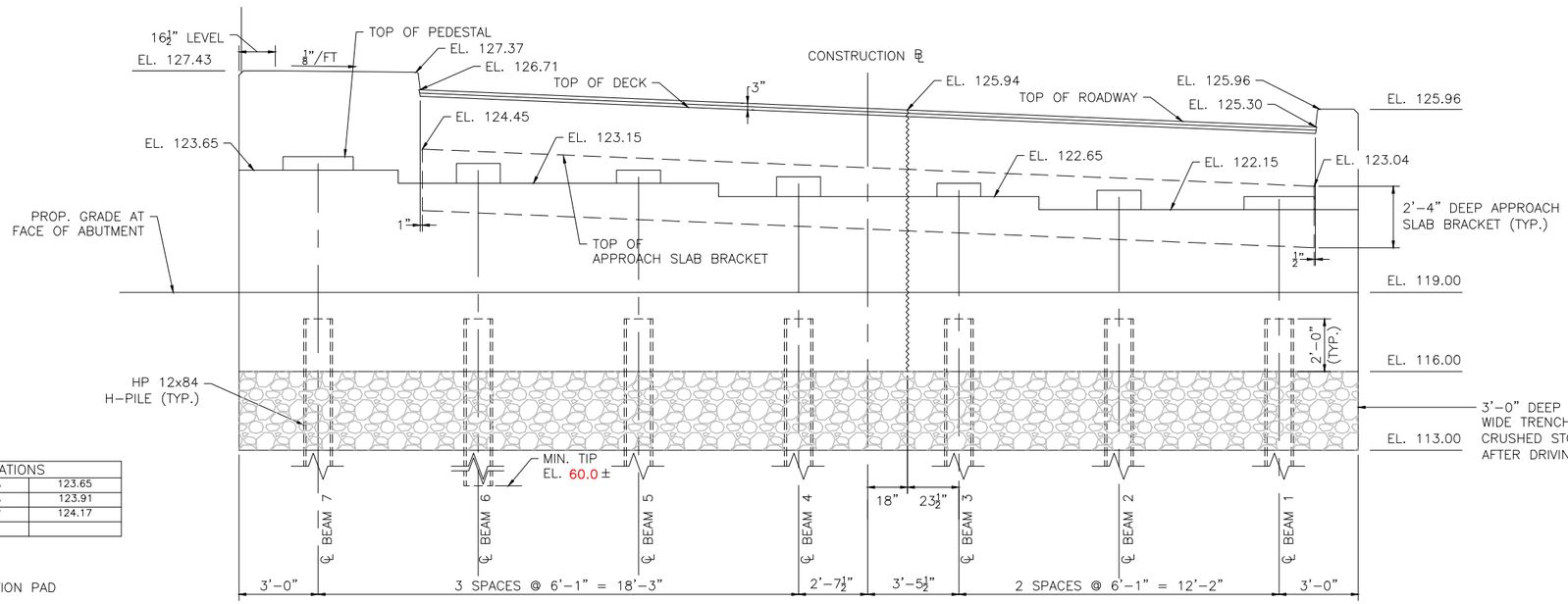
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–		XX
PROJECT FILE NO. 608460			

SOUTH ABUTMENT
PLAN AND ELEVATION



SOUTH ABUTMENT PLAN
SCALE: ⅜" = 1'–0"



SOUTH ABUTMENT ELEVATION
SCALE: ⅜" = 1'–0"

TOP OF PEDESTAL ELEVATIONS			
BM. #1	122.65	BM. #5	123.65
BM. #2	122.89	BM. #6	123.91
BM. #3	123.15	BM. #7	124.17
BM. #4	123.40		

NOTE:

ELEVATIONS DO NOT INCLUDE ERECTION PAD THICKNESS.

DRAWING PLOTTED HALF SIZE

NOTES:

1. ALL ELEVATIONS ARE SHOWN AT ABUTMENT CENTERLINE
2. DETAILS ABOVE DECK LEVEL AND INDEPENDENT WINGWALLS OMITTED FOR CLARITY

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 12 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

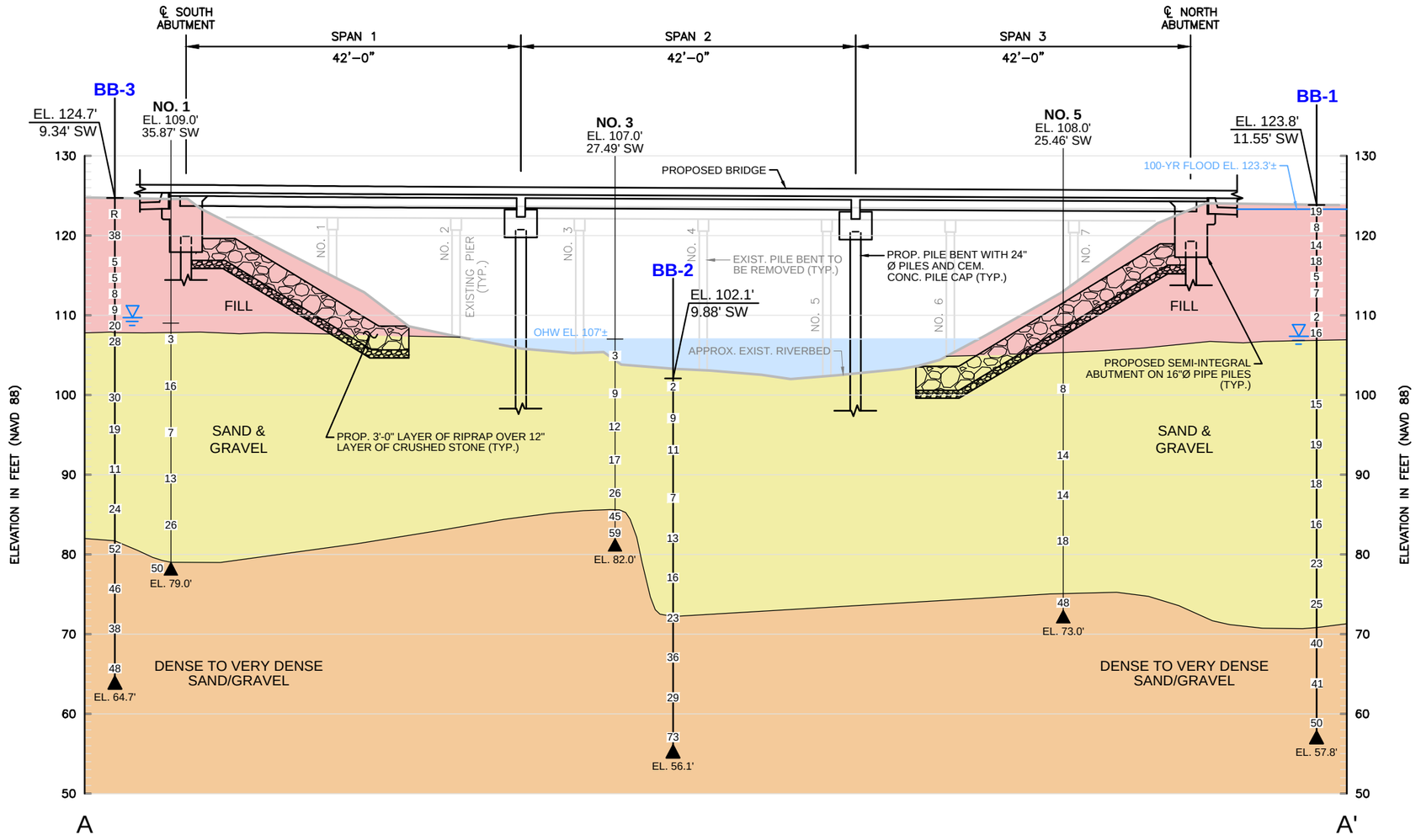
608460_BR11-14 (H-01-005)_ABUTMENTS.DWG Plotted on 12-Mar-2020 12:30 PM

608460 Bridge Sketch Plans () XX-April-2018

ATTACHMENT 3

Soil Profile & Estimated Geotechnical Design Parameters

© 2018 – GZA GeoEnvironmental, Inc. GZA–J:\170,000–179,999\173284\173284–00.STS\FIGURES\CAD\DWG\GZA_608460_BR04–09_Elev&XSect_v2.dwg [PROFILE_16SCALE] March 22, 2018 – 3:00pm anthony.pungitore



LEGEND

- **BB-3** — BORING NO.
- EL. 124.7' / 9.34' SW — ELEVATION AT BORING / OFFSET DISTANCE FROM PROFILE LINE
- GROUND SURFACE OR MUDLINE
- 48 — STANDARD PENETRATION RESISTANCE (SEE NOTE 6)
- GROUNDWATER ELEVATION (FT)
- R — REFUSAL
- EL. 64.7' — BOTTOM OF BORING (ELEVATION)

LITHOLOGY KEY

- WATER
- FILL
- SAND / GRAVEL
- DENSE TO VERY DENSE SAND / GRAVEL

VERTICAL SCALE IN FEET
0 8 16 32
0 8 16 32
HORIZONTAL SCALE IN FEET

NOTES:

1. REFER TO FIGURE 2 FOR THE LOCATION OF PROFILE LINE A-A'.
2. EXISTING AND PROPOSED BRIDGE PROFILES BASED ON AN ELECTRONIC DRAWING ENTITLED "608460_BR04-09_ELEV&XSECT.DWG," PREPARED BY ALFRED BENESCH AND COMPANY, DATED SEPTEMBER 29, 2017.
3. STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND ARE BASED ON CONDITIONS OBSERVED BY GZA'S FIELD REPRESENTATIVE. ACTUAL CONDITIONS MAY VARY.
4. SUBSURFACE INFORMATION BASED ON BORINGS PERFORMED BY SEABOARD DRILLING INC. BETWEEN OCTOBER 30, 2017 THROUGH NOVEMBER 8, 2017 AND BORINGS PERFORMED FOR THE EXISTING BRIDGE DATED 1935.
5. WATER SURFACE MEASUREMENTS WERE MADE UNDER CONDITIONS STATED ON THE BORING LOGS. THIS DATA HAS BEEN REVIEWED AND INTERPRETATIONS ARE MADE IN THE TEXT OF THIS REPORT. FLUCTUATIONS OF THE WATER SURFACE MAY OCCUR.
6. METHOD USED TO PERFORM HISTORIC BORINGS WAS NOT NOTED ON THE1935 DRAWINGS. BLOW COUNT VALUES INDICATE " BLOWS PER FOOT ON SPOON" USING A 250lb HAMMER.

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

PROPOSED BRIDGE
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

SUBSURFACE PROFILE A-A'
(EAST SIDE OF BRIDGE)

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: benesch	
PROJ MGR: STS	REVIEWED BY: STS	CHECKED BY: TMK	FIGURE 3
DESIGNED BY: STS	DRAWN BY: ADP	SCALE: AS SHOWN	
DATE: 03/22/2018	PROJECT NO. 01.0173284.00	REVISION NO.	

TABLE 1

Bay Road (Route 47) over Fort River River, Hadley, Massachusetts
Summary of Subsurface Conditions

Boring No.	Bridge Structure	Top of Stratum Elevation (ft)					Approximate Stratum Thickness (ft)			Groundwater Elevation (ft)	Depth to Bottom of Exploration (ft)
		Approx. Ground Surface/ Mud Line El.	Fill	Sand and Gravel	Dense Sand and Gravel	Bottom of Exploration	Fill	Sand and Gravel	Dense Sand and Gravel		
Recent Borings											
BB-1	North Abutment	125.0	125.0	109.0	72.0	59.0	16.0	37.0	13.0	108.5	66.0
BB-2	Intermediate Piers	105.2	NE	105.2	72.2	59.2	NE	33.0	13.0	See Note 3	46.0
BB-3	South Abutment	126.0	126.0	109.1	83.0	66.0	16.9	26.1	17.0	111.0	60.0
Previous (1935) Borings											
No.1	South Abutment	109.0	NE	109.0	79.0	75.0	NE	30.0	4.0	NR	34.0
No.2	South Abutment	110.0	NE	110.0	80.0	78.0	NE	30.0	2.0	NR	32.0
No.3	Intermediate Piers	107.0	NE	107.0	82.0	75.0	NE	25.0	7.0	NR	32.0
No.4	Intermediate Piers	110.0	NE	110.0	80.0	75.0	NE	30.0	5.0	NR	35.0
No.5	North Abutment	108.0	NE	108.0	73.0	70.0	NE	35.0	3.0	NR	38.0
No.6	North Abutment	108.0	NE	108.0	73.0	71.0	NE	35.0	2.0	NR	37.0

NE - Not Encountered; NR - Data not reported

Notes:

1) Depths shown are below existing ground surface for borings BB-1 and BB-3, and below mudline for BB-2.
2) Ground surface elevation estimated based on available GIS data from a drawing entitled "Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA" prepared by GZA, dated August 24, 2017.
3) Boring BB-2 was drilled through the bridge deck, water in casing was approximately at the river level at the end of drilling.
4) Refer to the boring logs in Appendices B and C for additional information.

Table 21. Relationship among relative density, penetration resistance, dry unit weight, and angle of internal friction of cohesionless soils (after Duncan and Buchignani, 1976)

Descriptive Relative Density	Relative Density **	Standard Penetration Resistance N_1 (see Note) *	Static Cone Resistance q_c	Angle of Internal Friction ϕ	Dry Unit Weight
	%	blows/foot	tsf or kgf/cm^2	degrees	KN/m^3
Very Loose	< 15	< 4	< 50	< 30	< 14
Loose	15 - 35	4 - 10	50 - 100	30 - 32	14 - 16
Medium Dense	35 - 65	10 - 30	100 - 150	32 - 35	16 - 18
Dense	65 - 85	30 - 50	150 - 200	35 - 38	18 - 20
Very Dense	85 - 100	> 50	> 200	> 38	> 20

* N_1 = N -value corrected to an effective vertical overburden pressure of 1.0 tsf or 100 kPa

** Freshly deposited, normally consolidated sand

Note: As originally proposed, this correlation used the uncorrected SPT blowcount, N_1. However, hammers delivering 60% of the theoretical energy have been the most commonly used hammers for SPT tests, and it seems likely that the data on which the correlation was based was obtained primarily from tests with such hammers. It therefore seems logical to use $N_{1,60}$ with this correlation, and it is the recommendation of this report that this be done.

1kN/cubic meter=6.24 pcf

$\gamma_m = [(G_s-1)/G_s) \times \gamma_{drv}] + \gamma_w$

γ_m = Moist unit weight (pcf)

γ_{dry} = Dry unit weight (pcf)

γ_w = Unit weight of water (pcf)

G_s = Soil specific gravity

Layer	Average $N_{1,60}$ (bpf)	Dry Unit Weight (kN/m^3)	Dry Unit Weight (pcf)	Specific Gravity Gs	Saturated Unit Weight (pcf)	Moist Unit Weight (pcf)	Friction Angle ϕ' (deg)
Fill	15	16	99.8	2.6	124	120	30
S&G	16	17	106.1	2.6	128	125	32
D-S&G	34	18	112.3	2.65	132	130	34

Notes:

Neglect N=100 bpf in Fill and N=2 bpf in S&G for evaluation of the average N-value

$N_{1,60}$ evaluated as described in 10.4.6.2.4 of 2017 AASHTO LRFD based on N-values from Borings BB-1 through BB-3

A00804-58

ATTACHMENT 4

Single Pile Axial Geotechnical Resistance – Hand Calculations

Bay Road (Route 47) Bridge over Fort River
Hadley, Massachusetts
Summary of Calculations - Nominal Geotechnical Axial Resistance (Limiting End Bearing based on Depth of 30D)

North Abutment (BB-1)

Soil Stratum	Depth to bottom of Layer below Ground Surface (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	In-Situ Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	17.0	17.0	120	2040	2040	2040	0.00	0	0	0	0.80	0	153
S&G	**31.0**	**14.0**	**125**	**3790**	**2916**	**2478**	**0.68**	**39**	**89**	**128**	**0.80**	**102**	
S&G	**52.0**	**21.0**	**125**	**6415**	**4231**	**2916**	**0.75**	**103**	**89**	**192**	**0.80**	**154**	

Diameter (in)= 12.3
30D (ft)= 31
Tip Area At (sf)= 1.05
S&G Nq = 29
Dense S&G Nq = 42
GW Depth (ft)= 17
Limiting EB (kips)= Note 1

Note: Depth to very dense sand and gravel stratum is variable based on the borings. Perform analysis assuming med. dense sand and gravel along full length of pile.

Pier 2 - North Int. Pier (BB-2)

Soil Stratum	Depth to bottom of Layer Below Scoured Mudline (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	0.0	0.0	120	0	0	0	0.00	0	0	0	0.65	0	305
S&G	30.5	30.5	125	3813	1909	955	0.35	67	174	241	0.65	156	
DS&G	**41.5**	**11.0**	**130**	**5243**	**2653**	**2281**	**0.83**	**124**	**350**	**474**	**0.65**	**308**	
DS&G	44.5	3.0	130	5633	2856	2754	1.00	143	363	506	0.65	329	

Diameter (in)= 24
30D (ft)= 60
Tip Area At (sf)= 3.14
S&G Nq = 29
DS&G Nq = 42
GW Depth (ft)= 0
Limiting EB (kips)= Note 1

Pier 1 - South Int. Pier (BB-2)

Soil Stratum	Depth to bottom of Layer Below Scoured Mudline (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	0.0	0.0	120	0	0	0	0.00	0	0	0	0.65	0	305
S&G	30.5	30.5	125	3813	1909	955	0.35	67	174	241	0.65	156	
DS&G	**41.5**	**11.0**	**130**	**5243**	**2653**	**2281**	**0.83**	**124**	**350**	**474**	**0.65**	**308**	
DS&G	44.5	3.0	130	5633	2856	2754	1.00	143	363	506	0.65	329	

Diameter (in)= 24
30D (ft)= 60
Tip Area At (sf)= 3.14
S&G Nq = 29
DS&G Nq = 42
GW Depth (ft)= 0
Limiting EB (kips)= Note 1

South Abutment (BB-3)

Soil Stratum	Depth to bottom of Layer below Ground Surface (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	17.0	17.0	120	2040	2040	2040	0.00	0	0	0	0.80	0	153
S&G	**31.0**	**14.0**	**125**	**3790**	**2916**	**2478**	**0.68**	**39**	**89**	**128**	0.80	**102**	
S&G	**52.0**	**21.0**	**125**	**6415**	**4231**	**2916**	**0.75**	**103**	**89**	**192**	**0.80**	**154**	

Diameter (in)= 12.3
30D (ft)= 31
Tip Area At (sf)= 1.05
S&G Nq= 29
DS&G Nq = 42
GW Depth (ft)= 17
Limiting EB (kips)= Note 1

Note: Depth to very dense sand and gravel stratum is variable based on the borings. Perform analysis assuming med. dense sand and gravel along full length of pile.

Notes:
1. Bold numbers indicate depth of 30D into Sand and Gravel layer (D= pile diameter) where applicable.
2. Bold red numbers indicate the depth at which the design axial load is achieved.

Bay Road (Route 47) Bridge over Fort River
Hadley, Massachusetts
Summary of Calculations - Nominal Geotechnical Axial Resistance (Limiting End Bearing based on Depth of 20D)

North Abutment (BB-1)

Soil Stratum	Depth to bottom of Layer below Ground Surface (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	In-Situ Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	17.0	17.0	120	2040	2040	2040	0.00	0	0	0	0.80	0	
S&G	**21.0**	**4.0**	**125**	**2540**	**2290**	**2165**	**0.59**	**10**	**70**	**79**	**0.80**	**64**	153
S&G	**65.0**	**44.0**	**125**	**8040**	**5045**	**2290**	**0.63**	**122**	**70**	**192**	**0.80**	**154**	

Diameter (in)= 12.3
20D (ft)= 21
Tip Area At (sf)= 1.05
S&G Nq= 29
DS&G Nq = 42
GW Depth (ft)= 17
Limiting EB (kips)= Note 1

Note: Depth to very dense sand and gravel stratum is variable based on the borings. Perform analysis assuming med. dense sand and gravel along full length of pile.

Pier 2 - North Int. Pier (BB-2)

Soil Stratum	Depth to bottom of Layer Below Scoured Mudline (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	0.0	0.0	120	0	0	0	0.00	0	0	0	0.65	0	
S&G	30.5	30.5	125	3813	1909	955	0.35	67	174	241	0.65	156	
DS&G	**40.0**	**9.5**	**130**	**5048**	**2552**	**2230**	**0.81**	**115**	**294**	**409**	**0.65**	**266**	305
DS&G	**44.0**	**4.0**	**130**	**5568**	**2822**	**2552**	**0.93**	**138**	**337**	**475**	**0.65**	**309**	
DS&G	44.5	0.5	130	5633	2856	2552	0.93	141	337	478	0.65	311	

Diameter (in)= 24
20D (ft)= 40
Tip Area At (sf)= 3.14
S&G Nq= 29
DS&G Nq= 42
GW Depth (ft)= 0
Limiting EB (kips)= Note 1

Pier 1 - South Int. Pier (BB-2)

Soil Stratum	Depth to bottom of Layer Below Scoured Mudline (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	0.0	0.0	120	0	0	0	0.00	0	0	0	0.65	0	
S&G	30.5	30.5	125	3813	1909	955	0.35	67	174	241	0.65	156	
DS&G	**40.0**	**9.5**	**130**	**5048**	**2552**	**2230**	**0.81**	**115**	**294**	**409**	**0.65**	**266**	305
DS&G	**44.0**	**4.0**	**130**	**5568**	**2822**	**2552**	**0.93**	**138**	**337**	**475**	**0.65**	**309**	
DS&G	44.5	0.5	130	5633	2856	2552	0.93	141	337	478	0.65	311	

Diameter (in)= 24
20D (ft)= 40
Tip Area At (sf)= 3.14
S&G Nq= 29
DS&G Nq= 42
GW Depth (ft)= 0
Limiting EB (kips)= Note 1

South Abutment (BB-3)

Soil Stratum	Depth to bottom of Layer below Ground Surface (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	17.0	17.0	120	2040	2040	2040	0.00	0	0	0	0.80	0	
S&G	**21.0**	**4.0**	**125**	**2540**	**2290**	**2165**	**0.59**	**10**	**70**	**79**	**0.80**	**64**	153
S&G	**65.0**	**44.0**	**125**	**8040**	**5045**	**2290**	**0.63**	**122**	**70**	**192**	**0.80**	**154**	

Diameter (in)= 12.3
20D (ft)= 21
Tip Area At (sf)= 1.05
S&G Nq= 29
DS&G Nq = 42
GW Depth (ft)= 17
Limiting EB (kips)= Note 1

Note: Depth to very dense sand and gravel stratum is variable based on the borings. Perform analysis assuming med. dense sand and gravel along full length of pile.

Notes:
1. Bold numbers indicate depth of 30D into Sand and Gravel layer (D= pile diameter) where applicable.
2. Bold red numbers indicate the depth at which the design axial load is achieved.

Bay Road (Route 47) Bridge over Fort River
Hadley, Massachusetts
Summary of Calculations - Nominal Geotechnical Axial Resistance
(Assume Unit Side Friction to 0.75 and 1.0 ksf; Limiting End Bearing based on Effective Stress at an Embedment Depth of 20D)

North Abutment (BB-1)

Soil Stratum	Depth to bottom of Layer below Ground Surface (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	In-Situ Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	17.0	17.0	120	2040	2040	2040	0.00	0	0	0	0.80	0	
S&G	**21.0**	**4.0**	**125**	**2540**	**2290**	**2165**	**0.75**	**12**	**70**	**82**	**0.80**	**66**	153
S&G	**57.0**	**36.0**	**125**	**7040**	**4544**	**2290**	**0.75**	**123**	**70**	**193**	**0.80**	**154**	

Diameter (in)= 12.3
20D (ft)= 21
Tip Area At (sf)= 1.05
S&G Nq= 29
DS&G Nq = 42
GW Depth (ft)= 17
Limiting EB (kips)= Note 1

Note: Depth to very dense sand and gravel stratum is variable based on the borings. Perform analysis assuming med. dense sand and gravel along full length of pile.

Pier 2 - North Int. Pier (BB-2)

Soil Stratum	Depth to bottom of Layer Below Scoured Mudline (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	0.0	0.0	120	0	0	0	0.00	0	0	0	0.65	0	
S&G	12.5	12.5	125	1563	783	391	0.75	59	36	95	0.65	61	
S&G	30.5	18.0	125	3813	1909	1346	0.75	144	123	266	0.65	173	305
DS&G	**37.5**	**7.0**	**130**	**4723**	**2383**	**2146**	**1.00**	**188**	**283**	**471**	**0.65**	**306**	
DS&G	**40.0**	**2.5**	**130**	**5048**	**2552**	**2467**	**1.00**	**203**	**326**	**529**	**0.65**	**344**	
DS&G	44.5	4.5	130	5633	2856	2552	1.00	232	337	568	0.65	369	

Diameter (in)= 24
20D (ft)= 40
Tip Area At (sf)= 3.14
S&G Nq= 29
DS&G Nq = 42
GW Depth (ft)= 0
Limiting EB (kips)= Note 1

Pier 1 - South Int. Pier (BB-2)

Soil Stratum	Depth to bottom of Layer Below Scoured Mudline (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	0.0	0.0	120	0	0	0	0.00	0	0	0	0.65	0	
S&G	12.5	12.5	125	1563	783	391	0.75	59	36	95	0.65	61	
S&G	30.5	18.0	125	3813	1909	1346	0.75	144	123	266	0.65	173	305
DS&G	**37.5**	**7.0**	**130**	**4723**	**2383**	**2146**	**1.00**	**188**	**283**	**471**	**0.65**	**306**	
DS&G	**40.0**	**2.5**	**130**	**5048**	**2552**	**2467**	**1.00**	**203**	**326**	**529**	**0.65**	**344**	
DS&G	44.5	4.5	130	5633	2856	2552	1.00	232	337	568	0.65	369	

Diameter (in)= 24
20D (ft)= 40
Tip Area At (sf)= 3.14
S&G Nq= 29
DS&G Nq = 42
GW Depth (ft)= 0
Limiting EB (kips)= Note 1

South Abutment (BB-3)

Soil Stratum	Depth to bottom of Layer below Ground Surface (ft)	Thickness (ft)	Unit Weight (pcf)	Total Stress (psf)	Effective Stress (psf)	Effective Stress for Design (psf)	Unit Skin Friction (ksf)	Nominal Frictional Resistance (kips)	Nominal End-Bearing Resistance (kips)	Nominal Resistance (kips)	Resistance Factor	Factored Resistance (kips)	Design Axial Load per Pile (Strength I - kips)
Fill	17.0	17.0	120	2040	2040	2040	0.00	0	0	0	0.80	0	
S&G	**21.0**	**4.0**	**125**	**2540**	**2290**	**2165**	**0.75**	**12**	**70**	**82**	**0.80**	**66**	153
S&G	**57.0**	**36.0**	**125**	**7040**	**4544**	**2290**	**0.75**	**123**	**70**	**193**	**0.80**	**154**	

Diameter (in)= 12.3
20D (ft)= 21
Tip Area At (sf)= 1.05
S&G Nq = 29
DS&G Nq = 42
GW Depth (ft)= 17
Limiting EB (kips)= Note 1

Note: Depth to very dense sand and gravel stratum is variable based on the borings. Perform analysis assuming med. dense sand and gravel along full length of pile.

Notes:
1. Bold numbers indicate depth of 30D into Sand and Gravel layer (D= pile diameter) where applicable.
2. Bold red numbers indicate the depth at which the design axial load is achieved.

APPENDIX F

SEISMIC DESIGN PARAMETERS

APPENDIX F-1

SITE CLASS AND SEISMIC DESIGN PARAMETERS

Seismic Site Class Calculation Summary

Project: Bay Road (Route 47) over Fort River **Project No.:** 01.0173284
Location: Hadley, Massachusetts
Evaluated By/Date: MR **Date** 11/14/2017
Checked By/Date: JBH **Date** 3/15/2018

Objective: Determine seismic site class by performing calculations in accordance with the MassDOT LRFD Bridge Manual 2013 Edition, which references the AASHTO LRFD Seismic Bridge Design Specifications, 2nd Edition (2011) and Interim.

Subsurface Data: Borings BB-1, BB-2 and BB-2 were drilled by Seaboard Drilling Inc, of Chicopee, MA between October 30 and November 1 , 2017 and on November 8, 2017.

Assumptions: Soil borings extended to depths between 60 and 66 feet below the roadway level and bedrock was not encountered in the soil borings. Bedrock was assumed to be deeper than 100 feet Based on data from MassGIS. The soil between the bottom of boring and 100 feet was assumed to be Sand and Gravel with an average blow count based on the blow count in the Sand and Gravel layer encountered in each boring.

Approach: 1) Evaluate if the procedure in AASHTO LRFD Seismic Section 3.4.2.1 for classifying a site is appropriate for the site. Sites with highly variable subsurface conditions or very large sites may require multiple site class determinations or a site-specific seismic response analysis. Furthermore, classifying a site based on the 100 feet of soil and rock beneath the ground surface may be inappropriate if deep deposits of weak soils are present below 100 feet, or if foundation structures are supported on firm soil or rock below soft soils which can be justified as having little effect on the structure's seismic response.

2) Evaluate if soil properties are known in sufficient detail to determine site class. If data is not known in sufficient detail, AASHTO permits the use of Site Class D, unless conditions for Site Class E or Site Class F are likely to be present.

3) Check for the four categories of Site Class F requiring site-specific evaluation:
- Soils vulnerable to potential failure (liquefiable soils, sensitive clays, weakly cemented soils)
- Peats or highly organic clays greater than 10 feet in thickness
- Thick layers (greater than 25 feet) of highly plastic clay (PI > 75)
- Very thick soft/medium stiff clays (greater than 125 feet)

4) Check for existence of greater than 10 feet of soft clay (where s_u < 500 psf, w > 40%, and PI > 20). If these conditions are met, classify as Site Class E.

5) Categorize the site using one of the following three methods in AASHTO 3.4.2.2:
- $\overline{v}_s$ (Method A) - $\overline{N}$ (Method B) - $\overline{N}_{ch}$ *and* $\overline{s_u}$ (Method C)

If shear wave velocity data are available, they should be used to classify the site. The N and $\overline{s_u}$ methods should only be used if shear wave velocity data is not available, as the correlation between site amplification and these geotechnical parameters is more uncertain (and therefore more conservative) than the correlation with $\overline{v_s}$.

Results: Calculations of the Seismic Site Class based on Method B as described in section 3.4.2.2 of the LRFD Seismic Bridge Design Specifications are attached. Calculations results are summarized in the table below.

Boring ID	BB-1	BB-2	BB-3
N-Value	17	18	24

Conclusions: Based on the procedure outlined in section 3.4.2.2 and table 3.4.2.1-1 of the LRFD Seismic Bridge Design Specifications, we recommend that Site Class "D" be used for design.

Bay Road (Route 47) over Fort River
Hadley, Massachusetts

Calculated By: MR Date: 11/14/2017
Checked By: JBH Date: 3/15/2018

INPUT

Exploration ID: **BB-1** Ground Surface Elevation: 125.0 ft Depth of Boring: 66.0 ft

Depth to Bedrock: 100.0 ft

EQUATIONS

$$\overline{N}_{ch} = \frac{\sum_{i=1}^{m} d_i}{\sum_{i=1}^{m} \frac{d_i}{N_i}}$$

where: m = number of layers

d_i = the thickness of all layers between 0 and 100 feet.

d_c = the thickness of any clay layers between 0 and 100 feet.

N_i = the Standard Penetration Resistance (ASTM D 1586) of cohesionless soil layers not to exceed 100 blows/ft as directly measured in the field without corrections.

Note: d_i calculated assuming breaks between sub-layers occur at the midpoint between SPT sample intervals (unless noted otherwise)

CALCULATION

$\overline{N}$ = 17.3

Soil Strata	SPT Interval Depth Top, ft	SPT Interval Depth Bottom, ft	SPT Elevation (mid-interval)	SPT N-value	d_i	d_i / N_i	Comment
Fill	0.8	2.8	123.2	19	2.8	0.15	
	2.8	4.8	121.2	8	2.1	0.26	
	5.0	7.0	119.0	14	2.1	0.15	
	7.0	9.0	117.0	18	2.0	0.11	
	9.0	11.0	115.0	5	2.0	0.40	
	11.0	13.0	113.0	7	2.5	0.36	
River sediments	14.0	16.0	110.0	2	2.5	1.25	
	16.0	18.0	108.0	16	5.0	0.31	
	24.0	26.0	100.0	15	6.5	0.43	
	29.0	31.0	95.0	19	5.0	0.26	
	34.0	36.0	90.0	18	5.0	0.28	
	39.0	41.0	85.0	16	5.0	0.31	
	44.0	46.0	80.0	23	5.0	0.22	
	49.0	51.0	75.0	25	5.0	0.20	
Sand and Gravel	54.0	56.0	70.0	40	5.0	0.13	The soil between the bottom of boring and 100 feet was assumed to be Sand and Gravel with an average blow count based on the blow count in the Sand and Gravel layer encountered in each boring.
	59.0	61.0	65.0	41	5.0	0.12	
	64.0	66.0	60.0	50	3.5	0.07	
	66.0	100.0	42.0	44	34.0	0.78	

100.00

Bay Road (Route 47) over Fort River
Hadley, Massachusetts

Calculated By: MR Date: 11/14/2017
Checked By: JBH Date: 3/15/2018

INPUT

Exploration ID: **BB-2** Ground Surface Elevation: 105.2 ft Depth of Boring: 46.0 ft

Depth to Bedrock: 100.0 ft

EQUATIONS

$$\overline{N}_{ch} = \frac{\sum_{i=1}^{m} d_i}{\sum_{i=1}^{m} \frac{d_i}{N_i}}$$

where: m = number of layers

d_i = the thickness of all layers between 0 and 100 feet.

d_c = the thickness of any clay layers between 0 and 100 feet.

N_i = the Standard Penetration Resistance (ASTM D 1586) of cohesionless soil layers not to exceed 100 blows/ft as directly measured in the field without corrections.

Note: d_i calculated assuming breaks between sub-layers occur at the midpoint between SPT sample intervals (unless noted otherwise)

CALCULATION

$\overline{N}$ = 17.8

Soil Strata	SPT Interval Depth		SPT Elevation	SPT N-value	d_i	d_i / N_i	Comment
	Top, ft	Bottom, ft	(mid-interval)				
River sediments	0.0	2.0	104.2	2	3.0	1.50	
	4.0	6.0	100.2	9	4.0	0.44	
	8.0	10.0	96.2	11	5.0	0.45	
	14.0	16.0	90.2	7	5.5	0.79	
	19.0	21.0	85.2	13	5.0	0.38	
	24.0	26.0	80.2	16	5.0	0.31	
	29.0	31.0	75.2	23	5.0	0.22	
Sand and Gravel	34.0	36.0	70.2	36	5.0	0.14	The soil between the bottom of boring and 100 feet was assumed to be Sand and Gravel with an average blow count based on the blow count in the Sand and Gravel layer encountered in each boring.
	39.0	41.0	65.2	29	5.0	0.17	
	44.0	46.0	60.2	73	3.5	0.05	
	46.0	100.0	32.2	46	54.0	1.17	

100.00

Bay Road (Route 47) over Fort River
Hadley, Massachusetts

Calculated By: MR Date: 11/14/2017
Checked By: JBH Date: 3/15/2018

INPUT

Exploration ID: **BB-3** Ground Surface Elevation: 126.0 ft Depth of Boring: 60.0 ft

Depth to Bedrock: 100.0 ft

EQUATIONS

$$\overline{N}_{ch} = \frac{\sum_{i=1}^{m} d_i}{\sum_{i=1}^{m} \frac{d_i}{N_i}}$$

where: m = number of layers

d_i = the thickness of all layers between 0 and 100 feet.

d_c = the thickness of any clay layers between 0 and 100 feet.

N_i = the Standard Penetration Resistance (ASTM D 1586) of cohesionless soil layers not to exceed 100 blows/ft as directly measured in the field without corrections.

Note: d_i calculated assuming breaks between sub-layers occur at the midpoint between SPT sample intervals (unless noted otherwise)

CALCULATION

$\overline{N}$ = 23.6

Soil Strata	SPT Interval Depth Top, ft	SPT Interval Depth Bottom, ft	SPT Elevation (mid-interval)	SPT N-value	d_i	d_i / N_i	Comment
Fill	1.0	3.0	124.0	100	3.0	0.03	
	3.0	5.0	122.0	38	3.0	0.08	
	7.0	9.0	118.0	5	3.0	0.60	
	9.0	11.0	116.0	5	2.0	0.40	
	11.0	13.0	114.0	8	2.0	0.25	
	13.0	15.0	112.0	9	2.0	0.22	
	15.0	17.0	110.0	20	2.0	0.10	
River sediments	17.0	19.0	108.0	28	4.5	0.16	
	24.0	26.0	101.0	30	5.5	0.18	
	28.0	28.0	98.0	19	3.5	0.18	
	33.0	35.0	92.0	11	6.0	0.55	
	38.0	40.0	87.0	24	5.0	0.21	
Sand and Gravel	43.0	45.0	82.0	52	5.0	0.10	The soil between the bottom of boring and 100 feet was assumed to be Sand and Gravel with an average blow count based on the blow count in the Sand and Gravel layer encountered in each boring.
	48.0	50.0	77.0	46	5.0	0.11	
	53.0	55.0	72.0	38	5.0	0.13	
	58.0	60.0	67.0	48	3.5	0.07	
	60.0	100.0	46.0	46	40.0	0.87	
					100.00		

USGS Design Maps Summary Report

User–Specified Input

Report Title Bay Road over Fort River
Fri March 16, 2018 14:30:23 UTC

Building Code Reference Document 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design
(which utilizes USGS hazard data available in 2002)

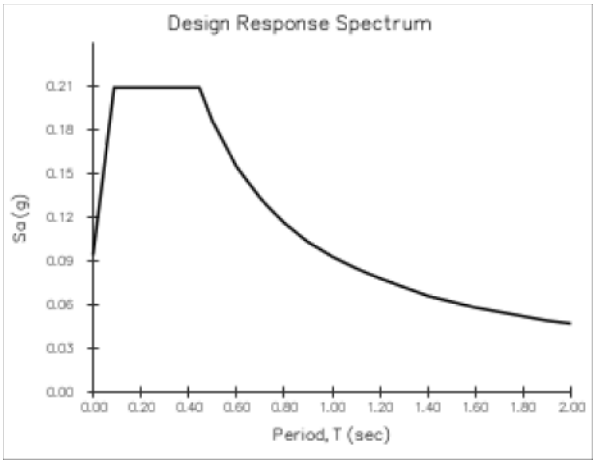
Site Coordinates 42.33274°N, 72.5788°W

Site Soil Classification Site Class D – "Stiff Soil"



USGS–Provided Output

PGA =	0.058 g	**A_s =**	0.094 g
S_s =	0.131 g	**S_{DS} =**	0.209 g
S_1 =	0.039 g	**S_{D1} =**	0.093 g



Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

Design Maps Detailed Report

2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design (42.33274°N, 72.5788°W)

Site Class D – "Stiff Soil"

Article 3.4.1 — Design Spectra Based on General Procedure

Note: Maps in the 2009 AASHTO Specifications are provided by AASHTO for Site Class B. Adjustments for other Site Classes are made, as needed, in Article 3.4.2.3.

From Figure 3.4.1-2 [1]	PGA = 0.058 g
From Figure 3.4.1-3 [2]	S_S = 0.131 g
From Figure 3.4.1-4 [3]	S_1 = 0.039 g

Article 3.4.2.1 — Site Class Definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Article 3.4.2.

Table 3.4.2.1–1 Site Class Definitions

SITE CLASS	SOIL PROFILE NAME	Soil shear wave velocity, $\overline{v}_s$, (ft/s)	Standard penetration resistance, $\overline{N}$	Soil undrained shear strength, $\overline{s}_u$, (psf)
A	Hard rock	$\overline{v}_s > 5{,}000$	N/A	N/A
B	Rock	$2{,}500 < \overline{v}_s \leq 5{,}000$	N/A	N/A
C	Very dense soil and soft rock	$1{,}200 < \overline{v}_s \leq 2{,}500$	$\overline{N} > 50$	>2,000 psf
D	Stiff soil profile	$600 \leq \overline{v}_s < 1{,}200$	$15 \leq \overline{N} \leq 50$	1,000 to 2,000 psf
E	Stiff soil profile	$\overline{v}_s < 600$	$\overline{N} < 15$	<1,000 psf
E	—	Any profile with more than 10 ft of soil having the characteristics: 1. Plasticity index $PI > 20$, 2. Moisture content $w \geq 40\%$, and 3. Undrained shear strength $\overline{s}_u < 500$ psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays ($H > 10$ feet of peat and/or highly organic clay where H = thickness of soil) 3. Very high plasticity clays ($H > 25$ feet with plasticity index $PI > 75$) 4. Very thick soft/medium stiff clays ($H > 120$ feet)		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Article 3.4.2.3 — Site Coefficients

Table 3.4.2.3-1 (for F_{pga})—Values of F_{pga} as a Function of Site Class and Mapped Peak Ground Acceleration Coefficient

Site Class	Mapped Peak Ground Acceleration				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.058 g, F_{PGA} = 1.600

Table 3.4.2.3-1 (for F_a)—Values of F_a as a Function of Site Class and Mapped Short-Period Spectral Acceleration Coefficient

Site Class	Spectral Response Acceleration Parameter at Short Periods				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 0.131 g, F_a = 1.600

Table 3.4.2.3-2—Values of F_v as a Function of Site Class and Mapped 1-sec Period Spectral Acceleration Coefficient

Site Class	Mapped Spectral Response Acceleration Coefficient at 1-sec Periods				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_1

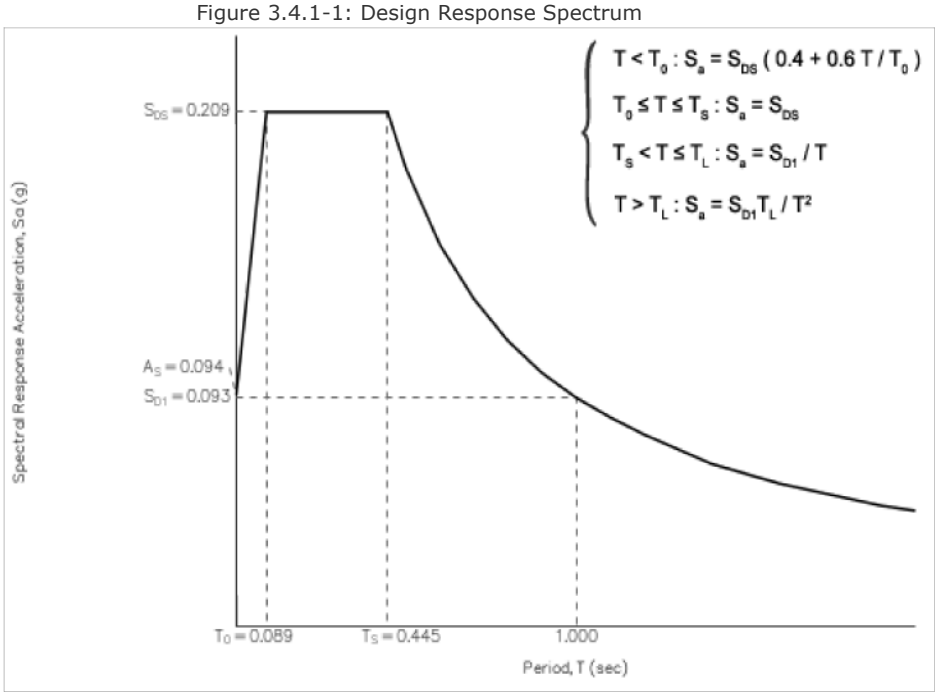
For Site Class = D and S_1 = 0.039 g, F_v = 2.400

Equation (3.4.1-1): $A_S = F_{PGA}\ PGA = 1.600 \times 0.058 = 0.094$ g

Equation (3.4.1-2): $S_{DS} = F_a\ S_S = 1.600 \times 0.131 = 0.209$ g

Equation (3.4.1-3): $S_{D1} = F_v\ S_1 = 2.400 \times 0.039 = 0.093$ g

Figure 3.4.1-1: Design Response Spectrum



Article 3.5 - Selection of Seismic Design Category (SDC)

Table 3.5-1—Partitions for Seismic Design Categories A, B, C, and D

VALUE OF S_{D1}	SDC
S_{D1} < 0.15g	A
0.15g ≤ S_{D1} < 0.30g	B
0.30g ≤ S_{D1} < 0.50g	C
0.50g ≤ S_{D1}	D

For S_{D1} = 0.093 g, Seismic Design Category = A

Seismic Design Category ≡ "the design category in accordance with Table 3.5-1" = A

References

1. *Figure 3.4.1-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-2.pdf
2. *Figure 3.4.1-3*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-3.pdf
3. *Figure 3.4.1-4*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-4.pdf

APPENDIX F-2

LIQUEFACTION SUSCEPTIBILITY EVALUATION

SPT-Based Liquefaction Susceptibility Calculation

Project: Bay Road over the Fort River **Project No:** 01.173284.00
Location: Hadley, MA
Calculated By: MR **Date:** 11/20/2017
Checked By: JBH **Date:** 3/15/2018

PURPOSE:

Evaluate the liquefaction susceptibility for the Bay Road Bridge Replacement Project based on the SPT data collected during the subsurface explorations.

REFERENCES:

1.Idriss, I.M. and Boulanger, R.W. (2008). Soil *Liquefaction During Earthquakes.* Earthquake Engineering Research Institute. Oakland, California. EERI Publication No. MNO-12.

2.Idriss, I.M. and Boulanger, R.W. (2004). Semi-Empirical Procedures for Evaluating Liquefaction Potential During Earthquakes. Proceedings of the Joint International Conference on Soil Dynamics & Earthquake Engineering and International Conference on Earthquake Geotechnical Engineering. Berkeley, California. January, 2004. pp.32-56.

3. Boring BB-1 through BB-3 performed by Seaboard Drilling Inc, on October 30 through November 1, 2017 and on November 8 2017 and observed by GZA Geoenvironmantal, Inc.

4. USGS Seismic tool for the evaluation of the Peak Ground Acceleration PGA and USGS Seismic Hazard tool for the evaluation of the Earthquake Magnitude M.

ASSUMPTIONS

1. PGA based on 1000-yr return period USGS Seismic Hazard Maps and on site class D;
2. Magnitude M based on probabilistic seismic hazard deaggregation (using the USGS Seismic Hazard tool);
3. Where geotechnical laboratory data were not available, the percent fines content was estimated based Burmister soil descriptions in the boring logs;

PROCEDURE:

1. Enter N-Values based on the boring logs for BB-1 through BB-3;
2. Enter Sublayer center and thickness;
3. Evaluate total and effective geostatic pressures;
4. Evaluate correction factors Ce, Cb , Cs, Cr and Cn and evaluate N1,60 as described in Idriss an Boulanger 2008;
5. Evaluate the fine content based on the soil descriptions in the logs and on available geotechnical laboratory data and calculated N1,60-cs;
6. Evaluate the CSR based on the selected peak ground acceleration, earthquake magnitude and geostatic pressures;
7. Evaluate CRR based on the Earthquake magnitude and N1,60-cs;
8. Evaluate the factor of safety against liquefaction as FS=CRR/CSR;
9. Evaluate liquefaction induced settlements.

SUMMARY OF RESULTS

Results are summarized in the table below. See attached calculation sheets for detailed calculation results

Boring ID	Min Fs	Est. Settlement (in)
BB-1	2.1	0.00
BB-2	1.1	0.39
BB-3	3.0	0.00

SPT-Based Liquefaction Factor of Safety Calculation

Calculated By: MR Date: 11/20/2017
Checked By: JBH Date: 3/15/2018

Project Name: Bay Road over the Fort River
Project Location: Hadley, MA
Project Number: 01.173284.00
Calculations Reference: Idriss & Boulanger (2008)

Exploration ID: BB-1

Elevation Data (at time of drilling):
Ground Surface Elevation: 125.0
Groundwater Elevation: 110.0
Groundwater Depth (ft): 15.0
Unit Weight of Water (pcf): 62.4
Depth of Boring (ft): 65.0

Drilling Data:
Typical rod stickup during SPT: 3 ft
Typical rod stickup during SPT: 0.9144 m
Borehole Diameter: 4 in

Material Properties:
Assumed Soil Weight Above Water Table, γ = 115 pcf
Assumed Soil Weight Below Water Table, γ_{sat} = 120 pcf
Atmospheric Pressure, P_a = 2109 psf

Seismic Assumptions (API Preliminary):
Max Accel at Surface, a_{max} (g)= 0.13
Design Earthquake Magnitude, M = 5.83
Is void redistribution significant? n/a
Earthquake Return Period (yrs) 1000

Design Ground Surface Elevation: 125.0
Design Groundwater Elevation: 110.0
Design Groundwater Depth (ft): 15.0
Thickness of New Fill (ft): 0.0
Thickness of New Fill (m): 0.0
Assumed Soil Weight New Fill, γ = 125 pcf

SPT Correction Factors:
Split Spoon Type: I.D.=1-3/8 in - Standard Sampler
Hammer Type: Auto Hammer

Subsurface Data and Parameter Calculations

Depth (mid-SPT interval)	Elev.	Depth	Total Stress, σ_v	Effective Stress, σ'_v	N_{field}	Soil Type	Stratum	Flags	Hammer Energy Ratio, ER	C_E	C_R	C_B	C_s	N_{60}	C_N	$(N_1)_{60}$	Fines Content	ΔN	$(N_1)_{60CS}$
ft	ft	m	psf	psf	blows/ft	SP			%					blows/ft		blows/ft	%	blows/ft	blows/ft
1.8	123.2	0.55	207	207	19	SP	Fill	Unsaturated	80	1.33	0.75	1.00	1.00	19	1.70	0	15	3	36
3.8	121.2	1.16	437	437	8	SP	Fill	Unsaturated	80	1.33	0.75	1.00	1.00	8	1.70	14	15	3	17
6.0	119.0	1.83	690	690	14	SP	Fill	Unsaturated	80	1.33	0.75	1.00	1.00	14	1.60	22	15	3	26
8.0	117.0	2.44	920	920	18	SP	Fill	Unsaturated	80	1.33	0.80	1.00	1.00	19	1.38	27	15	3	30
10.0	115.0	3.05	1150	1150	5	SP	Fill	Unsaturated	80	1.33	0.80	1.00	1.00	5	1.42	8	28	5	13
12.0	113.0	3.66	1380	1380	7	SP	Fill		80	1.33	0.85	1.00	1.00	8	1.26	0	28	5	15
15.0	110.0	4.57	1725	1725	2	SP	Riv.Sediments		80	1.33	0.85	1.00	1.00	2	1.14	3	40	6	8
17.0	108.0	5.18	1965	1840	16	SP	Riv.Sediments		80	1.33	0.95	1.00	1.00	20	1.06	21	5	0	21
25.0	100.0	7.62	2925	2301	15	SP	Riv.Sediments		80	1.33	0.95	1.00	1.00	19	0.96	18	5	0	18
30.0	95.0	9.14	3525	2589	19	SP	Riv.Sediments		80	1.33	1.00	1.00	1.00	25	0.92	23	5	0	23
35.0	90.0	10.67	4125	2877	18	SP	Riv.Sediments		80	1.33	1.00	1.00	1.00	24	0.87	0	5	0	21
40.0	85.0	12.19	4725	3165	16	SP	Riv.Sediments		80	1.33	1.00	1.00	1.00	21	0.83	18	15	3	21
45.0	80.0	13.72	5325	3453	23	SW	S&G		80	1.33	1.00	1.00	1.00	31	0.82	25	5	0	25
50.0	75.0	15.24	5925	3741	25	SW	S&G		80	1.33	1.00	1.00	1.00	33	0.80	27	5	0	27
55.0	70.0	16.76	6525	4029	40	SW	S&G		80	1.33	1.00	1.00	1.00	53	0.84	45	5	0	45
60.0	65.0	18.29	7125	4317	41	SW	S&G		80	1.33	1.00	1.00	1.00	55	0.83	45	15	3	48
65.0	60.0	19.81	7725	4605	50	SW	S&G		81	1.35	1.00	1.00	1.00	68	0.83	50	5	0	50

Capacity/Demand Ratio (Factor of Safety) Calculations

CRR (M=7.5, σ = 1 atm)	MSF	C_σ	K_σ	CRR (M, σ)	r_d	Design Total Stress, σ_v	Design Effective Stress, σ'_v	CSR	F_s
						psf	psf		
1.25	1.55	0.23	1.10	2.13	1.00	207	207	0.08	**5.0**
0.17	1.55	0.11	1.10	0.29	0.99	437	437	0.08	**5.0**
0.31	1.55	0.15	1.10	0.52	0.98	690	690	0.08	**5.0**
0.47	1.55	0.17	1.10	0.80	0.97	920	920	0.08	**5.0**
0.14	1.55	0.08	1.05	0.23	0.96	1150	1150	0.08	**5.0**
0.16	1.55	0.09	1.04	0.25	0.94	1380	1380	0.08	**3.2**
0.11	1.55	0.07	1.01	0.17	0.92	1725	1725	0.08	**2.1**
0.23	1.55	0.14	1.02	0.36	0.91	1965	1840	0.08	**4.3**
0.19	1.55	0.12	0.99	0.29	0.85	2925	2301	0.09	**3.1**
0.25	1.55	0.15	0.97	0.38	0.81	3525	2589	0.09	**4.1**
0.22	1.55	0.14	0.96	0.32	0.77	4125	2877	0.09	**3.5**
0.22	1.55	0.12	0.95	0.32	0.73	4725	3165	0.09	**3.5**
0.29	1.55	0.16	0.92	0.42	0.69	5325	3453	0.09	**4.6**
0.34	1.55	0.17	0.90	0.47	0.66	5925	3741	0.09	**5.0**
4.13	1.55	0.30	0.81	5.16	0.62	6525	4029	0.09	**5.0**
4.13	1.55	0.30	0.79	5.02	0.59	7125	4317	0.08	**5.0**
4.13	1.55	0.30	0.77	4.90	0.56	7725	4605	0.08	**5.0**

Vertical Settlement

Layer Thickness	F_α	γ_{lim}	γ_{max}	Vertical reconsol Strain, ε_v	ΔSi
ft				ft	in
2.8	-0.48	0.02	0.000	0.000	0.00
2.1	0.67	0.22	0.000	0.000	0.00
2.1	0.19	0.08	0.000	0.000	0.00
2.0	-0.07	0.05	0.000	0.000	0.00
2.0	0.84	0.35	0.000	0.000	0.00
2.5	0.74	0.27	0.000	0.000	0.00
2.5	0.94	0.58	0.000	0.000	0.00
5.0	0.44	0.13	0.000	0.000	0.00
6.5	0.61	0.19	0.000	0.000	0.00
5.0	0.34	0.11	0.000	0.000	0.00
5.0	0.46	0.14	0.000	0.000	0.00
5.0	0.47	0.14	0.000	0.000	0.00
5.0	0.22	0.09	0.000	0.000	0.00
5.0	0.13	0.07	0.000	0.000	0.00
5.0	-1.17	0.00	0.000	0.000	0.00
5.0	-1.46	0.00	0.000	0.000	0.00
2.5	-1.62	0.00	0.000	0.000	0.00

Notes:
1. Factor of safety calculations limited to 5.0. Actual FS may be greater but shown as 5.0.
2. Factor of safety presented as 5.0 for Unsaturated and Clay soils; not calculated.
3. Design ground surface elevation was assumed equal to the current ground surface elevation as a design FFE has not been determined.
4. Fines content was estimated based on soil description provided on log where laboratory test results were not available.
5. Water level were considered at ground surface for the river borings (BB-2, BB-3, BB-6) and approximate river water level for land borings (BB-4, BB-5, BB-8).

SPT-Based Liquefaction Factor of Safety Calculation

Project Name: Bay Road over the Fort River
Project Location: Hadley, MA
Project Number: 01.173284.00
Calculations Reference: Idriss & Boulanger (2008)

Calculated By: MR Date: 11/20/2017
Checked By: JBH Date: 3/15/2018

Exploration ID: BB-2

Elevation Data (at time of drilling):
Ground Surface Elevation: 105.2
Groundwater Elevation: 110.0
Groundwater Depth (ft): -4.8
Unit Weight of Water (pcf): 62.4
Depth of Boring (ft): 46.0

Drilling Data:
Typical rod stickup during SPT: 3 ft
Typical rod stickup during SPT: 0.9144 m
Borehole Diameter: 4 in

Material Properties:
Assumed Soil Weight Above Water Table, γ = 115 pcf
Assumed Soil Weight Below Water Table, γ_{sat} = 120 pcf
Atmospheric Pressure, P_a = 2109 psf

Seismic Assumptions (API Preliminary):
Max Accel at Surface, a_{max} (g)= 0.13
Design Earthquake Magnitude, M = 5.83
Is void redistribution significant? n/a
Earthquake Return Period (yrs) 1000

Design Ground Surface Elevation: 105.2
Design Groundwater Elevation: 110.0
Design Groundwater Depth (ft): -4.8
Thickness of New Fill (ft): 0.0
Thickness of New Fill (m): 0.0
Assumed Soil Weight New Fill, γ = 125 pcf

SPT Correction Factors:
Split Spoon Type: I.D.=1-3/8 in - Standard Sampler
Hammer Type: Auto Hammer

Subsurface Data and Parameter Calculations																							Capacity/Demand Ratio (Factor of Safety) Calculations										Vertical Settlement					
Depth (mid-SPT interval)	Elev.	Depth	Total Stress, σ_v	Effective Stress, σ'_v	N_{field}	Soil Type	Stratum	Flags	Hammer Energy Ratio, ER	C_E	C_R	C_B	C_s	N_{60}	C_N	$(N_1)_{60}$	Fines Content	ΔN	$(N_1)_{60CS}$	CRR (M=7.5, σ = 1 atm)	MSF	C_{σ}	K_{σ}	CRR (M, σ)	r_d	Design Total Stress, σ_v	Design Effective Stress, σ'_v	CSR	F_s	Layer Thickness	F_{α}	γ_{lim}	γ_{max}	Vertical reconsol Strain, ε_v	ΔSi
ft	ft	m	psf	psf	blows/ft	SP			%					blows/ft		blows/ft	%	blows/ft	blows/ft							psf	psf			ft				ft	in
1.0	104.2	0.30	144	82	2	SP	Riv.Sediments		80	1.33	0.75	1.00	1.00	2	1.70	3	15	3	7	0.10	1.55	0.07	1.10	0.16	1.00	144	82	0.15	1.1	3.0	0.95	0.69	0.012	0.007	0.39
5.0	100.2	1.52	624	312	9	SP	Riv.Sediments		80	1.33	0.75	1.00	1.00	9	1.70	15	15	3	19	0.19	1.55	0.11	1.10	0.32	0.98	624	312	0.17	**1.9**	4.0	0.59	0.19	0.001	0.000	0.15
9.0	96.2	2.74	1104	542	11	SP	Riv.Sediments		80	1.33	0.80	1.00	1.00	12	1.70	20	15	3	23	0.25	1.55	0.13	1.10	0.43	0.96	1104	542	0.17	**2.6**	5.0	0.34	0.11	0.000	0.000	0.14
15.0	90.2	4.57	1824	888	7	SP	Riv.Sediments		80	1.33	0.85	1.00	1.00	8	1.56	12	5	0	12	0.14	1.55	0.10	1.09	0.23	0.92	1824	888	0.16	**1.4**	5.5	0.85	0.37	0.005	0.002	0.14
20.0	85.2	6.10	2424	1176	13	SP	Riv.Sediments		80	1.33	0.95	1.00	1.00	16	1.29	21	15	3	24	0.28	1.55	0.14	1.08	0.46	0.89	2424	1176	0.15	**3.0**	5.0	0.27	0.10	0.000	0.000	0.00
25.0	80.2	7.62	3024	1464	16	SP	Riv.Sediments		80	1.33	0.95	1.00	1.00	20	1.16	24	15	3	27	0.34	1.55	0.15	1.06	0.56	0.85	3024	1464	0.15	**3.8**	5.0	0.12	0.07	0.000	0.000	0.00
30.0	75.2	9.14	3624	1752	23	SP	Riv.Sediments		80	1.33	1.00	1.00	1.00	31	1.07	33	50	6	38	2.47	1.55	0.23	1.04	4.00	0.81	3624	1752	0.14	**5.0**	5.0	-0.68	0.01	0.000	0.000	0.00
35.0	70.2	10.67	4224	2040	36	SP	S&G		80	1.33	1.00	1.00	1.00	48	1.01	48	5	0	48	4.13	1.55	0.30	1.01	6.46	0.77	4224	2040	0.14	**5.0**	5.0	-1.46	0.00	0.000	0.000	0.00
40.0	65.2	12.19	4824	2328	29	SP	S&G		80	1.33	1.00	1.00	1.00	39	0.97	39	15	3	42	4.13	1.55	0.30	0.97	6.21	0.73	4824	2328	0.13	**5.0**	5.0	-0.96	0.01	0.000	0.000	0.00
45.0	60.2	13.72	5424	2616	73	SP	S&G		80	1.33	1.00	1.00	1.00	97	0.99	97	5	0	97	4.13	1.55	0.30	0.94	5.99	0.69	5424	2616	0.12	**5.0**	3.5	-5.76	0.00	0.000	0.000	0.00

Notes:
1. Factor of safety calculations limited to 5.0. Actual FS may be greater but shown as 5.0.
2. Factor of safety presented as 5.0 for Unsaturated and Clay soils; not calculated.
3. Design ground surface elevation was assumed equal to the current ground surface elevation as a design FFE has not been determined.
4. Fines content was estimated based on soil description provided on log where laboratory test results were not available.
5. Water level were considered at ground surface for the river borings (BB-2, BB-3, BB-6) and approximate river water level for land borings (BB-4, BB-5, BB-8).

SPT-Based Liquefaction Factor of Safety Calculation

Calculated By: MR Date: 11/20/2017
Checked By: JBH Date: 3/15/2018

Project Name: Bay Road over the Fort River
Project Location: Hadley, MA
Project Number: 01.173284.00
Calculations Reference: Idriss & Boulanger (2008)

Exploration ID: BB-3

Elevation Data (at time of drilling):
Ground Surface Elevation: 126.0
Groundwater Elevation: 110.0
Groundwater Depth (ft): 16.0
Unit Weight of Water (pcf): 62.4
Depth of Boring (ft): 60.0

Drilling Data:
Typical rod stickup during SPT: 3 ft
Typical rod stickup during SPT: 0.9144 m
Borehole Diameter: 4 in

Material Properties:
Assumed Soil Weight Above Water Table, γ = 115 pcf
Assumed Soil Weight Below Water Table, γ_{sat} = 120 pcf
Atmospheric Pressure, P_a = 2109 psf

Seismic Assumptions (API Preliminary):
Max Accel at Surface, a_{max} (g)= 0.13
Design Earthquake Magnitude, M = 5.83
Is void redistribution significant? n/a
Earthquake Return Period (yrs) 1000

Design Ground Surface Elevation: 126.0
Design Groundwater Elevation: 110.0
Design Groundwater Depth (ft): 16.0
Thickness of New Fill (ft): 0.0
Thickness of New Fill (m): 0.0
Assumed Soil Weight New Fill, γ = 125 pcf

SPT Correction Factors:
Split Spoon Type: I.D.=1-3/8 in - Standard Sampler
Hammer Type: Auto Hammer

Subsurface Data and Parameter Calculations																								Capacity/Demand Ratio (Factor of Safety) Calculations										Vertical Settlement					
Depth (mid-SPT interval)	Elev.	Depth	Total Stress, σ_v	Effective Stress, σ'_v	N_{field}	Soil Type	Stratum	Flags	Hammer Energy Ratio, ER	C_E	C_R	C_B	C_s	N_{60}	C_N	$(N_1)_{60}$	Fines Content	ΔN	$(N_1)_{60CS}$	CRR (M=7.5, σ = 1 atm)	MSF	C_{σ}	K_{σ}	CRR (M, σ)	r_d	Design Total Stress, σ_v	Design Effective Stress, σ'_v	CSR	F_s	Layer Thickness	F_{α}	γ_{lim}	γ_{max}	Vertical reconsol Strain, ε_v	ΔSi
ft	ft	m	psf	psf	blows/ft	SP			%					blows/ft		blows/ft	%	blows/ft	blows/ft							psf	psf			ft				ft	in
2.0	124.0	0.61	230	230	100	SP	Fill	Unsaturated	80	1.33	0.75	1.00	1.00	100	1.02	102	5	0	102	4.13	1.55	0.30	1.10	7.04	1.00	230	230	0.08	**5.0**	3.0	-6.25	0.00	0.000	0.000	0.00
4.0	122.0	1.22	460	460	38	SP	Fill	Unsaturated	80	1.33	0.75	1.00	1.00	38	1.40	53	5	0	53	4.13	1.55	0.30	1.10	7.04	0.99	460	460	0.08	**5.0**	3.0	-1.86	0.00	0.000	0.000	0.00
8.0	118.0	2.44	920	920	5	SP	Fill	Unsaturated	80	1.33	0.80	1.00	1.00	5	1.59	8	15	3	12	0.13	1.55	0.09	1.07	0.22	0.97	920	920	0.08	**5.0**	3.0	0.87	0.39	0.000	0.000	0.00
10.0	116.0	3.05	1150	1150	5	SP	Fill	Unsaturated	80	1.33	0.80	1.00	1.00	5	1.42	8	15	3	11	0.12	1.55	0.08	1.05	0.20	0.96	1150	1150	0.08	**5.0**	2.0	0.90	0.43	0.000	0.000	0.00
12.0	114.0	3.66	1380	1380	8	SP	Fill	Unsaturated	80	1.33	0.85	1.00	1.00	9	1.25	11	15	3	15	0.15	1.55	0.10	1.04	0.25	0.94	1380	1380	0.08	**5.0**	2.0	0.77	0.29	0.000	0.000	0.00
14.0	112.0	4.27	1610	1610	9	SP	Fill	Unsaturated	80	1.33	0.85	1.00	1.00	10	1.15	12	15	3	15	0.16	1.55	0.10	1.03	0.25	0.93	1610	1610	0.08	**5.0**	2.0	0.75	0.28	0.000	0.000	0.00
16.0	110.0	4.88	1840	1840	20	SP	Fill		80	1.33	0.85	1.00	1.00	23	1.06	24	15	3	27	0.35	1.55	0.16	1.02	0.56	0.92	1840	1840	0.08	**5.0**	2.0	0.09	0.07	0.000	0.000	0.00
18.0	108.0	5.49	2080	1955	28	SP	Riv.Sediments		80	1.33	0.95	1.00	1.00	35	1.02	36	15	3	40	3.64	1.55	0.28	1.02	5.75	0.90	2080	1955	0.08	**5.0**	4.5	-0.77	0.01	0.000	0.000	0.00
25.0	101.0	7.62	2920	2358	30	SP	Riv.Sediments		80	1.33	0.95	1.00	1.00	38	0.96	37	5	0	37	1.61	1.55	0.29	0.97	2.42	0.85	2920	2358	0.09	**5.0**	5.0	-0.56	0.02	0.000	0.000	0.00
28.0	98.0	8.53	3280	2531	19	SP	Riv.Sediments		80	1.33	0.95	1.00	1.00	24	0.00	22	5	0	22	0.24	1.55	0.15	0.97	0.36	0.83	3280	2531	0.09	**4.0**	4.5	0.39	0.12	0.000	0.000	0.00
34.0	92.0	10.36	4000	2877	11	SP	Riv.Sediments		80	1.33	1.00	1.00	1.00	15	0.85	13	28	5	18	0.18	1.55	0.10	0.97	0.27	0.78	4000	2877	0.09	**3.0**	5.5	0.63	0.20	0.000	0.000	0.00
39.0	87.0	11.89	4600	3165	24	SP	Riv.Sediments		80	1.33	1.00	1.00	1.00	32	0.86	27	15	3	31	0.53	1.55	0.18	0.93	0.76	0.74	4600	3165	0.09	**5.0**	5.0	-0.13	0.04	0.000	0.000	0.00
44.0	82.0	13.41	5200	3453	52	SW	S&G		80	1.33	1.00	1.00	1.00	69	0.92	64	15	3	67	4.13	1.55	0.30	0.85	5.45	0.70	5200	3453	0.09	**5.0**	5.0	-3.03	0.00	0.000	0.000	0.00
49.0	77.0	14.94	5800	3741	46	SW	S&G		80	1.33	1.00	1.00	1.00	61	0.88	54	15	3	57	4.13	1.55	0.30	0.83	5.30	0.67	5800	3741	0.09	**5.0**	5.0	-2.20	0.00	0.000	0.000	0.00
54.0	72.0	16.46	6400	4029	38	SW	S&G		80	1.33	1.00	1.00	1.00	51	0.83	42	5	0	42	4.13	1.55	0.30	0.81	5.16	0.63	6400	4029	0.08	**5.0**	5.0	-0.97	0.01	0.000	0.000	0.00
59.0	67.0	17.98	7000	4317	48	SW	S&G		80	1.33	1.00	1.00	1.00	64	0.86	55	5	0	55	4.13	1.55	0.30	0.79	5.02	0.60	7000	4317	0.08	**5.0**	3.5	-1.99	0.00	0.000	0.000	0.00

Notes:
1. Factor of safety calculations limited to 5.0. Actual FS may be greater but shown as 5.0.
2. Factor of safety presented as 5.0 for Unsaturated and Clay soils; not calculated.
3. Design ground surface elevation was assumed equal to the current ground surface elevation as a design FFE has not been determined.
4. Fines content was estimated based on soil description provided on log where laboratory test results were not available.
5. Water level were considered at ground surface for the river borings (BB-2, BB-3, BB-6) and approximate river water level for land borings (BB-4, BB-5, BB-8).

APPENDIX G

ENVIRONMENTAL LABORATORY TEST RESULTS

TABLE 1

Summary Table of Environmental Testing Results

BAY ROAD OVER FORT RIVER

HADLEY, MASSACHUSETTS

BRIDGE NO. H-01-005

								REPORTABLE / DISPOSAL CRITERIA		
Sample Name:	**BRP2**	**BRP3**	**BRP4**	**BRUS-A**	**BRUS-B**	**BRUS-C**	**BRD5**	**MA COMM 97 Lined**	**MA COMM 97 Unlined**	**MA RCS1**
Volatile Organic Compounds (VOCs) EPA Method 8260C (µg/kg dry)										
Naphthalene	**11.7**	< 3.62	33.4	< 4.34	< 5.53	< 6.53	< 5.13	100000	100000	4000
Total VOCs	11.70	ND	33.400	ND	ND	ND	ND			
Semi-Volatile Organics EPA Method 8270D (µg/kg dry)										
Anthracene	**103.0**	**86.5**	**232.0**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	1000000
Benzo(a)Anthracene	**149.0**	**125.0**	**146.0**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	7000
Benzo(a)Pyrene	**80.3**	< 73.1	< 84.8	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	2000
Benzo(b)Fluoranthene	**98.5**	< 73.1	**96.7**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	7000
Benzo(k)Fluoranthene	**95.5**	< 73.1	< 84.8	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	70000
Chrysene	**147.0**	**111.0**	**147.0**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	70000
Fluoranthene	**404.0**	**314.0**	**498.0**	< 75.3	< 83.1	< 89.9	86.1	100000	100000	1000000
Phenanthrene	**216.0**	**192.0**	**431.0**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	10000
Pyrene	**335.0**	**255.0**	**396.0**	< 75.3	< 83.1	< 89.9	< 80.1	100000	100000	1000000
Total SVOCs	1628.30	1083.50	1946.70	ND	ND	ND	ND			
Semi-Volatile Organics MADEP EPH 5/2004 R (mg/kg dry)										
Unadjusted C11-C22 Aromatic Hydrocarb	**15.40**	< 10.9	**12.70**	< 11.2	< 12.3	< 13.4	< 11.9			
Phenanthrene	**1.73**	< 0.364	< 0.421	< 0.372	< 0.410	< 0.447	< 0.395	100	100	10
Fluoranthene	**1.25**	< 0.364	< 0.421	< 0.372	< 0.410	< 0.447	< 0.395	100	100	1000
Pyrene	**0.78**	< 0.364	< 0.421	< 0.372	< 0.410	< 0.447	< 0.395	100	100	1000
Chrysene	**0.39**	< 0.364	< 0.421	< 0.372	< 0.410	< 0.447	< 0.395	100	100	70
Total SVOCs	19.545	ND	12.700	ND	ND	ND	ND			
Organochlorine Pesticides EPA Method 8081B (ug/Kg)										
4,4'-DDD	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			8000
4,4'-DDE	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			6000
4,4'-DDT[2C]	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			6000
a-BHC	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			50000
Alachlor	< 5.74	< 5.50	< 6.31	< 7.5	< 8.4	< 8.7	< 7.9			100000
Aldrin	< 5.74	< 5.50	< 6.31	< 3.8	< 4.2	< 4.4	< 4.0			80
b-BHC	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			10000
Chlordane	< 23.0	< 22.0	< 25.2	< 38	< 42	< 44	< 40			5000
d-BHC	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			10000
Dieldrin	< 5.74	< 5.50	< 6.31	< 3.8	< 4.2	< 4.4	< 4.0			80
Endosulfan I	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			500
Endosulfan II	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			500
Endosulfan sulfate	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			
Endrin	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			10000
Endrin aldehyde	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			10000
Endrin ketone	< 9.18	< 8.80	< 10.1	< 7.5	< 2.1	< 2.2	< 7.9			
g-BHC	< 3.44	< 3.30	< 3.78	< 1.5	< 1.7	< 1.7	< 1.6			3
Heptachlor	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			300
Heptachlor epoxide	< 5.74	< 5.50	< 6.31	< 7.5	< 2.1	< 2.2	< 7.9			100
Hexachlorobenzene	NT	NT	NT	< 3.8	< 4.2	< 4.4	< 4.0			
Methoxychlor	< 9.18	< 8.80	< 10.1	< 38	< 42	< 44	< 40			200000
Toxaphene	< 115	< 110	< 126	< 150	< 170	< 170	< 160			10000
Organochlorine Peticides EPA Method 8081B (µg/kg dry)										
alpha-Chlordane	< 5.74	< 5.50	< 6.31	NT	NT	NT	NT			10000
gamma-Chlordane	< 5.74	< 5.50	< 6.31	NT	NT	NT	NT			
Chlorinated Herbicides EPA Method 8151A (ug/Kg)										
2,4,5-T	< 94	< 97	< 100	< 94	< 110	< 110	< 98			100000
2,4,5-TP (Silvex)	< 94	< 97	< 100	< 94	< 110	< 110	< 98			100000
2,4-D	< 190	< 190	< 200	< 190	< 220	< 220	< 200			100000
2,4-DB	< 940	< 970	< 1000	< 940	< 1100	< 1100	< 980			100000
Dalapon	< 94	< 97	< 100	< 94	< 110	< 110	< 98			1000000
Dicamba	< 94	< 97	< 100	< 94	< 110	< 110	< 98			500000
Dichloroprop	< 140	< 140	< 150	< 140	< 160	< 160	< 150			
Dinoseb	< 94	< 97	< 100	< 94	< 110	< 110	< 98			500000
MCPA	< 28000	< 29000	< 30000	< 28000	< 32000	< 33000	< 29000			100000
MCPP	< 28000	< 29000	< 30000	< 28000	< 32000	< 33000	< 29000			
Metals EPA Method 6010C (mg/kg dry)										
Arsenic	**2.45**	**1.62**	**2.39**	**1.90**	**1.21**	**3.46**	**2.93**	40	40	20
Cadmium	< 0.559	< 0.505	< 0.595	< 0.40	< 0.38	< 0.43	< 0.37	80	30	70
Chromium	**6.44**	**4.80**	**6.56**	**12.40**	**5.61**	**23.50**	**4.48**	1000	1000	100
Copper	**8.50**	**4.31**	**5.92**	**9.75**	**3.05**	**18.30**	**3.74**			1000
Lead	**8.81**	**5.77**	**6.60**	**8.73**	**6.87**	**15.20**	**2.86**	2000	1000	200
Nickel	**5.84**	**3.56**	**6.12**	**10.20**	**4.69**	**17.40**	**4.10**			600
Zinc	**25.90**	**19.60**	**57.50**	**46.10**	**23.10**	**82.10**	**20.90**			1000
Total Petroleum Hydrocarbons EPA Method 7471B (mg/kg dry)	**75.7**	< 29.0	**58.1**	**70.7**	**85.6**	**75.7**	< 31.8	5000	2500	1000
Metals EPA Method 7471B (mg/kg dry)										
Mercury	< 0.0322	< 0.0316	< 0.0351	< 0.03	0.09	< 0.03	**0.1**	10	10	20
Reactivity EPA Ch. 7.3 (mg/kg dry)										
Reactive Cyanide	< 24.4	< 24.8	< 24.4	< 24.5	< 24.9	< 22.9	< 23.3			30
Reactive Sulfide	< 48.8	< 49.5	< 48.7	< 48.9	< 49.8	< 45.8	< 46.5			
Conductivity (uS/cm) EPA 9050A										
Specific Conductance (EC)	**150.0**	**96.8**	**174.0**	**35.1**	**46.5**	**38.8**	**67.1**			
Total Organic Carbon EPA Method 9060A/L. Kahn (mg/kg)	**5300**	**2400**	**3800**	**6900**	**8100**	**10000**	**2100**			
Percent Solid	**88.0**	**85.0**	**82.0**	**88.0**	**77.0**	**75.0**	**84.0**			
Date of Sample Collection	8/21/2017	8/21/2017	8/21/2017	9/25/2017	9/25/2017	9/25/2017	9/25/2017			

Notes:

1. Environmental samples were collected by GZA personnel. Analyses were performed by Eurofins Laboratory in Agawam, Massachusetts.
2. Bold text indicates that the reported concentration exceeds the reportable detection limit (RDL).
3. Where RCS-1 and MA Landfills columns are blank, no limiting criteria has been established.
4. VOC and SVOC constituents that were not detected were omitted from this table.
5. NT indicates analyte Not Tested;
6. <# (e.g.<94) indicates the analyte was not detected over the reportable detection limit (RDL).
7. Reportable/Disposable limits in µg/kg or in mg/kg as specified in the table

eurofins | Spectrum Analytical

☑ Final Report
☐ Revised Report

Report Date:
05-Sep-17 15:59

Laboratory Report
SC38320

GZA GeoEnvironmental, Inc.
1350 Main St; Suite 1400
Springfield, MA 01103
Attn: Stephen Spink

Project: Bay Rd - Hadley, MA
Project #: 01.0173025.00

I attest that the information contained within the report has been reviewed for accuracy and checked against the quality control requirements for each method. These results relate only to the sample(s) as received.
All applicable NELAC requirements have been met.

Massachusetts # M-MA138/MA1110
Connecticut # PH-0777
Florida # E87936
Maine # MA138
New Hampshire # 2972/2538
New Jersey # MA011
New York # 11393
Pennsylvania # 68-04426/68-02924
Rhode Island # LAO00348
USDA # P330-15-00375
Vermont # VT-11393

Authorized by:

Dawn Wojcik
Laboratory Director

Dawn E Wojcik

Eurofins Spectrum Analytical holds primary certification in the State of Massachusetts for the analytes as indicated with an X in the "Cert." column within this report. Please note that the State of Massachusetts does not offer certification for all analytes. Please refer to our website for specific certification holdings in each state.
Please note that this report contains 67 pages of analytical data plus Chain of Custody document(s). When the Laboratory Report is indicated as revised, this report supersedes any previously dated reports for the laboratory ID(s) referenced above. Where this report identifies subcontracted analyses, copies of the subcontractor's test report are available upon request. This report may not be reproduced, except in full, without written approval from Eurofins Spectrum Analytical, Inc.

Eurofins Spectrum Analytical, Inc. is a NELAC accredited laboratory organization and meets NELAC testing standards. Use of the NELAC logo however does not insure that Eurofins Spectrum Analytical, Inc. is currently accredited for the specific method or analyte indicated. Please refer to our Quality web page at www.spectrum-analytical.com for a full listing of our current certifications and fields of accreditation. States in which Eurofins Spectrum Analytical, Inc. holds NELAC certification are New York, New Hampshire, New Jersey, Pennsylvania and Florida. All analytical work for Volatile Organic and Air analysis are transferred to and conducted at our 830 Silver Street location (PA-68-04426).

Please contact the Laboratory or Technical Director at 800-789-9115 with any questions regarding the data contained in this laboratory report.

Sample Summary

Work Order: SC38320

Project: Bay Rd - Hadley, MA

Project Number: 01.0173025.00

Laboratory ID	Client Sample ID	Matrix	Date Sampled	Date Received
SC38320-01	BRP2	Soil	21-Aug-17 09:00	21-Aug-17 13:45
SC38320-02	BRP3	Soil	21-Aug-17 09:30	21-Aug-17 13:45
SC38320-03	BRP4	Soil	21-Aug-17 10:30	21-Aug-17 13:45

The following outlines the condition of all EPH samples contained within this report upon laboratory receipt.

Matrices	Soil			
Containers	✓ Satisfactory			
Aqueous Preservative	✓ N/A	pH≤2	pH>2	pH adjusted to <2 in lab
Temperature	✓ Received on ice	Received at 4 ± 2 ºC	✓ Other: -0.2ºC	

Were all QA/QC procedures followed as required by the EPH method? *Yes*
Were any significant modifications made to the EPH method as specified in Section 11.3? *No*
Were all performance/acceptance standards for required QA/QC procedures achieved? *Yes*

I attest that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Authorized by:



Christina A. White
Laboratory Director

MassDEP Analytical Protocol Certification Form

Laboratory Name: Eurofins Spectrum Analytical, Inc.	**Project #:** 01.0173025.00
Project Location: Bay Rd - Hadley, MA	**RTN:**
This form provides certifications for the following data set:	SC38320-01 through SC38320-03
Matrices: Soil	

CAM Protocol

✓ 8260 VOC CAM II A	✓ 7470/7471 Hg CAM III B	MassDEP VPH CAM IV A	✓ 8081 Pesticides CAM V B	7196 Hex Cr CAM VI B	MassDEP APH CAM IX A
✓ 8270 SVOC CAM II B	7010 Metals CAM III C	✓ MassDEP EPH CAM IV B	✓ 8151 Herbicides CAM V C	8330 Explosives CAM VIII A	TO-15 VOC CAM IX B
✓ 6010 Metals CAM III A	6020 Metals CAM III D	8082 PCB CAM V A	9012 Total Cyanide/PAC CAM VI A	9014 Total Cyanide/PAC CAM VI A	6860 Perchlorate CAM VIII B

Affirmative responses to questions A through F are required for Presumptive Certainty status

A	Were all samples received in a condition consistent with those described on the Chain of Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	✓ Yes	No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	✓ Yes	No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	✓ Yes	No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	✓ Yes	No
E	a. VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	✓ Yes Yes	No No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to questions A through E)?	✓ Yes	No

Responses to questions G, H and I below are required for Presumptive Certainty status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	Yes	✓ No

***Data User Note:* Data that achieve Presumptive Certainty status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**

H	Were all QC performance standards specified in the CAM protocol(s) achieved?	Yes	✓ No
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes	✓ No

All negative responses are addressed in a case narrative on the cover page of this report.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.



Christina A. White
Laboratory Director
Date: 9/5/2017

CASE NARRATIVE:

Data has been reported to the RDL. This report excludes estimated concentrations detected below the RDL and above the MDL (J-Flag).

All non-detects and all results below the reporting limit are reported as "<" (less than) the reporting limit in this report.

The samples were received -0.2 degrees Celsius, please refer to the Chain of Custody for details specific to temperature upon receipt. An infrared thermometer with a tolerance of +/- 1.0 degrees Celsius was used immediately upon receipt of the samples.

If a Matrix Spike (MS), Matrix Spike Duplicate (MSD) or Duplicate (DUP) was not requested on the Chain of Custody, method criteria may have been fulfilled with a source sample not of this Sample Delivery Group.

MADEP has published a list of analytical methods (CAM) which provides a series of recommended protocols for the acquisition, analysis and reporting of analytical data in support of MCP decisions. "Presumptive Certainty" can be established only for those methods published by the MADEP in the MCP CAM. The compounds and/or elements reported were specifically requested by the client on the Chain of Custody and in some cases may not include the full analyte list as defined in the method. Regulatory limits may not be achieved if specific method and/or technique was not requested on the Chain of Custody.

According to WSC-CAM 5/2009 Rev.1, Table 11 A-1, recovery for some VOC analytes have been deemed potentially difficult. Although they may still be within the recommended recovery range, a range has been set based on historical control limits.

Some target analytes which are not listed as exceptions in the Summary of CAM Reporting Limits may exceed the recommended RL based on sample initial volume or weight provided, % moisture content, or responsiveness of a particular analyte to purge and trap instrumentation.

All VOC soils samples submitted and analyzed in methanol will have a minimum dilution factor of 50. This is the minimum amount of solvent allowed on the instrumentation without causing interference. Soils are run on a manual load instrument. 100ug of sample (MEOH) is spiked into 5ml DI water along with the surrogate and added directly onto the instrument. Additional dilution factors may be required to keep analyte concentration within instrument calibration range.

Method SW846 5035A is designed to use on samples containing low levels of VOCs, ranging from 0.5 to 200 ug/Kg. Target analytes that are less responsive to purge and trap may be present at concentrations over 200ug/Kg but may not be reportable in the methanol preserved vial (SW846 5030). This is the result of the inherent dilution factor required for the methanol preservation.

Reactivity (40 CFR 261.23) Case Narrative:

These samples do not exhibit the characteristics of reactivity as defined in 40 CFR 261.23, sections (1), (2) and (4); however, Eurofins Spectrum Analytical, Inc. does not test for detonation, explosive reaction or potential, or forbidden explosives as defined in 40 CFR 261.23, sections (3), (6), (7) and (8).

Reactive sulfide and cyanide are tested at a pH of 2 and not tested at all conditions between pH 2 and12.5 as stated in 40 CFR 261.23, section (5); thus reactive cyanide and sulfide results as reported in this document can not be used to support the nonreactive properties of these samples.

The responsibility falls on the generator to use knowledge of the waste to determine if the waste meets or does not meet the descriptive, prose definition of reactivity.

TOC via Lloyd Kahn Case Narrative:

Following the acidification via a 1:1 phosphoric acid solution to remove the inorganic carbon, the sample is dried in a 100°C oven for 10-15 minutes. A homogenous sample is then weighed into the platinum boat and tested, on a dry weight basis, for TOC using the Lloyd Kahn method.

Grain Size Case Narrative:

The sample on this work order were analyzed for addition sieve sizes. The results are reported below.

SC38320-01	Fractional % Sieve 1.5 in (>25.4mm)	0
SC38320-01	Fractional % Sieve 1 in (25.4-19.0mm)	0
SC38320-01	Fractional % Sieve 0.75 in (19.0-12.7mm)	0.09
SC38320-01	Fractional % Sieve 0.5 in (12.7-9.51mm)	0
SC38320-01	Fractional % Sieve #4 (9.51mm-4750µm)	7.51
SC38320-01	Fractional % Sieve #10 (4750-2000µm)	19.9
SC38320-01	Fractional % Sieve #20 (2000-850µm)	18.3
SC38320-01	Fractional % Sieve #40 (850-425µm)	8.73
SC38320-01	Fractional % Sieve #60 (425-250µm)	20.8
SC38320-01	Fractional % Sieve #100 (250-150µm)	8.58
SC38320-01	Fractional % Sieve #200 (150-75µm)	8.31
SC38320-01	Fractional % Sieve #230 (less than 75µm)	7.74
SC38320-02	Fractional % Sieve 1.5 in (>25.4mm)	0
SC38320-02	Fractional % Sieve 1 in (25.4-19.0mm)	0
SC38320-02	Fractional % Sieve 0.75 in (19.0-12.7mm)	0
SC38320-02	Fractional % Sieve 0.5 in (12.7-9.51mm)	0
SC38320-02	Fractional % Sieve #4 (9.51mm-4750µm)	22.3
SC38320-02	Fractional % Sieve #10 (4750-2000µm)	28.9
SC38320-02	Fractional % Sieve #20 (2000-850µm)	19.2
SC38320-02	Fractional % Sieve #40 (850-425µm)	13.6
SC38320-02	Fractional % Sieve #60 (425-250µm)	9.69
SC38320-02	Fractional % Sieve #100 (250-150µm)	3.61
SC38320-02	Fractional % Sieve #200 (150-75µm)	1.78
SC38320-02	Fractional % Sieve #230 (less than 75µm)	0.94
SC38320-03	Fractional % Sieve 1.5 in (>25.4mm)	0
SC38320-03	Fractional % Sieve 1 in (25.4-19.0mm)	0
SC38320-03	Fractional % Sieve 0.75 in (19.0-12.7mm)	0
SC38320-03	Fractional % Sieve 0.5 in (12.7-9.51mm)	0
SC38320-03	Fractional % Sieve #4 (9.51mm-4750µm)	7.82
SC38320-03	Fractional % Sieve #10 (4750-2000µm)	9.96
SC38320-03	Fractional % Sieve #20 (2000-850µm)	19.1
SC38320-03	Fractional % Sieve #40 (850-425µm)	23.8
SC38320-03	Fractional % Sieve #60 (425-250µm)	21.2
SC38320-03	Fractional % Sieve #100 (250-150µm)	9.05
SC38320-03	Fractional % Sieve #200 (150-75µm)	5.75
SC38320-03	Fractional % Sieve #230 (less than 75µm)	3.32

See below for any non-conformances and issues relating to quality control samples and/or sample analysis/matrix.

MADEP EPH 5/2004 R

Calibration:

1707040

Analyte quantified by quadratic equation type calibration.

Acenaphthylene
Benzo (g,h,i) perylene
Dibenzo (a,h) anthracene
Indeno (1,2,3-cd) pyrene
Unadjusted C11-C22 Aromatic Hydrocarbons

MADEP EPH 5/2004 R

Calibration:

1707040

This affected the following samples:

S706407-ICV1
S706407-ICV2

1707043

Analyte quantified by quadratic equation type calibration.

C19-C36 Aliphatic Hydrocarbons

This affected the following samples:

1714758-BLK1
1714758-BS1
1714758-BS2
1714758-BSD1
BRP4
S706487-ICV2
S707729-CCV1
S707729-CCV2
S707729-CCV3

S707729-CCV3

The method allows for a closing CCV to fail for up to four analytes.

n-Decane
n-Dodecane
n-Nonane (C9)
n-Tetradecane

Laboratory Control Samples:

1714758 BSD

2-Methylnaphthalene RPD 41% (25%) is outside individual acceptance criteria.

Acenaphthene RPD 43% (25%) is outside individual acceptance criteria.

Acenaphthylene RPD 42% (25%) is outside individual acceptance criteria.

Anthracene RPD 46% (25%) is outside individual acceptance criteria.

Benzo (a) anthracene RPD 52% (25%) is outside individual acceptance criteria.

Benzo (a) pyrene RPD 52% (25%) is outside individual acceptance criteria.

Benzo (b) fluoranthene RPD 49% (25%) is outside individual acceptance criteria.

Benzo (g,h,i) perylene RPD 54% (25%) is outside individual acceptance criteria.

Benzo (k) fluoranthene RPD 50% (25%) is outside individual acceptance criteria.

C9-C18 Aliphatic Hydrocarbons RPD 40% (25%) is outside individual acceptance criteria.

Chrysene RPD 50% (25%) is outside individual acceptance criteria.

MADEP EPH 5/2004 R

Laboratory Control Samples:

1714758 BSD

Dibenzo (a,h) anthracene RPD 53% (25%) is outside individual acceptance criteria.

Fluoranthene RPD 50% (25%) is outside individual acceptance criteria.

Fluorene RPD 44% (25%) is outside individual acceptance criteria.

Indeno (1,2,3-cd) pyrene RPD 60% (25%) is outside individual acceptance criteria.

Naphthalene RPD 38% (25%) is outside individual acceptance criteria.

Phenanthrene RPD 50% (25%) is outside individual acceptance criteria.

Pyrene RPD 50% (25%) is outside individual acceptance criteria.

Unadjusted C11-C22 Aromatic Hydrocarbons RPD 51% (25%) is outside individual acceptance criteria.

Samples:

S707729-CCV2

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

Acenaphthene (-20.5%)
Benzo (b) fluoranthene (-20.7%)
Chrysene (-20.6%)
Dibenzo (a,h) anthracene (-21.6%)
Fluorene (-22.4%)

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

Phenanthrene (-21.2%)
Pyrene (-23.2%)

This affected the following samples:

1714758-BLK1
1714758-BS1
1714758-BS2
1714758-BSD1
BRP4

S707729-CCV3

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

Acenaphthene (-23.1%)
Acenaphthylene (-21.7%)
Dibenzo (a,h) anthracene (-20.3%)

Analyte percent difference is outside individual acceptance criteria (25), but within overall method allowances.

n-Decane (117%)
n-Dodecane (113%)
n-Tetradecane (93.0%)

Analyte percent difference is outside individual acceptance criteria (30), but within overall method allowances.

n-Nonane (C9) (94.8%)

MADEP EPH 5/2004 R

Samples:

S707729-CCV3

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

Phenanthrene (-22.9%)
Pyrene (-21.4%)

This affected the following samples:

1714758-BLK1
1714758-BS1
1714758-BS2
1714758-BSD1
BRP4

SC38320-01 *BRP2*

The method allows for a surrogate to fail high as long as there are no reportable target compounds in the sample.

1-Chlorooctadecane

SW8151A

Laboratory Control Samples:

BY88203-LCS

This parameter is outside laboratory rpd specified recovery limits.

Dinoseb

BY88203-LCSD

This parameter is outside laboratory rpd specified recovery limits.

Dinoseb

BY88203-MS

This parameter is outside laboratory rpd specified recovery limits.

Dinoseb

BY88203-MSD

This parameter is outside laboratory rpd specified recovery limits.

Dinoseb

SW846 6010C

Duplicates:

1714358-DUP1 *Source: SC38320-01*

The RPD exceeded the QC control limits; however precision is demonstrated with acceptable RPD values for MS/MSD.

Arsenic

SW846 8081B

Samples:

SC38320-01 *BRP2*

The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.

Decachlorobiphenyl (Sr)

SW846 8081B

Samples:

SC38320-02 *BRP3*

The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.

Decachlorobiphenyl (Sr)

SW846 8260C

Calibration:

1708081

Analyte quantified by quadratic equation type calibration.

1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene
1,2-Dibromo-3-chloropropane
1,4-Dioxane
2-Hexanone (MBK)
4-Methyl-2-pentanone (MIBK)
Bromoform
Dibromochloromethane
Naphthalene
trans-1,3-Dichloropropene
trans-1,4-Dichloro-2-butene

This affected the following samples:

1714362-BLK1
1714362-BS1
1714362-BSD1
BRP2
BRP3
BRP4
S707410-ICV1
S707454-CCV1

Samples:

S707454-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

2-Chlorotoluene (-22.5%)
Ethyl ether (-24.3%)
Vinyl chloride (26.1%)

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

Naphthalene (-32.9%)

This affected the following samples:

1714362-BLK1
1714362-BS1
1714362-BSD1
BRP2
BRP3
BRP4

SW846 8270D

Calibration:

SW846 8270D

Calibration:

1708113

Analyte quantified by quadratic equation type calibration.

2,4,6-Tribromophenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Nitroaniline
3-Nitroaniline
4,6-Dinitro-2-methylphenol
4-Nitrophenol
Aniline
Benzidine
Benzoic acid
Bis(2-chloroisopropyl)ether
Carbazole
Hexachlorocyclopentadiene
Pentachlorophenol

Laboratory Control Samples:

1714754 BS/BSD

Benzidine percent recoveries (35/35) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRP2
BRP3
BRP4

Benzoic acid percent recoveries (15/14) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRP2
BRP3
BRP4

Pentachlorophenol percent recoveries (16/11) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRP2
BRP3
BRP4

1714754 BSD

Pentachlorophenol RPD 37% (30%) is outside individual acceptance criteria.

Samples:

S707708-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

2,4,5-Trichlorophenol (25.0%)
3,3´-Dichlorobenzidine (20.3%)
4-Nitroaniline (20.7%)
Butyl benzyl phthalate (119%)
Hexachlorocyclopentadiene (27.7%)
Pentachlorophenol (-23.1%)

SW846 8270D

Samples:

S707708-CCV1

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

4-Nitrophenol (102%)
Benzoic acid (-23.5%)

This affected the following samples:

1714754-BLK1
1714754-BS1
1714754-BSD1

S707798-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

4-Chloro-3-methylphenol (22.1%)
4-Nitroaniline (39.8%)
Azobenzene/Diphenyldiazene (24.9%)
Benzo (b) fluoranthene (24.6%)
Bis(2-ethylhexyl)phthalate (35.8%)
Butyl benzyl phthalate (35.7%)
Di-n-octyl phthalate (48.8%)
Isophorone (21.7%)
Nitrobenzene (29.3%)

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

3-Nitroaniline (35.6%)
4-Nitrophenol (27.0%)
Aniline (37.4%)
Benzidine (25.9%)
Bis(2-chloroisopropyl)ether (30.0%)
Carbazole (42.9%)

This affected the following samples:

BRP2
BRP3
BRP4

SW9060A/L. Kahn

Laboratory Control Samples:

BY84585-LCS

MS is not reported due to high sample concentration.

Tot.Org.Carbon

BY84585-BLK

MS is not reported due to high sample concentration.

Tot.Org.Carbon

BY84585-DUP

MS is not reported due to high sample concentration.

Tot.Org.Carbon

Sample Acceptance Check Form

Client:	GZA GeoEnvironmental, Inc. - Springfield, MA
Project:	Bay Rd - Hadley, MA / 01.0173025.00
Work Order:	SC38320
Sample(s) received on:	8/21/2017

The following outlines the condition of samples for the attached Chain of Custody upon receipt.

	Yes	No	N/A
Were custody seals present?	☐	☑	☐
Were custody seals intact?	☐	☐	☑
Were samples received at a temperature of ≤ 6°C?	☑	☐	☐
Were samples cooled on ice upon transfer to laboratory representative?	☑	☐	☐
Were sample containers received intact?	☑	☐	☐
Were samples properly labeled (labels affixed to sample containers and include sample ID, site location, and/or project number and the collection date)?	☑	☐	☐
Were samples accompanied by a Chain of Custody document?	☑	☐	☐
Does Chain of Custody document include proper, full, and complete documentation, which shall include sample ID, site location, and/or project number, date and time of collection, collector's name, preservation type, sample matrix and any special remarks concerning the sample?	☑	☐	☐
Did sample container labels agree with Chain of Custody document?	☑	☐	☐
Were samples received within method-specific holding times?	☑	☐	☐

Summary of Hits

Lab ID: SC38320-01 **Client ID:** BRP2

Parameter	Result	Flag	Reporting Limit	Units	Analytical Method
Chrysene	0.386		0.384	mg/kg	MADEP EPH 5/2004 R
Fluoranthene	1.25		0.384	mg/kg	MADEP EPH 5/2004 R
Phenanthrene	1.73		0.384	mg/kg	MADEP EPH 5/2004 R
Pyrene	0.779		0.384	mg/kg	MADEP EPH 5/2004 R
Unadjusted C11-C22 Aromatic Hydrocarbons	15.4		11.5	mg/kg	MADEP EPH 5/2004 R
Specific Conductance (EC)	150		10.0	uS/cm	SM22 2510B
Arsenic	2.45		1.68	mg/kg	SW846 6010C
Chromium	6.44		1.12	mg/kg	SW846 6010C
Copper	8.50		1.12	mg/kg	SW846 6010C
Lead	8.81		1.68	mg/kg	SW846 6010C
Nickel	5.84		1.12	mg/kg	SW846 6010C
Zinc	25.9		1.12	mg/kg	SW846 6010C
Total Petroleum Hydrocarbons	75.7		30.4	mg/kg	SW846 8100Mod.
Unidentified	75.7		30.4	mg/kg	SW846 8100Mod.
Naphthalene	11.7		3.95	µg/kg	SW846 8260C
Anthracene	103		76.1	µg/kg	SW846 8270D
Benzo (a) anthracene	149		76.1	µg/kg	SW846 8270D
Benzo (a) pyrene	80.3		76.1	µg/kg	SW846 8270D
Benzo (b) fluoranthene	98.5		76.1	µg/kg	SW846 8270D
Benzo (k) fluoranthene	95.5		76.1	µg/kg	SW846 8270D
Chrysene	147		76.1	µg/kg	SW846 8270D
Fluoranthene	404		76.1	µg/kg	SW846 8270D
Phenanthrene	216		76.1	µg/kg	SW846 8270D
Pyrene	335		76.1	µg/kg	SW846 8270D
Tot.Org.Carbon	5300		100	mg/kg	SW9060A/L. Kahn

Lab ID: SC38320-02 **Client ID:** BRP3

Parameter	Result	Flag	Reporting Limit	Units	Analytical Method
Specific Conductance (EC)	96.8		10.0	uS/cm	SM22 2510B
Arsenic	1.62		1.51	mg/kg	SW846 6010C
Chromium	4.80		1.01	mg/kg	SW846 6010C
Copper	4.31		1.01	mg/kg	SW846 6010C
Lead	5.77		1.51	mg/kg	SW846 6010C
Nickel	3.56		1.01	mg/kg	SW846 6010C
Zinc	19.6		1.01	mg/kg	SW846 6010C
Anthracene	86.5		73.1	µg/kg	SW846 8270D
Benzo (a) anthracene	125		73.1	µg/kg	SW846 8270D
Chrysene	111		73.1	µg/kg	SW846 8270D
Fluoranthene	314		73.1	µg/kg	SW846 8270D
Phenanthrene	192		73.1	µg/kg	SW846 8270D
Pyrene	255		73.1	µg/kg	SW846 8270D
Tot.Org.Carbon	2400		100	mg/kg	SW9060A/L. Kahn

Lab ID: SC38320-03 **Client ID:** BRP4

Parameter	Result	Flag	Reporting Limit	Units	Analytical Method
Unadjusted C11-C22 Aromatic Hydrocarbons	12.7		12.6	mg/kg	MADEP EPH 5/2004 R
Specific Conductance (EC)	174		10.0	uS/cm	SM22 2510B
Arsenic	2.39		1.79	mg/kg	SW846 6010C
Chromium	6.56		1.19	mg/kg	SW846 6010C
Copper	5.92		1.19	mg/kg	SW846 6010C
Lead	6.60		1.79	mg/kg	SW846 6010C
Nickel	6.12		1.19	mg/kg	SW846 6010C
Zinc	57.5		1.19	mg/kg	SW846 6010C
Total Petroleum Hydrocarbons	58.1		33.4	mg/kg	SW846 8100Mod.
Unidentified	58.1		33.4	mg/kg	SW846 8100Mod.
Naphthalene	33.4		5.15	µg/kg	SW846 8260C
Anthracene	232		84.8	µg/kg	SW846 8270D
Benzo (a) anthracene	146		84.8	µg/kg	SW846 8270D
Benzo (b) fluoranthene	96.7		84.8	µg/kg	SW846 8270D
Chrysene	147		84.8	µg/kg	SW846 8270D
Fluoranthene	498		84.8	µg/kg	SW846 8270D
Phenanthrene	431		84.8	µg/kg	SW846 8270D
Pyrene	396		84.8	µg/kg	SW846 8270D
Tot.Org.Carbon	3800		100	mg/kg	SW9060A/L. Kahn

Please note that because there are no reporting limits associated with hazardous waste characterizations or micro analyses, this summary does not include hits from these analyses if included in this work order.

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP2 SC38320-01	01.0173025.00	Soil	21-Aug-17 09:00	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Prepared by method Volatiles													
	VOC Extraction	**Field extracted**		N/A			1	VOC Soil Extraction			BD	1714336	
Volatile Organic Compounds by SW846 8260													
Prepared by method SW846 5035A Soil (low level)							Initial weight: 9.11 g						
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	< 3.95		µg/kg dry	3.95	2.00	1	SW846 8260C	22-Aug-17	22-Aug-17	GMA	1714362	
67-64-1	Acetone	< 39.5		µg/kg dry	39.5	15.8	1	"	"	"	"	"	
107-13-1	Acrylonitrile	< 3.95		µg/kg dry	3.95	3.80	1	"	"	"	"	"	
71-43-2	Benzene	< 3.95		µg/kg dry	3.95	1.05	1	"	"	"	"	"	
108-86-1	Bromobenzene	< 3.95		µg/kg dry	3.95	1.06	1	"	"	"	"	"	
74-97-5	Bromochloromethane	< 3.95		µg/kg dry	3.95	2.00	1	"	"	"	"	"	
75-27-4	Bromodichloromethane	< 3.95		µg/kg dry	3.95	2.64	1	"	"	"	"	"	
75-25-2	Bromoform	< 3.95		µg/kg dry	3.95	3.77	1	"	"	"	"	"	
74-83-9	Bromomethane	< 7.91		µg/kg dry	7.91	3.57	1	"	"	"	"	"	
78-93-3	2-Butanone (MEK)	< 7.91		µg/kg dry	7.91	7.07	1	"	"	"	"	"	
104-51-8	n-Butylbenzene	< 3.95		µg/kg dry	3.95	1.13	1	"	"	"	"	"	
135-98-8	sec-Butylbenzene	< 3.95		µg/kg dry	3.95	0.72	1	"	"	"	"	"	
98-06-6	tert-Butylbenzene	< 3.95		µg/kg dry	3.95	0.89	1	"	"	"	"	"	
75-15-0	Carbon disulfide	< 7.91		µg/kg dry	7.91	2.53	1	"	"	"	"	"	
56-23-5	Carbon tetrachloride	< 3.95		µg/kg dry	3.95	3.23	1	"	"	"	"	"	
108-90-7	Chlorobenzene	< 3.95		µg/kg dry	3.95	1.24	1	"	"	"	"	"	
75-00-3	Chloroethane	< 7.91		µg/kg dry	7.91	2.19	1	"	"	"	"	"	
67-66-3	Chloroform	< 3.95		µg/kg dry	3.95	2.12	1	"	"	"	"	"	
74-87-3	Chloromethane	< 7.91		µg/kg dry	7.91	1.63	1	"	"	"	"	"	
95-49-8	2-Chlorotoluene	< 3.95		µg/kg dry	3.95	0.98	1	"	"	"	"	"	
106-43-4	4-Chlorotoluene	< 3.95		µg/kg dry	3.95	0.93	1	"	"	"	"	"	
96-12-8	1,2-Dibromo-3-chloropropane	< 7.91		µg/kg dry	7.91	5.71	1	"	"	"	"	"	
124-48-1	Dibromochloromethane	< 3.95		µg/kg dry	3.95	2.68	1	"	"	"	"	"	
106-93-4	1,2-Dibromoethane (EDB)	< 3.95		µg/kg dry	3.95	2.65	1	"	"	"	"	"	
74-95-3	Dibromomethane	< 3.95		µg/kg dry	3.95	2.06	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 3.95		µg/kg dry	3.95	1.03	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 3.95		µg/kg dry	3.95	0.86	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 3.95		µg/kg dry	3.95	1.17	1	"	"	"	"	"	
75-71-8	Dichlorodifluoromethane (Freon12)	< 7.91		µg/kg dry	7.91	1.50	1	"	"	"	"	"	
75-34-3	1,1-Dichloroethane	< 3.95		µg/kg dry	3.95	1.04	1	"	"	"	"	"	
107-06-2	1,2-Dichloroethane	< 3.95		µg/kg dry	3.95	1.42	1	"	"	"	"	"	
75-35-4	1,1-Dichloroethene	< 3.95		µg/kg dry	3.95	2.07	1	"	"	"	"	"	
156-59-2	cis-1,2-Dichloroethene	< 3.95		µg/kg dry	3.95	1.47	1	"	"	"	"	"	
156-60-5	trans-1,2-Dichloroethene	< 3.95		µg/kg dry	3.95	2.10	1	"	"	"	"	"	
78-87-5	1,2-Dichloropropane	< 3.95		µg/kg dry	3.95	2.07	1	"	"	"	"	"	
142-28-9	1,3-Dichloropropane	< 3.95		µg/kg dry	3.95	2.05	1	"	"	"	"	"	
594-20-7	2,2-Dichloropropane	< 3.95		µg/kg dry	3.95	1.87	1	"	"	"	"	"	
563-58-6	1,1-Dichloropropene	< 3.95		µg/kg dry	3.95	1.27	1	"	"	"	"	"	
10061-01-5	cis-1,3-Dichloropropene	< 3.95		µg/kg dry	3.95	2.38	1	"	"	"	"	"	
10061-02-6	trans-1,3-Dichloropropene	< 3.95		µg/kg dry	3.95	2.08	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP2	01.0173025.00	Soil	21-Aug-17 09:00	21-Aug-17
SC38320-01				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Volatile Organic Compounds by SW846 8260													
						Initial weight: 9.11 g							
100-41-4	Ethylbenzene	< 3.95		µg/kg dry	3.95	0.57	1	SW846 8260C	22-Aug-17	22-Aug-17	GMA	1714362	
87-68-3	Hexachlorobutadiene	< 3.95		µg/kg dry	3.95	1.99	1	"	"	"	"	"	
591-78-6	2-Hexanone (MBK)	< 7.91		µg/kg dry	7.91	4.85	1	"	"	"	"	"	
98-82-8	Isopropylbenzene	< 3.95		µg/kg dry	3.95	0.78	1	"	"	"	"	"	
99-87-6	4-Isopropyltoluene	< 3.95		µg/kg dry	3.95	0.85	1	"	"	"	"	"	
1634-04-4	Methyl tert-butyl ether	< 3.95		µg/kg dry	3.95	1.46	1	"	"	"	"	"	
108-10-1	4-Methyl-2-pentanone (MIBK)	< 7.91		µg/kg dry	7.91	2.03	1	"	"	"	"	"	
75-09-2	Methylene chloride	< 7.91		µg/kg dry	7.91	1.57	1	"	"	"	"	"	
91-20-3	Naphthalene	11.7		µg/kg dry	3.95	2.35	1	"	"	"	"	"	
103-65-1	n-Propylbenzene	< 3.95		µg/kg dry	3.95	0.64	1	"	"	"	"	"	
100-42-5	Styrene	< 3.95		µg/kg dry	3.95	0.79	1	"	"	"	"	"	
630-20-6	1,1,1,2-Tetrachloroethane	< 3.95		µg/kg dry	3.95	3.36	1	"	"	"	"	"	
79-34-5	1,1,2,2-Tetrachloroethane	< 3.95		µg/kg dry	3.95	3.35	1	"	"	"	"	"	
127-18-4	Tetrachloroethene	< 3.95		µg/kg dry	3.95	1.35	1	"	"	"	"	"	
108-88-3	Toluene	< 3.95		µg/kg dry	3.95	1.28	1	"	"	"	"	"	
87-61-6	1,2,3-Trichlorobenzene	< 3.95		µg/kg dry	3.95	1.39	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 3.95		µg/kg dry	3.95	2.91	1	"	"	"	"	"	
108-70-3	1,3,5-Trichlorobenzene	< 3.95		µg/kg dry	3.95	1.24	1	"	"	"	"	"	
71-55-6	1,1,1-Trichloroethane	< 3.95		µg/kg dry	3.95	1.31	1	"	"	"	"	"	
79-00-5	1,1,2-Trichloroethane	< 3.95		µg/kg dry	3.95	2.87	1	"	"	"	"	"	
79-01-6	Trichloroethene	< 3.95		µg/kg dry	3.95	1.08	1	"	"	"	"	"	
75-69-4	Trichlorofluoromethane (Freon 11)	< 3.95		µg/kg dry	3.95	2.13	1	"	"	"	"	"	
96-18-4	1,2,3-Trichloropropane	< 3.95		µg/kg dry	3.95	2.97	1	"	"	"	"	"	
95-63-6	1,2,4-Trimethylbenzene	< 3.95		µg/kg dry	3.95	0.96	1	"	"	"	"	"	
108-67-8	1,3,5-Trimethylbenzene	< 3.95		µg/kg dry	3.95	0.68	1	"	"	"	"	"	
75-01-4	Vinyl chloride	< 3.95		µg/kg dry	3.95	1.34	1	"	"	"	"	"	
179601-23-1	m,p-Xylene	< 7.91		µg/kg dry	7.91	0.71	1	"	"	"	"	"	
95-47-6	o-Xylene	< 3.95		µg/kg dry	3.95	1.11	1	"	"	"	"	"	
109-99-9	Tetrahydrofuran	< 7.91		µg/kg dry	7.91	6.23	1	"	"	"	"	"	
60-29-7	Ethyl ether	< 3.95		µg/kg dry	3.95	3.58	1	"	"	"	"	"	
994-05-8	Tert-amyl methyl ether	< 3.95		µg/kg dry	3.95	1.32	1	"	"	"	"	"	
637-92-3	Ethyl tert-butyl ether	< 3.95		µg/kg dry	3.95	2.13	1	"	"	"	"	"	
108-20-3	Di-isopropyl ether	< 3.95		µg/kg dry	3.95	0.74	1	"	"	"	"	"	
75-65-0	Tert-Butanol / butyl alcohol	< 39.5		µg/kg dry	39.5	25.9	1	"	"	"	"	"	
123-91-1	1,4-Dioxane	< 79.1		µg/kg dry	79.1	68.7	1	"	"	"	"	"	
110-57-6	trans-1,4-Dichloro-2-butene	< 19.8		µg/kg dry	19.8	9.02	1	"	"	"	"	"	
64-17-5	Ethanol	< 791		µg/kg dry	791	147	1	"	"	"	"	"	
Surrogate recoveries:													
460-00-4	*4-Bromofluorobenzene*	*92*			*70-130 %*			"	"	"	"	"	
2037-26-5	*Toluene-d8*	*105*			*70-130 %*			"	"	"	"	"	
17060-07-0	*1,2-Dichloroethane-d4*	*129*			*70-130 %*			"	"	"	"	"	
1868-53-7	*Dibromofluoromethane*	*110*			*70-130 %*			"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP2	01.0173025.00	Soil	21-Aug-17 09:00	21-Aug-17
SC38320-01				

Semivolatile Organic Compounds by GCMS

Semivolatile Organic Compounds
Prepared by method SW846 3546

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
83-32-9	Acenaphthene	< 76.1		µg/kg dry	76.1	37.9	1	SW846 8270D	29-Aug-17	31-Aug-17	MSL	1714754	
208-96-8	Acenaphthylene	< 76.1		µg/kg dry	76.1	37.5	1	"	"	"	"	"	
62-53-3	Aniline	< 377		µg/kg dry	377	27.0	1	"	"	"	"	"	
120-12-7	Anthracene	**103**		µg/kg dry	76.1	36.4	1	"	"	"	"	"	
103-33-3	Azobenzene/Diphenyldiazene	< 377		µg/kg dry	377	37.0	1	"	"	"	"	"	
92-87-5	Benzidine	< 377		µg/kg dry	377	75.8	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	**149**		µg/kg dry	76.1	40.2	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	**80.3**		µg/kg dry	76.1	28.3	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	**98.5**		µg/kg dry	76.1	36.9	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 76.1		µg/kg dry	76.1	30.6	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	**95.5**		µg/kg dry	76.1	29.8	1	"	"	"	"	"	
65-85-0	Benzoic acid	< 377		µg/kg dry	377	79.1	1	"	"	"	"	"	
100-51-6	Benzyl alcohol	< 377		µg/kg dry	377	30.8	1	"	"	"	"	"	
111-91-1	Bis(2-chloroethoxy)methane	< 377		µg/kg dry	377	33.4	1	"	"	"	"	"	
111-44-4	Bis(2-chloroethyl)ether	< 191		µg/kg dry	191	27.3	1	"	"	"	"	"	
108-60-1	Bis(2-chloroisopropyl)ether	< 191		µg/kg dry	191	29.3	1	"	"	"	"	"	
117-81-7	Bis(2-ethylhexyl)phthalate	< 191		µg/kg dry	191	47.0	1	"	"	"	"	"	
101-55-3	4-Bromophenyl phenyl ether	< 377		µg/kg dry	377	35.3	1	"	"	"	"	"	
85-68-7	Butyl benzyl phthalate	< 377		µg/kg dry	377	43.9	1	"	"	"	"	"	
86-74-8	Carbazole	< 191		µg/kg dry	191	106	1	"	"	"	"	"	
59-50-7	4-Chloro-3-methylphenol	< 377		µg/kg dry	377	35.9	1	"	"	"	"	"	
106-47-8	4-Chloroaniline	< 191		µg/kg dry	191	41.2	1	"	"	"	"	"	
91-58-7	2-Chloronaphthalene	< 377		µg/kg dry	377	34.8	1	"	"	"	"	"	
95-57-8	2-Chlorophenol	< 191		µg/kg dry	191	33.9	1	"	"	"	"	"	
7005-72-3	4-Chlorophenyl phenyl ether	< 377		µg/kg dry	377	44.7	1	"	"	"	"	"	
218-01-9	Chrysene	**147**		µg/kg dry	76.1	38.0	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 76.1		µg/kg dry	76.1	29.2	1	"	"	"	"	"	
132-64-9	Dibenzofuran	< 191		µg/kg dry	191	29.0	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 377		µg/kg dry	377	32.9	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 377		µg/kg dry	377	32.9	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 377		µg/kg dry	377	34.9	1	"	"	"	"	"	
91-94-1	3,3´-Dichlorobenzidine	< 377		µg/kg dry	377	57.3	1	"	"	"	"	"	
120-83-2	2,4-Dichlorophenol	< 191		µg/kg dry	191	35.6	1	"	"	"	"	"	
84-66-2	Diethyl phthalate	< 377		µg/kg dry	377	46.6	1	"	"	"	"	"	
131-11-3	Dimethyl phthalate	< 377		µg/kg dry	377	41.2	1	"	"	"	"	"	
105-67-9	2,4-Dimethylphenol	< 377		µg/kg dry	377	26.9	1	"	"	"	"	"	
84-74-2	Di-n-butyl phthalate	< 377		µg/kg dry	377	39.9	1	"	"	"	"	"	
534-52-1	4,6-Dinitro-2-methylphenol	< 377		µg/kg dry	377	48.4	1	"	"	"	"	"	
51-28-5	2,4-Dinitrophenol	< 377		µg/kg dry	377	33.9	1	"	"	"	"	"	
121-14-2	2,4-Dinitrotoluene	< 191		µg/kg dry	191	73.7	1	"	"	"	"	"	
606-20-2	2,6-Dinitrotoluene	< 191		µg/kg dry	191	42.9	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP2	01.0173025.00	Soil	21-Aug-17 09:00	21-Aug-17
SC38320-01				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds													
117-84-0	Di-n-octyl phthalate	< 377		µg/kg dry	377	42.6	1	SW846 8270D	29-Aug-17	31-Aug-17	MSL	1714754	
206-44-0	Fluoranthene	**404**		µg/kg dry	76.1	40.2	1	"	"	"	"	"	
86-73-7	Fluorene	< 76.1		µg/kg dry	76.1	38.7	1	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 191		µg/kg dry	191	37.5	1	"	"	"	"	"	
87-68-3	Hexachlorobutadiene	< 191		µg/kg dry	191	45.5	1	"	"	"	"	"	
77-47-4	Hexachlorocyclopentadiene	< 191		µg/kg dry	191	25.9	1	"	"	"	"	"	
67-72-1	Hexachloroethane	< 191		µg/kg dry	191	41.1	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 76.1		µg/kg dry	76.1	27.4	1	"	"	"	"	"	
78-59-1	Isophorone	< 191		µg/kg dry	191	35.7	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 76.1		µg/kg dry	76.1	46.0	1	"	"	"	"	"	
95-48-7	2-Methylphenol	< 377		µg/kg dry	377	32.0	1	"	"	"	"	"	
108-39-4, 106-44-5	3 & 4-Methylphenol	< 377		µg/kg dry	377	36.4	1	"	"	"	"	"	
91-20-3	Naphthalene	< 76.1		µg/kg dry	76.1	35.5	1	"	"	"	"	"	
88-74-4	2-Nitroaniline	< 377		µg/kg dry	377	32.0	1	"	"	"	"	"	
99-09-2	3-Nitroaniline	< 377		µg/kg dry	377	51.5	1	"	"	"	"	"	
100-01-6	4-Nitroaniline	< 191		µg/kg dry	191	54.6	1	"	"	"	"	"	
98-95-3	Nitrobenzene	< 191		µg/kg dry	191	34.7	1	"	"	"	"	"	
88-75-5	2-Nitrophenol	< 191		µg/kg dry	191	31.6	1	"	"	"	"	"	
100-02-7	4-Nitrophenol	< 1510		µg/kg dry	1510	60.9	1	"	"	"	"	"	
62-75-9	N-Nitrosodimethylamine	< 191		µg/kg dry	191	35.4	1	"	"	"	"	"	
621-64-7	N-Nitrosodi-n-propylamine	< 191		µg/kg dry	191	37.1	1	"	"	"	"	"	
86-30-6	N-Nitrosodiphenylamine	< 377		µg/kg dry	377	40.8	1	"	"	"	"	"	
87-86-5	Pentachlorophenol	< 377		µg/kg dry	377	40.2	1	"	"	"	"	"	
85-01-8	Phenanthrene	**216**		µg/kg dry	76.1	35.4	1	"	"	"	"	"	
108-95-2	Phenol	< 377		µg/kg dry	377	24.8	1	"	"	"	"	"	
129-00-0	Pyrene	**335**		µg/kg dry	76.1	42.5	1	"	"	"	"	"	
110-86-1	Pyridine	< 377		µg/kg dry	377	56.1	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 377		µg/kg dry	377	37.3	1	"	"	"	"	"	
90-12-0	1-Methylnaphthalene	< 76.1		µg/kg dry	76.1	37.4	1	"	"	"	"	"	
95-95-4	2,4,5-Trichlorophenol	< 377		µg/kg dry	377	33.9	1	"	"	"	"	"	
88-06-2	2,4,6-Trichlorophenol	< 191		µg/kg dry	191	34.0	1	"	"	"	"	"	
82-68-8	Pentachloronitrobenzene	< 377		µg/kg dry	377	59.5	1	"	"	"	"	"	
95-94-3	1,2,4,5-Tetrachlorobenzene	< 377		µg/kg dry	377	36.5	1	"	"	"	"	"	
Surrogate recoveries:													
321-60-8	*2-Fluorobiphenyl*	*53*			*30-130 %*			"	"	"	"	"	
367-12-4	*2-Fluorophenol*	*62*			*30-130 %*			"	"	"	"	"	
4165-60-0	*Nitrobenzene-d5*	*75*			*30-130 %*			"	"	"	"	"	
4165-62-2	*Phenol-d5*	*71*			*30-130 %*			"	"	"	"	"	
1718-51-0	*Terphenyl-dl4*	*75*			*30-130 %*			"	"	"	"	"	
118-79-6	*2,4,6-Tribromophenol*	*51*			*30-130 %*			"	"	"	"	"	
Pesticides													
Organochlorine Pesticides Prepared by method SW846 3546													
319-84-6	alpha-BHC	< 5.74		µg/kg dry	5.74	1.01	1	SW846 8081B	29-Aug-17	01-Sep-17	SM	1714757	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP2	01.0173025.00	Soil	21-Aug-17 09:00	21-Aug-17
SC38320-01				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Pesticides													
Organochlorine Pesticides													
319-85-7	beta-BHC	< 5.74		µg/kg dry	5.74	1.24	1	SW846 8081B	29-Aug-17	01-Sep-17	SM	1714757	
319-86-8	delta-BHC	< 5.74		µg/kg dry	5.74	1.15	1	"	"	"	"	"	
58-89-9	gamma-BHC (Lindane)	< 3.44		µg/kg dry	3.44	0.973	1	"	"	"	"	"	
76-44-8	Heptachlor	< 5.74		µg/kg dry	5.74	1.08	1	"	"	"	"	"	
309-00-2	Aldrin	< 5.74		µg/kg dry	5.74	1.09	1	"	"	"	"	"	
1024-57-3	Heptachlor epoxide	< 5.74		µg/kg dry	5.74	1.24	1	"	"	"	"	"	
959-98-8	Endosulfan I	< 5.74		µg/kg dry	5.74	1.38	1	"	"	"	"	"	
60-57-1	Dieldrin	< 5.74		µg/kg dry	5.74	1.40	1	"	"	"	"	"	
72-55-9	4,4'-DDE (p,p')	< 5.74		µg/kg dry	5.74	1.37	1	"	"	"	"	"	
72-20-8	Endrin	< 9.18		µg/kg dry	9.18	1.84	1	"	"	"	"	"	
33213-65-9	Endosulfan II	< 9.18		µg/kg dry	9.18	1.89	1	"	"	"	"	"	
72-54-8	4,4'-DDD (p,p')	< 9.18		µg/kg dry	9.18	1.63	1	"	"	"	"	"	
1031-07-8	Endosulfan sulfate	< 9.18		µg/kg dry	9.18	1.73	1	"	"	"	"	"	
50-29-3	4,4'-DDT (p,p')	< 9.18		µg/kg dry	9.18	1.77	1	"	"	"	"	"	
72-43-5	Methoxychlor	< 9.18		µg/kg dry	9.18	2.04	1	"	"	"	"	"	
53494-70-5	Endrin ketone	< 9.18		µg/kg dry	9.18	1.57	1	"	"	"	"	"	
7421-93-4	Endrin aldehyde	< 9.18		µg/kg dry	9.18	1.84	1	"	"	"	"	"	
5103-71-9	alpha-Chlordane	< 5.74		µg/kg dry	5.74	1.29	1	"	"	"	"	"	
5103-74-2	Chlordane (gamma)(trans)	< 5.74		µg/kg dry	5.74	1.27	1	"	"	"	"	"	
8001-35-2	Toxaphene	< 115		µg/kg dry	115	14.4	1	"	"	"	"	"	
57-74-9	Chlordane	< 23.0		µg/kg dry	23.0	21.6	1	"	"	"	"	"	
15972-60-8	Alachlor	< 5.74		µg/kg dry	5.74	2.81	1	"	"	"	"	"	
Surrogate recoveries:													
10386-84-2	*4,4-DB-Octafluorobiphenyl (Sr)*	*132*			*30-150 %*			"	"	"	"	"	
10386-84-2	*4,4-DB-Octafluorobiphenyl (Sr) [2C]*	*131*			*30-150 %*			"	"	"	"	"	
2051-24-3	*Decachlorobiphenyl (Sr)*	*188*	S02		*30-150 %*			"	"	"	"	"	
2051-24-3	*Decachlorobiphenyl (Sr) [2C]*	*148*			*30-150 %*			"	"	"	"	"	
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													
	C9-C18 Aliphatic Hydrocarbons	< 11.5		mg/kg dry	11.5	1.61	1	MADEP EPH 5/2004 R	29-Aug-17	01-Sep-17	EDT	1714758	
	C19-C36 Aliphatic Hydrocarbons	< 11.5		mg/kg dry	11.5	1.63	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	< 11.5		mg/kg dry	11.5	5.50	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	**15.4**		mg/kg dry	11.5	5.50	1	"	"	"	"	"	
91-20-3	Naphthalene	< 0.384		mg/kg dry	0.384	0.342	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 0.384		mg/kg dry	0.384	0.330	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.384		mg/kg dry	0.384	0.152	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.384		mg/kg dry	0.384	0.381	1	"	"	"	"	"	
86-73-7	Fluorene	< 0.384		mg/kg dry	0.384	0.345	1	"	"	"	"	"	
85-01-8	Phenanthrene	**1.73**		mg/kg dry	0.384	0.332	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.384		mg/kg dry	0.384	0.330	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP2 SC38320-01	01.0173025.00	Soil	21-Aug-17 09:00	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
MADEP EPH													
206-44-0	Fluoranthene	**1.25**		mg/kg dry	0.384	0.145	1	MADEP EPH 5/2004 R	29-Aug-17	01-Sep-17	EDT	1714758	
129-00-0	Pyrene	**0.779**		mg/kg dry	0.384	0.148	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.384		mg/kg dry	0.384	0.365	1	"	"	"	"	"	
218-01-9	Chrysene	**0.386**		mg/kg dry	0.384	0.364	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.384		mg/kg dry	0.384	0.316	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.384		mg/kg dry	0.384	0.202	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.384		mg/kg dry	0.384	0.344	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.384		mg/kg dry	0.384	0.256	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.384		mg/kg dry	0.384	0.246	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.384		mg/kg dry	0.384	0.252	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*142*	Z-2a		*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*57*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*60*			*40-140 %*			"	"	"	"	"	
Fingerprinting by GC													
8006-61-9	Gasoline	< 30.4		mg/kg dry	30.4		1	SW846 8100Mod.	"	30-Aug-17	DJS	1714755	
68476-30-2	Fuel Oil #2	< 30.4		mg/kg dry	30.4	21.6	1	"	"	"	"	"	
68476-31-3	Fuel Oil #4	< 30.4		mg/kg dry	30.4		1	"	"	"	"	"	
68553-00-4	Fuel Oil #6	< 30.4		mg/kg dry	30.4		1	"	"	"	"	"	
M09800000	Motor Oil	< 30.4		mg/kg dry	30.4		1	"	"	"	"	"	
8032-32-4	Ligroin	< 30.4		mg/kg dry	30.4		1	"	"	"	"	"	
J00100000	Aviation Fuel	< 30.4		mg/kg dry	30.4		1	"	"	"	"	"	
	Hydraulic Oil	< 30.4		mg/kg dry	30.4		1	"	"	"	"	"	
	Dielectric Fluid	< 30.4		mg/kg dry	30.4		1	"	"	"	"	"	
	Unidentified	**75.7**		mg/kg dry	30.4		1	"	"	"	"	"	
	Other Oil	< 30.4	*TPH	mg/kg dry	30.4		1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	**75.7**		mg/kg dry	30.4		1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*123*			*40-140 %*			"	"	"	"	"	
Total Metals by EPA 6000/7000 Series Methods													
Prepared by method SW846 3051A													
7440-38-2	Arsenic	**2.45**		mg/kg dry	1.68	0.212	1	SW846 6010C	24-Aug-17	25-Aug-17	TBC	1714358	
7440-43-9	Cadmium	< 0.559		mg/kg dry	0.559	0.0290	1	"	"	"	"	"	
7440-47-3	Chromium	**6.44**		mg/kg dry	1.12	0.149	1	"	"	"	"	"	
7440-50-8	Copper	**8.50**		mg/kg dry	1.12	0.268	1	"	"	"	"	"	
7439-97-6	Mercury	< 0.0322		mg/kg dry	0.0322	0.0089	1	SW846 7471B	"	25-Aug-17	LNB	1714359	
Prepared by method SW846 3051A													
7440-02-0	Nickel	**5.84**		mg/kg dry	1.12	0.129	1	SW846 6010C	"	25-Aug-17	TBC	1714358	
7439-92-1	Lead	**8.81**		mg/kg dry	1.68	0.237	1	"	"	"	"	"	
7440-66-6	Zinc	**25.9**		mg/kg dry	1.12	0.865	1	"	"	29-Aug-17	"	"	
General Chemistry Parameters													
	% Solids	**86.5**		%			1	SM2540 G (11) Mod.	22-Aug-17	22-Aug-17	BD	1714386	

This laboratory report is not valid without an authorized signature on the cover page.

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP2 SC38320-01	01.0173025.00	Soil	21-Aug-17 09:00	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
General Chemistry Parameters													
	Specific Conductance (EC)	**150**		uS/cm	10.0	10.0	1	SM22 2510B	23-Aug-17	23-Aug-17	BD	1714384	
Prepared by method General Preparation SVOC													
	Moisture	**13.5**		%			1	SM2540 G (11) Mod. calculation	22-Aug-17	22-Aug-17	BD	1714390	
Toxicity Characteristics													
	Fractional % Sieve #4 (>4750µm)	**7.52**		% Retained			1	ASTM D422	24-Aug-17	01-Sep-17	BD	1714539	
Reactivity Cyanide/Sulfide													
	Reactivity	**See Narrative**		mg/kg dry			1	SW846 Ch. 7.3	22-Aug-17	22-Aug-17	TN	1714405	
57-12-5	Reactive Cyanide	< 24.4		mg/kg dry	24.4	24.4	1	"	"	"	"	"	
18496-25-8	Reactive Sulfide	< 48.8		mg/kg dry	48.8	48.8	1	"	"	"	"	"	
Subcontracted Analyses													
Subcontracted Analyses													
Prepared by method 398809-										Methylation date: 22-Aug-17			
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
93-76-5	2,4,5-T	< 94		ug/Kg	94	94	10	SW8151A	22-Aug-17	23-Aug-17 17:50	M-CT0	398809A	
93-72-1	2,4,5-TP (Silvex)	< 94		ug/Kg	94	94	10	"	"	"	"	"	
94-75-7	2,4-D	< 190		ug/Kg	190	190	10	"	"	"	"	"	
94-82-6	2,4-DB	< 940		ug/Kg	940	940	10	"	"	"	"	"	
75-99-0	Dalapon	< 94		ug/Kg	94	94	10	"	"	"	"	"	
1918-00-9	Dicamba	< 94		ug/Kg	94	94	10	"	"	"	"	"	
120-36-5	Dichloroprop	< 140		ug/Kg	140	140	10	"	"	"	"	"	
88-85-7	Dinoseb	< 94		ug/Kg	94	94	10	"	"	"	"	"	
94-74-6	MCPA	< 28000		ug/Kg	28000	28000	10	"	"	"	"	"	
7085-19-0	MCPP	< 28000		ug/Kg	28000	28000	10	"	"	"	"	"	
Surrogate recoveries:													
19719-28-9	*% DCAA*	*50*			*30-150 %*			"	"	"	"	"	
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Percent Solid	**88**		%			1	SW846-%Solid		22-Aug-17 19:18	M-CT0	'[none]'	
Prepared by method 398998-SW9060A/													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Tot.Org.Carbon	**5,300**		mg/kg	100	100	1	SW9060A/L. Kahn	"	23-Aug-17 17:55	M-CT0	398998A	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP3	01.0173025.00	Soil	21-Aug-17 09:30	21-Aug-17
SC38320-02				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Prepared by method Volatiles													
	VOC Extraction	**Field extracted**		N/A			1	VOC Soil Extraction			BD	1714336	
Volatile Organic Compounds by SW846 8260													
Prepared by method SW846 5035A Soil (low level)							Initial weight: 8.86 g						
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	< 3.62		µg/kg dry	3.62	1.84	1	SW846 8260C	22-Aug-17	22-Aug-17	GMA	1714362	
67-64-1	Acetone	< 36.2		µg/kg dry	36.2	14.5	1	"	"	"	"	"	
107-13-1	Acrylonitrile	< 3.62		µg/kg dry	3.62	3.48	1	"	"	"	"	"	
71-43-2	Benzene	< 3.62		µg/kg dry	3.62	0.96	1	"	"	"	"	"	
108-86-1	Bromobenzene	< 3.62		µg/kg dry	3.62	0.97	1	"	"	"	"	"	
74-97-5	Bromochloromethane	< 3.62		µg/kg dry	3.62	1.83	1	"	"	"	"	"	
75-27-4	Bromodichloromethane	< 3.62		µg/kg dry	3.62	2.42	1	"	"	"	"	"	
75-25-2	Bromoform	< 3.62		µg/kg dry	3.62	3.46	1	"	"	"	"	"	
74-83-9	Bromomethane	< 7.25		µg/kg dry	7.25	3.27	1	"	"	"	"	"	
78-93-3	2-Butanone (MEK)	< 7.25		µg/kg dry	7.25	6.48	1	"	"	"	"	"	
104-51-8	n-Butylbenzene	< 3.62		µg/kg dry	3.62	1.04	1	"	"	"	"	"	
135-98-8	sec-Butylbenzene	< 3.62		µg/kg dry	3.62	0.66	1	"	"	"	"	"	
98-06-6	tert-Butylbenzene	< 3.62		µg/kg dry	3.62	0.81	1	"	"	"	"	"	
75-15-0	Carbon disulfide	< 7.25		µg/kg dry	7.25	2.32	1	"	"	"	"	"	
56-23-5	Carbon tetrachloride	< 3.62		µg/kg dry	3.62	2.96	1	"	"	"	"	"	
108-90-7	Chlorobenzene	< 3.62		µg/kg dry	3.62	1.13	1	"	"	"	"	"	
75-00-3	Chloroethane	< 7.25		µg/kg dry	7.25	2.01	1	"	"	"	"	"	
67-66-3	Chloroform	< 3.62		µg/kg dry	3.62	1.95	1	"	"	"	"	"	
74-87-3	Chloromethane	< 7.25		µg/kg dry	7.25	1.50	1	"	"	"	"	"	
95-49-8	2-Chlorotoluene	< 3.62		µg/kg dry	3.62	0.90	1	"	"	"	"	"	
106-43-4	4-Chlorotoluene	< 3.62		µg/kg dry	3.62	0.85	1	"	"	"	"	"	
96-12-8	1,2-Dibromo-3-chloropropane	< 7.25		µg/kg dry	7.25	5.24	1	"	"	"	"	"	
124-48-1	Dibromochloromethane	< 3.62		µg/kg dry	3.62	2.46	1	"	"	"	"	"	
106-93-4	1,2-Dibromoethane (EDB)	< 3.62		µg/kg dry	3.62	2.43	1	"	"	"	"	"	
74-95-3	Dibromomethane	< 3.62		µg/kg dry	3.62	1.88	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 3.62		µg/kg dry	3.62	0.94	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 3.62		µg/kg dry	3.62	0.79	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 3.62		µg/kg dry	3.62	1.07	1	"	"	"	"	"	
75-71-8	Dichlorodifluoromethane (Freon12)	< 7.25		µg/kg dry	7.25	1.37	1	"	"	"	"	"	
75-34-3	1,1-Dichloroethane	< 3.62		µg/kg dry	3.62	0.95	1	"	"	"	"	"	
107-06-2	1,2-Dichloroethane	< 3.62		µg/kg dry	3.62	1.30	1	"	"	"	"	"	
75-35-4	1,1-Dichloroethene	< 3.62		µg/kg dry	3.62	1.89	1	"	"	"	"	"	
156-59-2	cis-1,2-Dichloroethene	< 3.62		µg/kg dry	3.62	1.34	1	"	"	"	"	"	
156-60-5	trans-1,2-Dichloroethene	< 3.62		µg/kg dry	3.62	1.92	1	"	"	"	"	"	
78-87-5	1,2-Dichloropropane	< 3.62		µg/kg dry	3.62	1.90	1	"	"	"	"	"	
142-28-9	1,3-Dichloropropane	< 3.62		µg/kg dry	3.62	1.88	1	"	"	"	"	"	
594-20-7	2,2-Dichloropropane	< 3.62		µg/kg dry	3.62	1.71	1	"	"	"	"	"	
563-58-6	1,1-Dichloropropene	< 3.62		µg/kg dry	3.62	1.17	1	"	"	"	"	"	
10061-01-5	cis-1,3-Dichloropropene	< 3.62		µg/kg dry	3.62	2.18	1	"	"	"	"	"	
10061-02-6	trans-1,3-Dichloropropene	< 3.62		µg/kg dry	3.62	1.90	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP3	01.0173025.00	Soil	21-Aug-17 09:30	21-Aug-17
SC38320-02				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Volatile Organic Compounds by SW846 8260													
						Initial weight: 8.86 g							
100-41-4	Ethylbenzene	< 3.62		µg/kg dry	3.62	0.52	1	SW846 8260C	22-Aug-17	22-Aug-17	GMA	1714362	
87-68-3	Hexachlorobutadiene	< 3.62		µg/kg dry	3.62	1.82	1	"	"	"	"	"	
591-78-6	2-Hexanone (MBK)	< 7.25		µg/kg dry	7.25	4.45	1	"	"	"	"	"	
98-82-8	Isopropylbenzene	< 3.62		µg/kg dry	3.62	0.71	1	"	"	"	"	"	
99-87-6	4-Isopropyltoluene	< 3.62		µg/kg dry	3.62	0.78	1	"	"	"	"	"	
1634-04-4	Methyl tert-butyl ether	< 3.62		µg/kg dry	3.62	1.33	1	"	"	"	"	"	
108-10-1	4-Methyl-2-pentanone (MIBK)	< 7.25		µg/kg dry	7.25	1.86	1	"	"	"	"	"	
75-09-2	Methylene chloride	< 7.25		µg/kg dry	7.25	1.44	1	"	"	"	"	"	
91-20-3	Naphthalene	< 3.62		µg/kg dry	3.62	2.16	1	"	"	"	"	"	
103-65-1	n-Propylbenzene	< 3.62		µg/kg dry	3.62	0.59	1	"	"	"	"	"	
100-42-5	Styrene	< 3.62		µg/kg dry	3.62	0.73	1	"	"	"	"	"	
630-20-6	1,1,1,2-Tetrachloroethane	< 3.62		µg/kg dry	3.62	3.08	1	"	"	"	"	"	
79-34-5	1,1,2,2-Tetrachloroethane	< 3.62		µg/kg dry	3.62	3.06	1	"	"	"	"	"	
127-18-4	Tetrachloroethene	< 3.62		µg/kg dry	3.62	1.24	1	"	"	"	"	"	
108-88-3	Toluene	< 3.62		µg/kg dry	3.62	1.17	1	"	"	"	"	"	
87-61-6	1,2,3-Trichlorobenzene	< 3.62		µg/kg dry	3.62	1.27	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 3.62		µg/kg dry	3.62	2.67	1	"	"	"	"	"	
108-70-3	1,3,5-Trichlorobenzene	< 3.62		µg/kg dry	3.62	1.14	1	"	"	"	"	"	
71-55-6	1,1,1-Trichloroethane	< 3.62		µg/kg dry	3.62	1.20	1	"	"	"	"	"	
79-00-5	1,1,2-Trichloroethane	< 3.62		µg/kg dry	3.62	2.63	1	"	"	"	"	"	
79-01-6	Trichloroethene	< 3.62		µg/kg dry	3.62	0.99	1	"	"	"	"	"	
75-69-4	Trichlorofluoromethane (Freon 11)	< 3.62		µg/kg dry	3.62	1.95	1	"	"	"	"	"	
96-18-4	1,2,3-Trichloropropane	< 3.62		µg/kg dry	3.62	2.72	1	"	"	"	"	"	
95-63-6	1,2,4-Trimethylbenzene	< 3.62		µg/kg dry	3.62	0.88	1	"	"	"	"	"	
108-67-8	1,3,5-Trimethylbenzene	< 3.62		µg/kg dry	3.62	0.62	1	"	"	"	"	"	
75-01-4	Vinyl chloride	< 3.62		µg/kg dry	3.62	1.22	1	"	"	"	"	"	
179601-23-1	m,p-Xylene	< 7.25		µg/kg dry	7.25	0.65	1	"	"	"	"	"	
95-47-6	o-Xylene	< 3.62		µg/kg dry	3.62	1.01	1	"	"	"	"	"	
109-99-9	Tetrahydrofuran	< 7.25		µg/kg dry	7.25	5.71	1	"	"	"	"	"	
60-29-7	Ethyl ether	< 3.62		µg/kg dry	3.62	3.28	1	"	"	"	"	"	
994-05-8	Tert-amyl methyl ether	< 3.62		µg/kg dry	3.62	1.21	1	"	"	"	"	"	
637-92-3	Ethyl tert-butyl ether	< 3.62		µg/kg dry	3.62	1.95	1	"	"	"	"	"	
108-20-3	Di-isopropyl ether	< 3.62		µg/kg dry	3.62	0.67	1	"	"	"	"	"	
75-65-0	Tert-Butanol / butyl alcohol	< 36.2		µg/kg dry	36.2	23.7	1	"	"	"	"	"	
123-91-1	1,4-Dioxane	< 72.5		µg/kg dry	72.5	62.9	1	"	"	"	"	"	
110-57-6	trans-1,4-Dichloro-2-buten e	< 18.1		µg/kg dry	18.1	8.27	1	"	"	"	"	"	
64-17-5	Ethanol	< 725		µg/kg dry	725	135	1	"	"	"	"	"	
Surrogate recoveries:													
460-00-4	*4-Bromofluorobenzene*	*93*			*70-130 %*			"	"	"	"	"	
2037-26-5	*Toluene-d8*	*101*			*70-130 %*			"	"	"	"	"	
17060-07-0	*1,2-Dichloroethane-d4*	*129*			*70-130 %*			"	"	"	"	"	
1868-53-7	*Dibromofluoromethane*	*105*			*70-130 %*			"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP3	01.0173025.00	Soil	21-Aug-17 09:30	21-Aug-17
SC38320-02				

Semivolatile Organic Compounds by GCMS

Semivolatile Organic Compounds
Prepared by method SW846 3546

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
83-32-9	Acenaphthene	< 73.1		µg/kg dry	73.1	36.4	1	SW846 8270D	29-Aug-17	31-Aug-17	MSL	1714754	
208-96-8	Acenaphthylene	< 73.1		µg/kg dry	73.1	36.0	1	"	"	"	"	"	
62-53-3	Aniline	< 361		µg/kg dry	361	26.0	1	"	"	"	"	"	
120-12-7	Anthracene	**86.5**		µg/kg dry	73.1	34.9	1	"	"	"	"	"	
103-33-3	Azobenzene/Diphenyldiazene	< 361		µg/kg dry	361	35.5	1	"	"	"	"	"	
92-87-5	Benzidine	< 361		µg/kg dry	361	72.7	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	**125**		µg/kg dry	73.1	38.6	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 73.1		µg/kg dry	73.1	27.2	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 73.1		µg/kg dry	73.1	35.4	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 73.1		µg/kg dry	73.1	29.4	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 73.1		µg/kg dry	73.1	28.6	1	"	"	"	"	"	
65-85-0	Benzoic acid	< 361		µg/kg dry	361	75.9	1	"	"	"	"	"	
100-51-6	Benzyl alcohol	< 361		µg/kg dry	361	29.6	1	"	"	"	"	"	
111-91-1	Bis(2-chloroethoxy)methane	< 361		µg/kg dry	361	32.1	1	"	"	"	"	"	
111-44-4	Bis(2-chloroethyl)ether	< 183		µg/kg dry	183	26.2	1	"	"	"	"	"	
108-60-1	Bis(2-chloroisopropyl)ether	< 183		µg/kg dry	183	28.1	1	"	"	"	"	"	
117-81-7	Bis(2-ethylhexyl)phthalate	< 183		µg/kg dry	183	45.1	1	"	"	"	"	"	
101-55-3	4-Bromophenyl phenyl ether	< 361		µg/kg dry	361	33.9	1	"	"	"	"	"	
85-68-7	Butyl benzyl phthalate	< 361		µg/kg dry	361	42.2	1	"	"	"	"	"	
86-74-8	Carbazole	< 183		µg/kg dry	183	102	1	"	"	"	"	"	
59-50-7	4-Chloro-3-methylphenol	< 361		µg/kg dry	361	34.5	1	"	"	"	"	"	
106-47-8	4-Chloroaniline	< 183		µg/kg dry	183	39.5	1	"	"	"	"	"	
91-58-7	2-Chloronaphthalene	< 361		µg/kg dry	361	33.4	1	"	"	"	"	"	
95-57-8	2-Chlorophenol	< 183		µg/kg dry	183	32.5	1	"	"	"	"	"	
7005-72-3	4-Chlorophenyl phenyl ether	< 361		µg/kg dry	361	42.9	1	"	"	"	"	"	
218-01-9	Chrysene	**111**		µg/kg dry	73.1	36.5	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 73.1		µg/kg dry	73.1	28.0	1	"	"	"	"	"	
132-64-9	Dibenzofuran	< 183		µg/kg dry	183	27.8	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 361		µg/kg dry	361	31.5	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 361		µg/kg dry	361	31.5	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 361		µg/kg dry	361	33.5	1	"	"	"	"	"	
91-94-1	3,3´-Dichlorobenzidine	< 361		µg/kg dry	361	55.0	1	"	"	"	"	"	
120-83-2	2,4-Dichlorophenol	< 183		µg/kg dry	183	34.2	1	"	"	"	"	"	
84-66-2	Diethyl phthalate	< 361		µg/kg dry	361	44.7	1	"	"	"	"	"	
131-11-3	Dimethyl phthalate	< 361		µg/kg dry	361	39.5	1	"	"	"	"	"	
105-67-9	2,4-Dimethylphenol	< 361		µg/kg dry	361	25.8	1	"	"	"	"	"	
84-74-2	Di-n-butyl phthalate	< 361		µg/kg dry	361	38.3	1	"	"	"	"	"	
534-52-1	4,6-Dinitro-2-methylphenol	< 361		µg/kg dry	361	46.4	1	"	"	"	"	"	
51-28-5	2,4-Dinitrophenol	< 361		µg/kg dry	361	32.6	1	"	"	"	"	"	
121-14-2	2,4-Dinitrotoluene	< 183		µg/kg dry	183	70.7	1	"	"	"	"	"	
606-20-2	2,6-Dinitrotoluene	< 183		µg/kg dry	183	41.2	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP3	01.0173025.00	Soil	21-Aug-17 09:30	21-Aug-17
SC38320-02				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds													
117-84-0	Di-n-octyl phthalate	< 361		µg/kg dry	361	40.8	1	SW846 8270D	29-Aug-17	31-Aug-17	MSL	1714754	
206-44-0	Fluoranthene	**314**		µg/kg dry	73.1	38.6	1	"	"	"	"	"	
86-73-7	Fluorene	< 73.1		µg/kg dry	73.1	37.1	1	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 183		µg/kg dry	183	36.0	1	"	"	"	"	"	
87-68-3	Hexachlorobutadiene	< 183		µg/kg dry	183	43.7	1	"	"	"	"	"	
77-47-4	Hexachlorocyclopentadiene	< 183		µg/kg dry	183	24.9	1	"	"	"	"	"	
67-72-1	Hexachloroethane	< 183		µg/kg dry	183	39.4	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 73.1		µg/kg dry	73.1	26.3	1	"	"	"	"	"	
78-59-1	Isophorone	< 183		µg/kg dry	183	34.3	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 73.1		µg/kg dry	73.1	44.1	1	"	"	"	"	"	
95-48-7	2-Methylphenol	< 361		µg/kg dry	361	30.7	1	"	"	"	"	"	
108-39-4, 106-44-5	3 & 4-Methylphenol	< 361		µg/kg dry	361	34.9	1	"	"	"	"	"	
91-20-3	Naphthalene	< 73.1		µg/kg dry	73.1	34.1	1	"	"	"	"	"	
88-74-4	2-Nitroaniline	< 361		µg/kg dry	361	30.7	1	"	"	"	"	"	
99-09-2	3-Nitroaniline	< 361		µg/kg dry	361	49.4	1	"	"	"	"	"	
100-01-6	4-Nitroaniline	< 183		µg/kg dry	183	52.4	1	"	"	"	"	"	
98-95-3	Nitrobenzene	< 183		µg/kg dry	183	33.3	1	"	"	"	"	"	
88-75-5	2-Nitrophenol	< 183		µg/kg dry	183	30.3	1	"	"	"	"	"	
100-02-7	4-Nitrophenol	< 1450		µg/kg dry	1450	58.4	1	"	"	"	"	"	
62-75-9	N-Nitrosodimethylamine	< 183		µg/kg dry	183	34.0	1	"	"	"	"	"	
621-64-7	N-Nitrosodi-n-propylamine	< 183		µg/kg dry	183	35.6	1	"	"	"	"	"	
86-30-6	N-Nitrosodiphenylamine	< 361		µg/kg dry	361	39.2	1	"	"	"	"	"	
87-86-5	Pentachlorophenol	< 361		µg/kg dry	361	38.6	1	"	"	"	"	"	
85-01-8	Phenanthrene	**192**		µg/kg dry	73.1	34.0	1	"	"	"	"	"	
108-95-2	Phenol	< 361		µg/kg dry	361	23.8	1	"	"	"	"	"	
129-00-0	Pyrene	**255**		µg/kg dry	73.1	40.7	1	"	"	"	"	"	
110-86-1	Pyridine	< 361		µg/kg dry	361	53.9	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 361		µg/kg dry	361	35.8	1	"	"	"	"	"	
90-12-0	1-Methylnaphthalene	< 73.1		µg/kg dry	73.1	35.9	1	"	"	"	"	"	
95-95-4	2,4,5-Trichlorophenol	< 361		µg/kg dry	361	32.5	1	"	"	"	"	"	
88-06-2	2,4,6-Trichlorophenol	< 183		µg/kg dry	183	32.6	1	"	"	"	"	"	
82-68-8	Pentachloronitrobenzene	< 361		µg/kg dry	361	57.1	1	"	"	"	"	"	
95-94-3	1,2,4,5-Tetrachlorobenzene	< 361		µg/kg dry	361	35.0	1	"	"	"	"	"	
Surrogate recoveries:													
321-60-8	*2-Fluorobiphenyl*	*57*			*30-130 %*			"	"	"	"	"	
367-12-4	*2-Fluorophenol*	*73*			*30-130 %*			"	"	"	"	"	
4165-60-0	*Nitrobenzene-d5*	*85*			*30-130 %*			"	"	"	"	"	
4165-62-2	*Phenol-d5*	*75*			*30-130 %*			"	"	"	"	"	
1718-51-0	*Terphenyl-dl4*	*75*			*30-130 %*			"	"	"	"	"	
118-79-6	*2,4,6-Tribromophenol*	*56*			*30-130 %*			"	"	"	"	"	
Pesticides													
Organochlorine Pesticides Prepared by method SW846 3546													
319-84-6	alpha-BHC	< 5.50		µg/kg dry	5.50	0.971	1	SW846 8081B	29-Aug-17	01-Sep-17	SM	1714757	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP3	01.0173025.00	Soil	21-Aug-17 09:30	21-Aug-17
SC38320-02				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Pesticides													
Organochlorine Pesticides													
319-85-7	beta-BHC	< 5.50		µg/kg dry	5.50	1.19	1	SW846 8081B	29-Aug-17	01-Sep-17	SM	1714757	
319-86-8	delta-BHC	< 5.50		µg/kg dry	5.50	1.10	1	"	"	"	"	"	
58-89-9	gamma-BHC (Lindane)	< 3.30		µg/kg dry	3.30	0.933	1	"	"	"	"	"	
76-44-8	Heptachlor	< 5.50		µg/kg dry	5.50	1.04	1	"	"	"	"	"	
309-00-2	Aldrin	< 5.50		µg/kg dry	5.50	1.05	1	"	"	"	"	"	
1024-57-3	Heptachlor epoxide	< 5.50		µg/kg dry	5.50	1.19	1	"	"	"	"	"	
959-98-8	Endosulfan I	< 5.50		µg/kg dry	5.50	1.32	1	"	"	"	"	"	
60-57-1	Dieldrin	< 5.50		µg/kg dry	5.50	1.34	1	"	"	"	"	"	
72-55-9	4,4'-DDE (p,p')	< 5.50		µg/kg dry	5.50	1.31	1	"	"	"	"	"	
72-20-8	Endrin	< 8.80		µg/kg dry	8.80	1.76	1	"	"	"	"	"	
33213-65-9	Endosulfan II	< 8.80		µg/kg dry	8.80	1.81	1	"	"	"	"	"	
72-54-8	4,4'-DDD (p,p')	< 8.80		µg/kg dry	8.80	1.56	1	"	"	"	"	"	
1031-07-8	Endosulfan sulfate	< 8.80		µg/kg dry	8.80	1.66	1	"	"	"	"	"	
50-29-3	4,4'-DDT (p,p')	< 8.80		µg/kg dry	8.80	1.69	1	"	"	"	"	"	
72-43-5	Methoxychlor	< 8.80		µg/kg dry	8.80	1.95	1	"	"	"	"	"	
53494-70-5	Endrin ketone	< 8.80		µg/kg dry	8.80	1.50	1	"	"	"	"	"	
7421-93-4	Endrin aldehyde	< 8.80		µg/kg dry	8.80	1.76	1	"	"	"	"	"	
5103-71-9	alpha-Chlordane	< 5.50		µg/kg dry	5.50	1.24	1	"	"	"	"	"	
5103-74-2	Chlordane (gamma)(trans)	< 5.50		µg/kg dry	5.50	1.22	1	"	"	"	"	"	
8001-35-2	Toxaphene	< 110		µg/kg dry	110	13.8	1	"	"	"	"	"	
57-74-9	Chlordane	< 22.0		µg/kg dry	22.0	20.7	1	"	"	"	"	"	
15972-60-8	Alachlor	< 5.50		µg/kg dry	5.50	2.70	1	"	"	"	"	"	
Surrogate recoveries:													
10386-84-2	*4,4-DB-Octafluorobiphenyl (Sr)*	*103*			*30-150 %*			"	"	"	"	"	
10386-84-2	*4,4-DB-Octafluorobiphenyl (Sr) [2C]*	*102*			*30-150 %*			"	"	"	"	"	
2051-24-3	*Decachlorobiphenyl (Sr)*	*163*	S02		*30-150 %*			"	"	"	"	"	
2051-24-3	*Decachlorobiphenyl (Sr) [2C]*	*130*			*30-150 %*			"	"	"	"	"	
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													
	C9-C18 Aliphatic Hydrocarbons	< 10.9		mg/kg dry	10.9	1.52	1	MADEP EPH 5/2004 R	29-Aug-17	01-Sep-17	EDT	1714758	
	C19-C36 Aliphatic Hydrocarbons	< 10.9		mg/kg dry	10.9	1.54	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	< 10.9		mg/kg dry	10.9	5.21	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	< 10.9		mg/kg dry	10.9	5.21	1	"	"	"	"	"	
91-20-3	Naphthalene	< 0.364		mg/kg dry	0.364	0.323	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 0.364		mg/kg dry	0.364	0.312	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.364		mg/kg dry	0.364	0.144	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.364		mg/kg dry	0.364	0.360	1	"	"	"	"	"	
86-73-7	Fluorene	< 0.364		mg/kg dry	0.364	0.327	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 0.364		mg/kg dry	0.364	0.315	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.364		mg/kg dry	0.364	0.312	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP3 SC38320-02	01.0173025.00	Soil	21-Aug-17 09:30	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
MADEP EPH													
206-44-0	Fluoranthene	< 0.364		mg/kg dry	0.364	0.138	1	MADEP EPH 5/2004 R	29-Aug-17	01-Sep-17	EDT	1714758	
129-00-0	Pyrene	< 0.364		mg/kg dry	0.364	0.140	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.364		mg/kg dry	0.364	0.345	1	"	"	"	"	"	
218-01-9	Chrysene	< 0.364		mg/kg dry	0.364	0.344	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.364		mg/kg dry	0.364	0.299	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.364		mg/kg dry	0.364	0.191	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.364		mg/kg dry	0.364	0.326	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.364		mg/kg dry	0.364	0.242	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.364		mg/kg dry	0.364	0.233	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.364		mg/kg dry	0.364	0.238	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*121*			*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*59*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*60*			*40-140 %*			"	"	"	"	"	
Fingerprinting by GC													
8006-61-9	Gasoline	< 29.0		mg/kg dry	29.0		1	SW846 8100Mod.	"	30-Aug-17	DJS	1714755	
68476-30-2	Fuel Oil #2	< 29.0		mg/kg dry	29.0	20.6	1	"	"	"	"	"	
68476-31-3	Fuel Oil #4	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
68553-00-4	Fuel Oil #6	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
M09800000	Motor Oil	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
8032-32-4	Ligroin	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
J00100000	Aviation Fuel	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
	Hydraulic Oil	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
	Dielectric Fluid	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
	Unidentified	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
	Other Oil	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	< 29.0		mg/kg dry	29.0		1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*118*			*40-140 %*			"	"	"	"	"	
Total Metals by EPA 6000/7000 Series Methods													
Prepared by method SW846 3051A													
7440-38-2	Arsenic	**1.62**		mg/kg dry	1.51	0.192	1	SW846 6010C	24-Aug-17	25-Aug-17	TBC	1714358	
7440-43-9	Cadmium	< 0.505		mg/kg dry	0.505	0.0261	1	"	"	"	"	"	
7440-47-3	Chromium	**4.80**		mg/kg dry	1.01	0.134	1	"	"	"	"	"	
7440-50-8	Copper	**4.31**		mg/kg dry	1.01	0.242	1	"	"	"	"	"	
7439-97-6	Mercury	< 0.0316		mg/kg dry	0.0316	0.0088	1	SW846 7471B	"	25-Aug-17	LNB	1714359	
Prepared by method SW846 3051A													
7440-02-0	Nickel	**3.56**		mg/kg dry	1.01	0.116	1	SW846 6010C	"	25-Aug-17	TBC	1714358	
7439-92-1	Lead	**5.77**		mg/kg dry	1.51	0.214	1	"	"	"	"	"	
7440-66-6	Zinc	**19.6**		mg/kg dry	1.01	0.781	1	"	"	29-Aug-17	"	"	
General Chemistry Parameters													
	% Solids	**90.7**		%			1	SM2540 G (11) Mod.	22-Aug-17	22-Aug-17	BD	1714386	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP3 SC38320-02	01.0173025.00	Soil	21-Aug-17 09:30	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
General Chemistry Parameters													
	Specific Conductance (EC)	**96.8**		uS/cm	10.0	10.0	1	SM22 2510B	23-Aug-17	23-Aug-17	BD	1714384	
Prepared by method General Preparation SVOC													
	Moisture	**9.29**		%			1	SM2540 G (11) Mod. calculation	22-Aug-17	22-Aug-17	BD	1714390	
Toxicity Characteristics													
	Fractional % Sieve #4 (>4750µm)	**22.3**		% Retained			1	ASTM D422	24-Aug-17	01-Sep-17	BD	1714539	
Reactivity Cyanide/Sulfide													
	Reactivity	**See Narrative**		mg/kg dry			1	SW846 Ch. 7.3	22-Aug-17	22-Aug-17	TN	1714405	
57-12-5	Reactive Cyanide	< 24.8		mg/kg dry	24.8	24.8	1	"	"	"	"	"	
18496-25-8	Reactive Sulfide	< 49.5		mg/kg dry	49.5	49.5	1	"	"	"	"	"	
Subcontracted Analyses													
Subcontracted Analyses													
Prepared by method 398809-										Methylation date: 22-Aug-17			
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
93-76-5	2,4,5-T	< 97		ug/Kg	97	97	10	SW8151A	22-Aug-17	23-Aug-17 18:47	M-CT0	398809A	
93-72-1	2,4,5-TP (Silvex)	< 97		ug/Kg	97	97	10	"	"	"	"	"	
94-75-7	2,4-D	< 190		ug/Kg	190	190	10	"	"	"	"	"	
94-82-6	2,4-DB	< 970		ug/Kg	970	970	10	"	"	"	"	"	
75-99-0	Dalapon	< 97		ug/Kg	97	97	10	"	"	"	"	"	
1918-00-9	Dicamba	< 97		ug/Kg	97	97	10	"	"	"	"	"	
120-36-5	Dichloroprop	< 140		ug/Kg	140	140	10	"	"	"	"	"	
88-85-7	Dinoseb	< 97		ug/Kg	97	97	10	"	"	"	"	"	
94-74-6	MCPA	< 29000		ug/Kg	29000	29000	10	"	"	"	"	"	
7085-19-0	MCPP	< 29000		ug/Kg	29000	29000	10	"	"	"	"	"	
Surrogate recoveries:													
19719-28-9	*% DCAA*	*53*			*30-150 %*			"	"	"	"	"	
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Percent Solid	**85**		%			1	SW846-%Solid		22-Aug-17 19:18	M-CT0	'[none]'	
Prepared by method 398998-SW9060A/													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Tot.Org.Carbon	**2,400**		mg/kg	100	100	1	SW9060A/L. Kahn	"	23-Aug-17 17:55	M-CT0	398998A	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP4 SC38320-03	01.0173025.00	Soil	21-Aug-17 10:30	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Prepared by method Volatiles													
	VOC Extraction	**Field extracted**		N/A			1	VOC Soil Extraction			BD	1714336	
Volatile Organic Compounds by SW846 8260													
Prepared by method SW846 5035A Soil (low level)							Initial weight: 8.46 g						
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	< 5.15		µg/kg dry	5.15	2.61	1	SW846 8260C	22-Aug-17	22-Aug-17	GMA	1714362	
67-64-1	Acetone	< 51.5		µg/kg dry	51.5	20.6	1	"	"	"	"	"	
107-13-1	Acrylonitrile	< 5.15		µg/kg dry	5.15	4.95	1	"	"	"	"	"	
71-43-2	Benzene	< 5.15		µg/kg dry	5.15	1.37	1	"	"	"	"	"	
108-86-1	Bromobenzene	< 5.15		µg/kg dry	5.15	1.38	1	"	"	"	"	"	
74-97-5	Bromochloromethane	< 5.15		µg/kg dry	5.15	2.60	1	"	"	"	"	"	
75-27-4	Bromodichloromethane	< 5.15		µg/kg dry	5.15	3.44	1	"	"	"	"	"	
75-25-2	Bromoform	< 5.15		µg/kg dry	5.15	4.92	1	"	"	"	"	"	
74-83-9	Bromomethane	< 10.3		µg/kg dry	10.3	4.65	1	"	"	"	"	"	
78-93-3	2-Butanone (MEK)	< 10.3		µg/kg dry	10.3	9.21	1	"	"	"	"	"	
104-51-8	n-Butylbenzene	< 5.15		µg/kg dry	5.15	1.47	1	"	"	"	"	"	
135-98-8	sec-Butylbenzene	< 5.15		µg/kg dry	5.15	0.94	1	"	"	"	"	"	
98-06-6	tert-Butylbenzene	< 5.15		µg/kg dry	5.15	1.15	1	"	"	"	"	"	
75-15-0	Carbon disulfide	< 10.3		µg/kg dry	10.3	3.30	1	"	"	"	"	"	
56-23-5	Carbon tetrachloride	< 5.15		µg/kg dry	5.15	4.21	1	"	"	"	"	"	
108-90-7	Chlorobenzene	< 5.15		µg/kg dry	5.15	1.61	1	"	"	"	"	"	
75-00-3	Chloroethane	< 10.3		µg/kg dry	10.3	2.86	1	"	"	"	"	"	
67-66-3	Chloroform	< 5.15		µg/kg dry	5.15	2.77	1	"	"	"	"	"	
74-87-3	Chloromethane	< 10.3		µg/kg dry	10.3	2.13	1	"	"	"	"	"	
95-49-8	2-Chlorotoluene	< 5.15		µg/kg dry	5.15	1.28	1	"	"	"	"	"	
106-43-4	4-Chlorotoluene	< 5.15		µg/kg dry	5.15	1.21	1	"	"	"	"	"	
96-12-8	1,2-Dibromo-3-chloropropane	< 10.3		µg/kg dry	10.3	7.44	1	"	"	"	"	"	
124-48-1	Dibromochloromethane	< 5.15		µg/kg dry	5.15	3.49	1	"	"	"	"	"	
106-93-4	1,2-Dibromoethane (EDB)	< 5.15		µg/kg dry	5.15	3.46	1	"	"	"	"	"	
74-95-3	Dibromomethane	< 5.15		µg/kg dry	5.15	2.68	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 5.15		µg/kg dry	5.15	1.34	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 5.15		µg/kg dry	5.15	1.12	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 5.15		µg/kg dry	5.15	1.52	1	"	"	"	"	"	
75-71-8	Dichlorodifluoromethane (Freon12)	< 10.3		µg/kg dry	10.3	1.95	1	"	"	"	"	"	
75-34-3	1,1-Dichloroethane	< 5.15		µg/kg dry	5.15	1.35	1	"	"	"	"	"	
107-06-2	1,2-Dichloroethane	< 5.15		µg/kg dry	5.15	1.84	1	"	"	"	"	"	
75-35-4	1,1-Dichloroethene	< 5.15		µg/kg dry	5.15	2.69	1	"	"	"	"	"	
156-59-2	cis-1,2-Dichloroethene	< 5.15		µg/kg dry	5.15	1.91	1	"	"	"	"	"	
156-60-5	trans-1,2-Dichloroethene	< 5.15		µg/kg dry	5.15	2.73	1	"	"	"	"	"	
78-87-5	1,2-Dichloropropane	< 5.15		µg/kg dry	5.15	2.70	1	"	"	"	"	"	
142-28-9	1,3-Dichloropropane	< 5.15		µg/kg dry	5.15	2.67	1	"	"	"	"	"	
594-20-7	2,2-Dichloropropane	< 5.15		µg/kg dry	5.15	2.43	1	"	"	"	"	"	
563-58-6	1,1-Dichloropropene	< 5.15		µg/kg dry	5.15	1.66	1	"	"	"	"	"	
10061-01-5	cis-1,3-Dichloropropene	< 5.15		µg/kg dry	5.15	3.11	1	"	"	"	"	"	
10061-02-6	trans-1,3-Dichloropropene	< 5.15		µg/kg dry	5.15	2.70	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP4	01.0173025.00	Soil	21-Aug-17 10:30	21-Aug-17
SC38320-03				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Volatile Organic Compounds by SW846 8260													
						Initial weight: 8.46 g							
100-41-4	Ethylbenzene	< 5.15		µg/kg dry	5.15	0.74	1	SW846 8260C	22-Aug-17	22-Aug-17	GMA	1714362	
87-68-3	Hexachlorobutadiene	< 5.15		µg/kg dry	5.15	2.59	1	"	"	"	"	"	
591-78-6	2-Hexanone (MBK)	< 10.3		µg/kg dry	10.3	6.32	1	"	"	"	"	"	
98-82-8	Isopropylbenzene	< 5.15		µg/kg dry	5.15	1.01	1	"	"	"	"	"	
99-87-6	4-Isopropyltoluene	< 5.15		µg/kg dry	5.15	1.11	1	"	"	"	"	"	
1634-04-4	Methyl tert-butyl ether	< 5.15		µg/kg dry	5.15	1.90	1	"	"	"	"	"	
108-10-1	4-Methyl-2-pentanone (MIBK)	< 10.3		µg/kg dry	10.3	2.65	1	"	"	"	"	"	
75-09-2	Methylene chloride	< 10.3		µg/kg dry	10.3	2.05	1	"	"	"	"	"	
91-20-3	Naphthalene	33.4		µg/kg dry	5.15	3.07	1	"	"	"	"	"	
103-65-1	n-Propylbenzene	< 5.15		µg/kg dry	5.15	0.83	1	"	"	"	"	"	
100-42-5	Styrene	< 5.15		µg/kg dry	5.15	1.04	1	"	"	"	"	"	
630-20-6	1,1,1,2-Tetrachloroethane	< 5.15		µg/kg dry	5.15	4.38	1	"	"	"	"	"	
79-34-5	1,1,2,2-Tetrachloroethane	< 5.15		µg/kg dry	5.15	4.36	1	"	"	"	"	"	
127-18-4	Tetrachloroethene	< 5.15		µg/kg dry	5.15	1.76	1	"	"	"	"	"	
108-88-3	Toluene	< 5.15		µg/kg dry	5.15	1.67	1	"	"	"	"	"	
87-61-6	1,2,3-Trichlorobenzene	< 5.15		µg/kg dry	5.15	1.81	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 5.15		µg/kg dry	5.15	3.80	1	"	"	"	"	"	
108-70-3	1,3,5-Trichlorobenzene	< 5.15		µg/kg dry	5.15	1.62	1	"	"	"	"	"	
71-55-6	1,1,1-Trichloroethane	< 5.15		µg/kg dry	5.15	1.71	1	"	"	"	"	"	
79-00-5	1,1,2-Trichloroethane	< 5.15		µg/kg dry	5.15	3.74	1	"	"	"	"	"	
79-01-6	Trichloroethene	< 5.15		µg/kg dry	5.15	1.41	1	"	"	"	"	"	
75-69-4	Trichlorofluoromethane (Freon 11)	< 5.15		µg/kg dry	5.15	2.78	1	"	"	"	"	"	
96-18-4	1,2,3-Trichloropropane	< 5.15		µg/kg dry	5.15	3.86	1	"	"	"	"	"	
95-63-6	1,2,4-Trimethylbenzene	< 5.15		µg/kg dry	5.15	1.25	1	"	"	"	"	"	
108-67-8	1,3,5-Trimethylbenzene	< 5.15		µg/kg dry	5.15	0.89	1	"	"	"	"	"	
75-01-4	Vinyl chloride	< 5.15		µg/kg dry	5.15	1.74	1	"	"	"	"	"	
179601-23-1	m,p-Xylene	< 10.3		µg/kg dry	10.3	0.93	1	"	"	"	"	"	
95-47-6	o-Xylene	< 5.15		µg/kg dry	5.15	1.44	1	"	"	"	"	"	
109-99-9	Tetrahydrofuran	< 10.3		µg/kg dry	10.3	8.12	1	"	"	"	"	"	
60-29-7	Ethyl ether	< 5.15		µg/kg dry	5.15	4.67	1	"	"	"	"	"	
994-05-8	Tert-amyl methyl ether	< 5.15		µg/kg dry	5.15	1.72	1	"	"	"	"	"	
637-92-3	Ethyl tert-butyl ether	< 5.15		µg/kg dry	5.15	2.78	1	"	"	"	"	"	
108-20-3	Di-isopropyl ether	< 5.15		µg/kg dry	5.15	0.96	1	"	"	"	"	"	
75-65-0	Tert-Butanol / butyl alcohol	< 51.5		µg/kg dry	51.5	33.7	1	"	"	"	"	"	
123-91-1	1,4-Dioxane	< 103		µg/kg dry	103	89.5	1	"	"	"	"	"	
110-57-6	trans-1,4-Dichloro-2-butene	< 25.8		µg/kg dry	25.8	11.8	1	"	"	"	"	"	
64-17-5	Ethanol	< 1030		µg/kg dry	1030	192	1	"	"	"	"	"	
Surrogate recoveries:													
460-00-4	*4-Bromofluorobenzene*	*93*			*70-130 %*			"	"	"	"	"	
2037-26-5	*Toluene-d8*	*104*			*70-130 %*			"	"	"	"	"	
17060-07-0	*1,2-Dichloroethane-d4*	*126*			*70-130 %*			"	"	"	"	"	
1868-53-7	*Dibromofluoromethane*	*108*			*70-130 %*			"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP4	01.0173025.00	Soil	21-Aug-17 10:30	21-Aug-17
SC38320-03				

Semivolatile Organic Compounds by GCMS

Semivolatile Organic Compounds
Prepared by method SW846 3546

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
83-32-9	Acenaphthene	< 84.8		µg/kg dry	84.8	42.2	1	SW846 8270D	29-Aug-17	31-Aug-17	MSL	1714754	
208-96-8	Acenaphthylene	< 84.8		µg/kg dry	84.8	41.9	1	"	"	"	"	"	
62-53-3	Aniline	< 420		µg/kg dry	420	30.1	1	"	"	"	"	"	
120-12-7	Anthracene	**232**		µg/kg dry	84.8	40.6	1	"	"	"	"	"	
103-33-3	Azobenzene/Diphenyldiazene	< 420		µg/kg dry	420	41.3	1	"	"	"	"	"	
92-87-5	Benzidine	< 420		µg/kg dry	420	84.5	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	**146**		µg/kg dry	84.8	44.8	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 84.8		µg/kg dry	84.8	31.6	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	**96.7**		µg/kg dry	84.8	41.1	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 84.8		µg/kg dry	84.8	34.1	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 84.8		µg/kg dry	84.8	33.2	1	"	"	"	"	"	
65-85-0	Benzoic acid	< 420		µg/kg dry	420	88.1	1	"	"	"	"	"	
100-51-6	Benzyl alcohol	< 420		µg/kg dry	420	34.4	1	"	"	"	"	"	
111-91-1	Bis(2-chloroethoxy)methane	< 420		µg/kg dry	420	37.3	1	"	"	"	"	"	
111-44-4	Bis(2-chloroethyl)ether	< 212		µg/kg dry	212	30.4	1	"	"	"	"	"	
108-60-1	Bis(2-chloroisopropyl)ether	< 212		µg/kg dry	212	32.7	1	"	"	"	"	"	
117-81-7	Bis(2-ethylhexyl)phthalate	< 212		µg/kg dry	212	52.4	1	"	"	"	"	"	
101-55-3	4-Bromophenyl phenyl ether	< 420		µg/kg dry	420	39.3	1	"	"	"	"	"	
85-68-7	Butyl benzyl phthalate	< 420		µg/kg dry	420	49.0	1	"	"	"	"	"	
86-74-8	Carbazole	< 212		µg/kg dry	212	119	1	"	"	"	"	"	
59-50-7	4-Chloro-3-methylphenol	< 420		µg/kg dry	420	40.1	1	"	"	"	"	"	
106-47-8	4-Chloroaniline	< 212		µg/kg dry	212	45.9	1	"	"	"	"	"	
91-58-7	2-Chloronaphthalene	< 420		µg/kg dry	420	38.8	1	"	"	"	"	"	
95-57-8	2-Chlorophenol	< 212		µg/kg dry	212	37.8	1	"	"	"	"	"	
7005-72-3	4-Chlorophenyl phenyl ether	< 420		µg/kg dry	420	49.9	1	"	"	"	"	"	
218-01-9	Chrysene	**147**		µg/kg dry	84.8	42.4	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 84.8		µg/kg dry	84.8	32.6	1	"	"	"	"	"	
132-64-9	Dibenzofuran	< 212		µg/kg dry	212	32.3	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 420		µg/kg dry	420	36.6	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 420		µg/kg dry	420	36.6	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 420		µg/kg dry	420	38.9	1	"	"	"	"	"	
91-94-1	3,3´-Dichlorobenzidine	< 420		µg/kg dry	420	63.9	1	"	"	"	"	"	
120-83-2	2,4-Dichlorophenol	< 212		µg/kg dry	212	39.7	1	"	"	"	"	"	
84-66-2	Diethyl phthalate	< 420		µg/kg dry	420	51.9	1	"	"	"	"	"	
131-11-3	Dimethyl phthalate	< 420		µg/kg dry	420	45.9	1	"	"	"	"	"	
105-67-9	2,4-Dimethylphenol	< 420		µg/kg dry	420	30.0	1	"	"	"	"	"	
84-74-2	Di-n-butyl phthalate	< 420		µg/kg dry	420	44.5	1	"	"	"	"	"	
534-52-1	4,6-Dinitro-2-methylphenol	< 420		µg/kg dry	420	53.9	1	"	"	"	"	"	
51-28-5	2,4-Dinitrophenol	< 420		µg/kg dry	420	37.8	1	"	"	"	"	"	
121-14-2	2,4-Dinitrotoluene	< 212		µg/kg dry	212	82.2	1	"	"	"	"	"	
606-20-2	2,6-Dinitrotoluene	< 212		µg/kg dry	212	47.8	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP4	01.0173025.00	Soil	21-Aug-17 10:30	21-Aug-17
SC38320-03				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds													
117-84-0	Di-n-octyl phthalate	< 420		µg/kg dry	420	47.4	1	SW846 8270D	29-Aug-17	31-Aug-17	MSL	1714754	
206-44-0	Fluoranthene	**498**		µg/kg dry	84.8	44.8	1	"	"	"	"	"	
86-73-7	Fluorene	< 84.8		µg/kg dry	84.8	43.1	1	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 212		µg/kg dry	212	41.8	1	"	"	"	"	"	
87-68-3	Hexachlorobutadiene	< 212		µg/kg dry	212	50.8	1	"	"	"	"	"	
77-47-4	Hexachlorocyclopentadiene	< 212		µg/kg dry	212	28.9	1	"	"	"	"	"	
67-72-1	Hexachloroethane	< 212		µg/kg dry	212	45.8	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 84.8		µg/kg dry	84.8	30.5	1	"	"	"	"	"	
78-59-1	Isophorone	< 212		µg/kg dry	212	39.8	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 84.8		µg/kg dry	84.8	51.3	1	"	"	"	"	"	
95-48-7	2-Methylphenol	< 420		µg/kg dry	420	35.7	1	"	"	"	"	"	
108-39-4, 106-44-5	3 & 4-Methylphenol	< 420		µg/kg dry	420	40.6	1	"	"	"	"	"	
91-20-3	Naphthalene	< 84.8		µg/kg dry	84.8	39.6	1	"	"	"	"	"	
88-74-4	2-Nitroaniline	< 420		µg/kg dry	420	35.6	1	"	"	"	"	"	
99-09-2	3-Nitroaniline	< 420		µg/kg dry	420	57.4	1	"	"	"	"	"	
100-01-6	4-Nitroaniline	< 212		µg/kg dry	212	60.8	1	"	"	"	"	"	
98-95-3	Nitrobenzene	< 212		µg/kg dry	212	38.7	1	"	"	"	"	"	
88-75-5	2-Nitrophenol	< 212		µg/kg dry	212	35.2	1	"	"	"	"	"	
100-02-7	4-Nitrophenol	< 1680		µg/kg dry	1680	67.8	1	"	"	"	"	"	
62-75-9	N-Nitrosodimethylamine	< 212		µg/kg dry	212	39.4	1	"	"	"	"	"	
621-64-7	N-Nitrosodi-n-propylamine	< 212		µg/kg dry	212	41.4	1	"	"	"	"	"	
86-30-6	N-Nitrosodiphenylamine	< 420		µg/kg dry	420	45.5	1	"	"	"	"	"	
87-86-5	Pentachlorophenol	< 420		µg/kg dry	420	44.9	1	"	"	"	"	"	
85-01-8	Phenanthrene	**431**		µg/kg dry	84.8	39.5	1	"	"	"	"	"	
108-95-2	Phenol	< 420		µg/kg dry	420	27.6	1	"	"	"	"	"	
129-00-0	Pyrene	**396**		µg/kg dry	84.8	47.3	1	"	"	"	"	"	
110-86-1	Pyridine	< 420		µg/kg dry	420	62.6	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 420		µg/kg dry	420	41.6	1	"	"	"	"	"	
90-12-0	1-Methylnaphthalene	< 84.8		µg/kg dry	84.8	41.7	1	"	"	"	"	"	
95-95-4	2,4,5-Trichlorophenol	< 420		µg/kg dry	420	37.8	1	"	"	"	"	"	
88-06-2	2,4,6-Trichlorophenol	< 212		µg/kg dry	212	37.9	1	"	"	"	"	"	
82-68-8	Pentachloronitrobenzene	< 420		µg/kg dry	420	66.3	1	"	"	"	"	"	
95-94-3	1,2,4,5-Tetrachlorobenzene	< 420		µg/kg dry	420	40.7	1	"	"	"	"	"	
Surrogate recoveries:													
321-60-8	*2-Fluorobiphenyl*	*53*			*30-130 %*			"	"	"	"	"	
367-12-4	*2-Fluorophenol*	*58*			*30-130 %*			"	"	"	"	"	
4165-60-0	*Nitrobenzene-d5*	*63*			*30-130 %*			"	"	"	"	"	
4165-62-2	*Phenol-d5*	*64*			*30-130 %*			"	"	"	"	"	
1718-51-0	*Terphenyl-dl4*	*69*			*30-130 %*			"	"	"	"	"	
118-79-6	*2,4,6-Tribromophenol*	*42*			*30-130 %*			"	"	"	"	"	
Pesticides													
Organochlorine Pesticides Prepared by method SW846 3546													
319-84-6	alpha-BHC	< 6.31		µg/kg dry	6.31	1.11	1	SW846 8081B	29-Aug-17	01-Sep-17	SM	1714757	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP4 SC38320-03	01.0173025.00	Soil	21-Aug-17 10:30	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Pesticides													
Organochlorine Pesticides													
319-85-7	beta-BHC	< 6.31		µg/kg dry	6.31	1.37	1	SW846 8081B	29-Aug-17	01-Sep-17	SM	1714757	
319-86-8	delta-BHC	< 6.31		µg/kg dry	6.31	1.26	1	"	"	"	"	"	
58-89-9	gamma-BHC (Lindane)	< 3.78		µg/kg dry	3.78	1.07	1	"	"	"	"	"	
76-44-8	Heptachlor	< 6.31		µg/kg dry	6.31	1.19	1	"	"	"	"	"	
309-00-2	Aldrin	< 6.31		µg/kg dry	6.31	1.20	1	"	"	"	"	"	
1024-57-3	Heptachlor epoxide	< 6.31		µg/kg dry	6.31	1.36	1	"	"	"	"	"	
959-98-8	Endosulfan I	< 6.31		µg/kg dry	6.31	1.52	1	"	"	"	"	"	
60-57-1	Dieldrin	< 6.31		µg/kg dry	6.31	1.54	1	"	"	"	"	"	
72-55-9	4,4'-DDE (p,p')	< 6.31		µg/kg dry	6.31	1.50	1	"	"	"	"	"	
72-20-8	Endrin	< 10.1		µg/kg dry	10.1	2.02	1	"	"	"	"	"	
33213-65-9	Endosulfan II	< 10.1		µg/kg dry	10.1	2.08	1	"	"	"	"	"	
72-54-8	4,4'-DDD (p,p')	< 10.1		µg/kg dry	10.1	1.79	1	"	"	"	"	"	
1031-07-8	Endosulfan sulfate	< 10.1		µg/kg dry	10.1	1.90	1	"	"	"	"	"	
50-29-3	4,4'-DDT (p,p')	< 10.1		µg/kg dry	10.1	1.94	1	"	"	"	"	"	
72-43-5	Methoxychlor	< 10.1		µg/kg dry	10.1	2.24	1	"	"	"	"	"	
53494-70-5	Endrin ketone	< 10.1		µg/kg dry	10.1	1.72	1	"	"	"	"	"	
7421-93-4	Endrin aldehyde	< 10.1		µg/kg dry	10.1	2.02	1	"	"	"	"	"	
5103-71-9	alpha-Chlordane	< 6.31		µg/kg dry	6.31	1.42	1	"	"	"	"	"	
5103-74-2	Chlordane (gamma)(trans)	< 6.31		µg/kg dry	6.31	1.40	1	"	"	"	"	"	
8001-35-2	Toxaphene	< 126		µg/kg dry	126	15.8	1	"	"	"	"	"	
57-74-9	Chlordane	< 25.2		µg/kg dry	25.2	23.8	1	"	"	"	"	"	
15972-60-8	Alachlor	< 6.31		µg/kg dry	6.31	3.09	1	"	"	"	"	"	
Surrogate recoveries:													
10386-84-2	*4,4-DB-Octafluorobiphenyl (Sr)*	*103*			*30-150 %*			"	"	"	"	"	
10386-84-2	*4,4-DB-Octafluorobiphenyl (Sr) [2C]*	*107*			*30-150 %*			"	"	"	"	"	
2051-24-3	*Decachlorobiphenyl (Sr)*	*150*			*30-150 %*			"	"	"	"	"	
2051-24-3	*Decachlorobiphenyl (Sr) [2C]*	*119*			*30-150 %*			"	"	"	"	"	
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													
	C9-C18 Aliphatic Hydrocarbons	< 12.6		mg/kg dry	12.6	1.76	1	MADEP EPH 5/2004 R	29-Aug-17	31-Aug-17	EDT	1714758	
	C19-C36 Aliphatic Hydrocarbons	< 12.6		mg/kg dry	12.6	1.78	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	< 12.6		mg/kg dry	12.6	6.03	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	**12.7**		mg/kg dry	12.6	6.03	1	"	"	"	"	"	
91-20-3	Naphthalene	< 0.421		mg/kg dry	0.421	0.374	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 0.421		mg/kg dry	0.421	0.362	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.421		mg/kg dry	0.421	0.167	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.421		mg/kg dry	0.421	0.417	1	"	"	"	"	"	
86-73-7	Fluorene	< 0.421		mg/kg dry	0.421	0.378	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 0.421		mg/kg dry	0.421	0.364	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.421		mg/kg dry	0.421	0.362	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP4 SC38320-03	01.0173025.00	Soil	21-Aug-17 10:30	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
MADEP EPH													
206-44-0	Fluoranthene	< 0.421		mg/kg dry	0.421	0.159	1	MADEP EPH 5/2004 R	29-Aug-17	31-Aug-17	EDT	1714758	
129-00-0	Pyrene	< 0.421		mg/kg dry	0.421	0.162	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.421		mg/kg dry	0.421	0.400	1	"	"	"	"	"	
218-01-9	Chrysene	< 0.421		mg/kg dry	0.421	0.398	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.421		mg/kg dry	0.421	0.346	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.421		mg/kg dry	0.421	0.221	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.421		mg/kg dry	0.421	0.377	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.421		mg/kg dry	0.421	0.281	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.421		mg/kg dry	0.421	0.269	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.421		mg/kg dry	0.421	0.276	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*51*			*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*78*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*95*			*40-140 %*			"	"	"	"	"	
Fingerprinting by GC													
8006-61-9	Gasoline	< 33.4		mg/kg dry	33.4		1	SW846 8100Mod.	"	30-Aug-17	DJS	1714755	
68476-30-2	Fuel Oil #2	< 33.4		mg/kg dry	33.4	23.7	1	"	"	"	"	"	
68476-31-3	Fuel Oil #4	< 33.4		mg/kg dry	33.4		1	"	"	"	"	"	
68553-00-4	Fuel Oil #6	< 33.4		mg/kg dry	33.4		1	"	"	"	"	"	
M09800000	Motor Oil	< 33.4		mg/kg dry	33.4		1	"	"	"	"	"	
8032-32-4	Ligroin	< 33.4		mg/kg dry	33.4		1	"	"	"	"	"	
J00100000	Aviation Fuel	< 33.4		mg/kg dry	33.4		1	"	"	"	"	"	
	Hydraulic Oil	< 33.4		mg/kg dry	33.4		1	"	"	"	"	"	
	Dielectric Fluid	< 33.4		mg/kg dry	33.4		1	"	"	"	"	"	
	Unidentified	**58.1**		mg/kg dry	33.4		1	"	"	"	"	"	
	Other Oil	< 33.4	*TPH	mg/kg dry	33.4		1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	**58.1**		mg/kg dry	33.4		1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*121*			*40-140 %*			"	"	"	"	"	
Total Metals by EPA 6000/7000 Series Methods													
Prepared by method SW846 3051A													
7440-38-2	Arsenic	**2.39**		mg/kg dry	1.79	0.226	1	SW846 6010C	24-Aug-17	25-Aug-17	TBC	1714358	
7440-43-9	Cadmium	< 0.595		mg/kg dry	0.595	0.0308	1	"	"	"	"	"	
7440-47-3	Chromium	**6.56**		mg/kg dry	1.19	0.158	1	"	"	"	"	"	
7440-50-8	Copper	**5.92**		mg/kg dry	1.19	0.286	1	"	"	"	"	"	
7439-97-6	Mercury	< 0.0351		mg/kg dry	0.0351	0.0097	1	SW846 7471B	"	25-Aug-17	LNB	1714359	
Prepared by method SW846 3051A													
7440-02-0	Nickel	**6.12**		mg/kg dry	1.19	0.137	1	SW846 6010C	"	25-Aug-17	TBC	1714358	
7439-92-1	Lead	**6.60**		mg/kg dry	1.79	0.252	1	"	"	"	"	"	
7440-66-6	Zinc	**57.5**		mg/kg dry	1.19	0.922	1	"	"	29-Aug-17	"	"	
General Chemistry Parameters													
	% Solids	**78.4**		%			1	SM2540 G (11) Mod.	22-Aug-17	22-Aug-17	BD	1714386	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRP4 SC38320-03	01.0173025.00	Soil	21-Aug-17 10:30	21-Aug-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
General Chemistry Parameters													
	Specific Conductance (EC)	**174**		uS/cm	10.0	10.0	1	SM22 2510B	23-Aug-17	23-Aug-17	BD	1714384	
Prepared by method General Preparation SVOC													
	Moisture	**21.6**		%			1	SM2540 G (11) Mod. calculation	22-Aug-17	22-Aug-17	BD	1714390	
Toxicity Characteristics													
	Fractional % Sieve #4 (>4750µm)	**7.82**		% Retained			1	ASTM D422	24-Aug-17	01-Sep-17	BD	1714539	
Reactivity Cyanide/Sulfide													
	Reactivity	**See Narrative**		mg/kg dry			1	SW846 Ch. 7.3	22-Aug-17	22-Aug-17	TN	1714405	
57-12-5	Reactive Cyanide	< 24.4		mg/kg dry	24.4	24.4	1	"	"	"	"	"	
18496-25-8	Reactive Sulfide	< 48.7		mg/kg dry	48.7	48.7	1	"	"	"	"	"	
Subcontracted Analyses													
Subcontracted Analyses													
Prepared by method 398809-										Methylation date: 22-Aug-17			
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
93-76-5	2,4,5-T	< 100		ug/Kg	100	100	10	SW8151A	22-Aug-17	23-Aug-17 19:06	M-CT0	398809A	
93-72-1	2,4,5-TP (Silvex)	< 100		ug/Kg	100	100	10	"	"	"	"	"	
94-75-7	2,4-D	< 200		ug/Kg	200	200	10	"	"	"	"	"	
94-82-6	2,4-DB	< 1000		ug/Kg	1000	1000	10	"	"	"	"	"	
75-99-0	Dalapon	< 100		ug/Kg	100	100	10	"	"	"	"	"	
1918-00-9	Dicamba	< 100		ug/Kg	100	100	10	"	"	"	"	"	
120-36-5	Dichloroprop	< 150		ug/Kg	150	150	10	"	"	"	"	"	
88-85-7	Dinoseb	< 100		ug/Kg	100	100	10	"	"	"	"	"	
94-74-6	MCPA	< 30000		ug/Kg	30000	30000	10	"	"	"	"	"	
7085-19-0	MCPP	< 30000		ug/Kg	30000	30000	10	"	"	"	"	"	
Surrogate recoveries:													
19719-28-9	*% DCAA*	*56*			*30-150 %*			"	"	"	"	"	
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Percent Solid	**82**		%			1	SW846-%Solid		22-Aug-17 19:18	M-CT0	'[none]'	
Prepared by method 398998-SW9060A/													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Tot.Org.Carbon	**3,800**		mg/kg	100	100	1	SW9060A/L. Kahn	"	23-Aug-17 17:55	M-CT0	398998A	

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1714362 - SW846 5035A Soil (low level)										
Blank (1714362-BLK1)					Prepared & Analyzed: 22-Aug-17					
1,1,2-Trichlorotrifluoroethane (Freon 113)	< 5.00		µg/kg wet	5.00						
Acetone	< 50.0		µg/kg wet	50.0						
Acrylonitrile	< 5.00		µg/kg wet	5.00						
Benzene	< 5.00		µg/kg wet	5.00						
Bromobenzene	< 5.00		µg/kg wet	5.00						
Bromochloromethane	< 5.00		µg/kg wet	5.00						
Bromodichloromethane	< 5.00		µg/kg wet	5.00						
Bromoform	< 5.00		µg/kg wet	5.00						
Bromomethane	< 10.0		µg/kg wet	10.0						
2-Butanone (MEK)	< 10.0		µg/kg wet	10.0						
n-Butylbenzene	< 5.00		µg/kg wet	5.00						
sec-Butylbenzene	< 5.00		µg/kg wet	5.00						
tert-Butylbenzene	< 5.00		µg/kg wet	5.00						
Carbon disulfide	< 10.0		µg/kg wet	10.0						
Carbon tetrachloride	< 5.00		µg/kg wet	5.00						
Chlorobenzene	< 5.00		µg/kg wet	5.00						
Chloroethane	< 10.0		µg/kg wet	10.0						
Chloroform	< 5.00		µg/kg wet	5.00						
Chloromethane	< 10.0		µg/kg wet	10.0						
2-Chlorotoluene	< 5.00		µg/kg wet	5.00						
4-Chlorotoluene	< 5.00		µg/kg wet	5.00						
1,2-Dibromo-3-chloropropane	< 10.0		µg/kg wet	10.0						
Dibromochloromethane	< 5.00		µg/kg wet	5.00						
1,2-Dibromoethane (EDB)	< 5.00		µg/kg wet	5.00						
Dibromomethane	< 5.00		µg/kg wet	5.00						
1,2-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
1,3-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
1,4-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
Dichlorodifluoromethane (Freon12)	< 10.0		µg/kg wet	10.0						
1,1-Dichloroethane	< 5.00		µg/kg wet	5.00						
1,2-Dichloroethane	< 5.00		µg/kg wet	5.00						
1,1-Dichloroethene	< 5.00		µg/kg wet	5.00						
cis-1,2-Dichloroethene	< 5.00		µg/kg wet	5.00						
trans-1,2-Dichloroethene	< 5.00		µg/kg wet	5.00						
1,2-Dichloropropane	< 5.00		µg/kg wet	5.00						
1,3-Dichloropropane	< 5.00		µg/kg wet	5.00						
2,2-Dichloropropane	< 5.00		µg/kg wet	5.00						
1,1-Dichloropropene	< 5.00		µg/kg wet	5.00						
cis-1,3-Dichloropropene	< 5.00		µg/kg wet	5.00						
trans-1,3-Dichloropropene	< 5.00		µg/kg wet	5.00						
Ethylbenzene	< 5.00		µg/kg wet	5.00						
Hexachlorobutadiene	< 5.00		µg/kg wet	5.00						
2-Hexanone (MBK)	< 10.0		µg/kg wet	10.0						
Isopropylbenzene	< 5.00		µg/kg wet	5.00						
4-Isopropyltoluene	< 5.00		µg/kg wet	5.00						
Methyl tert-butyl ether	< 5.00		µg/kg wet	5.00						
4-Methyl-2-pentanone (MIBK)	< 10.0		µg/kg wet	10.0						
Methylene chloride	< 10.0		µg/kg wet	10.0						
Naphthalene	< 5.00		µg/kg wet	5.00						
n-Propylbenzene	< 5.00		µg/kg wet	5.00						

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1714362 - SW846 5035A Soil (low level)										
Blank (1714362-BLK1)					Prepared & Analyzed: 22-Aug-17					
Styrene	< 5.00		µg/kg wet	5.00						
1,1,1,2-Tetrachloroethane	< 5.00		µg/kg wet	5.00						
1,1,2,2-Tetrachloroethane	< 5.00		µg/kg wet	5.00						
Tetrachloroethene	< 5.00		µg/kg wet	5.00						
Toluene	< 5.00		µg/kg wet	5.00						
1,2,3-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,2,4-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,3,5-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,1,1-Trichloroethane	< 5.00		µg/kg wet	5.00						
1,1,2-Trichloroethane	< 5.00		µg/kg wet	5.00						
Trichloroethene	< 5.00		µg/kg wet	5.00						
Trichlorofluoromethane (Freon 11)	< 5.00		µg/kg wet	5.00						
1,2,3-Trichloropropane	< 5.00		µg/kg wet	5.00						
1,2,4-Trimethylbenzene	< 5.00		µg/kg wet	5.00						
1,3,5-Trimethylbenzene	< 5.00		µg/kg wet	5.00						
Vinyl chloride	< 5.00		µg/kg wet	5.00						
m,p-Xylene	< 10.0		µg/kg wet	10.0						
o-Xylene	< 5.00		µg/kg wet	5.00						
Tetrahydrofuran	< 10.0		µg/kg wet	10.0						
Ethyl ether	< 5.00		µg/kg wet	5.00						
Tert-amyl methyl ether	< 5.00		µg/kg wet	5.00						
Ethyl tert-butyl ether	< 5.00		µg/kg wet	5.00						
Di-isopropyl ether	< 5.00		µg/kg wet	5.00						
Tert-Butanol / butyl alcohol	< 50.0		µg/kg wet	50.0						
1,4-Dioxane	< 100		µg/kg wet	100						
trans-1,4-Dichloro-2-butene	< 25.0		µg/kg wet	25.0						
Ethanol	< 1000		µg/kg wet	1000						
Surrogate: 4-Bromofluorobenzene	*44.6*		µg/kg		*50.0*		*89*	*70-130*		
Surrogate: Toluene-d8	*51.5*		µg/kg		*50.0*		*103*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*64.0*		µg/kg		*50.0*		*128*	*70-130*		
Surrogate: Dibromofluoromethane	*56.2*		µg/kg		*50.0*		*112*	*70-130*		
LCS (1714362-BS1)					Prepared & Analyzed: 22-Aug-17					
1,1,2-Trichlorotrifluoroethane (Freon 113)	**20.2**		µg/kg		20.0		101	70-130		
Acetone	**23.1**		µg/kg		20.0		115	70-130		
Acrylonitrile	**19.7**		µg/kg		20.0		98	70-130		
Benzene	**20.1**		µg/kg		20.0		100	70-130		
Bromobenzene	**19.3**		µg/kg		20.0		97	70-130		
Bromochloromethane	**19.8**		µg/kg		20.0		99	70-130		
Bromodichloromethane	**20.0**		µg/kg		20.0		100	70-130		
Bromoform	**18.1**		µg/kg		20.0		90	70-130		
Bromomethane	**21.9**		µg/kg		20.0		109	70-130		
2-Butanone (MEK)	**16.8**		µg/kg		20.0		84	70-130		
n-Butylbenzene	**19.7**		µg/kg		20.0		99	70-130		
sec-Butylbenzene	**21.4**		µg/kg		20.0		107	70-130		
tert-Butylbenzene	**19.4**		µg/kg		20.0		97	70-130		
Carbon disulfide	**20.4**		µg/kg		20.0		102	70-130		
Carbon tetrachloride	**21.8**		µg/kg		20.0		109	70-130		
Chlorobenzene	**19.4**		µg/kg		20.0		97	70-130		
Chloroethane	**21.8**		µg/kg		20.0		109	70-130		
Chloroform	**20.0**		µg/kg		20.0		100	70-130		

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1714362 - SW846 5035A Soil (low level)										
LCS (1714362-BS1)						Prepared & Analyzed: 22-Aug-17				
Chloromethane	**19.7**		µg/kg		20.0		99	70-130		
2-Chlorotoluene	**15.2**		µg/kg		20.0		76	70-130		
4-Chlorotoluene	**21.0**		µg/kg		20.0		105	70-130		
1,2-Dibromo-3-chloropropane	**18.6**		µg/kg		20.0		93	70-130		
Dibromochloromethane	**18.9**		µg/kg		20.0		95	70-130		
1,2-Dibromoethane (EDB)	**19.8**		µg/kg		20.0		99	70-130		
Dibromomethane	**20.5**		µg/kg		20.0		103	70-130		
1,2-Dichlorobenzene	**19.0**		µg/kg		20.0		95	70-130		
1,3-Dichlorobenzene	**21.3**		µg/kg		20.0		107	70-130		
1,4-Dichlorobenzene	**19.6**		µg/kg		20.0		98	70-130		
Dichlorodifluoromethane (Freon12)	**18.3**		µg/kg		20.0		92	70-130		
1,1-Dichloroethane	**19.6**		µg/kg		20.0		98	70-130		
1,2-Dichloroethane	**19.9**		µg/kg		20.0		99	70-130		
1,1-Dichloroethene	**19.4**		µg/kg		20.0		97	70-130		
cis-1,2-Dichloroethene	**20.1**		µg/kg		20.0		100	70-130		
trans-1,2-Dichloroethene	**18.7**		µg/kg		20.0		94	70-130		
1,2-Dichloropropane	**18.9**		µg/kg		20.0		94	70-130		
1,3-Dichloropropane	**19.5**		µg/kg		20.0		97	70-130		
2,2-Dichloropropane	**19.3**		µg/kg		20.0		97	70-130		
1,1-Dichloropropene	**18.8**		µg/kg		20.0		94	70-130		
cis-1,3-Dichloropropene	**17.4**		µg/kg		20.0		87	70-130		
trans-1,3-Dichloropropene	**17.7**		µg/kg		20.0		88	70-130		
Ethylbenzene	**19.8**		µg/kg		20.0		99	70-130		
Hexachlorobutadiene	**19.8**		µg/kg		20.0		99	70-130		
2-Hexanone (MBK)	**16.3**		µg/kg		20.0		82	70-130		
Isopropylbenzene	**20.7**		µg/kg		20.0		103	70-130		
4-Isopropyltoluene	**19.8**		µg/kg		20.0		99	70-130		
Methyl tert-butyl ether	**18.0**		µg/kg		20.0		90	70-130		
4-Methyl-2-pentanone (MIBK)	**16.8**		µg/kg		20.0		84	70-130		
Methylene chloride	**18.9**		µg/kg		20.0		94	70-130		
Naphthalene	**15.2**		µg/kg		20.0		76	70-130		
n-Propylbenzene	**20.0**		µg/kg		20.0		100	70-130		
Styrene	**17.8**		µg/kg		20.0		89	70-130		
1,1,1,2-Tetrachloroethane	**19.6**		µg/kg		20.0		98	70-130		
1,1,2,2-Tetrachloroethane	**20.8**		µg/kg		20.0		104	70-130		
Tetrachloroethene	**19.8**		µg/kg		20.0		99	70-130		
Toluene	**19.1**		µg/kg		20.0		95	70-130		
1,2,3-Trichlorobenzene	**17.8**		µg/kg		20.0		89	70-130		
1,2,4-Trichlorobenzene	**17.6**		µg/kg		20.0		88	70-130		
1,3,5-Trichlorobenzene	**19.4**		µg/kg		20.0		97	70-130		
1,1,1-Trichloroethane	**20.6**		µg/kg		20.0		103	70-130		
1,1,2-Trichloroethane	**19.8**		µg/kg		20.0		99	70-130		
Trichloroethene	**19.8**		µg/kg		20.0		99	70-130		
Trichlorofluoromethane (Freon 11)	**24.1**		µg/kg		20.0		121	70-130		
1,2,3-Trichloropropane	**20.6**		µg/kg		20.0		103	70-130		
1,2,4-Trimethylbenzene	**19.3**		µg/kg		20.0		96	70-130		
1,3,5-Trimethylbenzene	**20.3**		µg/kg		20.0		101	70-130		
Vinyl chloride	**24.9**		µg/kg		20.0		125	70-130		
m,p-Xylene	**19.6**		µg/kg		20.0		98	70-130		
o-Xylene	**20.4**		µg/kg		20.0		102	70-130		

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1714362 - SW846 5035A Soil (low level)										
LCS (1714362-BS1)						Prepared & Analyzed: 22-Aug-17				
Tetrahydrofuran	**16.5**		µg/kg		20.0		83	70-130		
Ethyl ether	**20.4**		µg/kg		20.0		102	70-130		
Tert-amyl methyl ether	**20.2**		µg/kg		20.0		101	70-130		
Ethyl tert-butyl ether	**18.1**		µg/kg		20.0		91	70-130		
Di-isopropyl ether	**17.8**		µg/kg		20.0		89	70-130		
Tert-Butanol / butyl alcohol	**185**		µg/kg		200		92	70-130		
1,4-Dioxane	**172**		µg/kg		200		86	70-130		
trans-1,4-Dichloro-2-butene	**16.1**		µg/kg		20.0		81	70-130		
Ethanol	**422**		µg/kg		400		105	70-130		
Surrogate: 4-Bromofluorobenzene	*53.1*		µg/kg		*50.0*		*106*	*70-130*		
Surrogate: Toluene-d8	*50.9*		µg/kg		*50.0*		*102*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*53.4*		µg/kg		*50.0*		*107*	*70-130*		
Surrogate: Dibromofluoromethane	*52.2*		µg/kg		*50.0*		*104*	*70-130*		
LCS Dup (1714362-BSD1)						Prepared & Analyzed: 22-Aug-17				
1,1,2-Trichlorotrifluoroethane (Freon 113)	**20.9**		µg/kg		20.0		105	70-130	3	30
Acetone	**18.1**		µg/kg		20.0		90	70-130	24	30
Acrylonitrile	**21.3**		µg/kg		20.0		106	70-130	8	30
Benzene	**19.8**		µg/kg		20.0		99	70-130	1	30
Bromobenzene	**19.4**		µg/kg		20.0		97	70-130	0.6	30
Bromochloromethane	**20.4**		µg/kg		20.0		102	70-130	3	30
Bromodichloromethane	**19.9**		µg/kg		20.0		99	70-130	0.7	30
Bromoform	**17.9**		µg/kg		20.0		89	70-130	1	30
Bromomethane	**22.2**		µg/kg		20.0		111	70-130	1	30
2-Butanone (MEK)	**19.6**		µg/kg		20.0		98	70-130	16	30
n-Butylbenzene	**19.2**		µg/kg		20.0		96	70-130	3	30
sec-Butylbenzene	**20.9**		µg/kg		20.0		104	70-130	2	30
tert-Butylbenzene	**19.1**		µg/kg		20.0		96	70-130	1	30
Carbon disulfide	**21.4**		µg/kg		20.0		107	70-130	5	30
Carbon tetrachloride	**21.4**		µg/kg		20.0		107	70-130	2	30
Chlorobenzene	**19.2**		µg/kg		20.0		96	70-130	0.7	30
Chloroethane	**21.5**		µg/kg		20.0		108	70-130	1	30
Chloroform	**21.1**		µg/kg		20.0		105	70-130	5	30
Chloromethane	**18.6**		µg/kg		20.0		93	70-130	6	30
2-Chlorotoluene	**14.8**		µg/kg		20.0		74	70-130	3	30
4-Chlorotoluene	**20.6**		µg/kg		20.0		103	70-130	2	30
1,2-Dibromo-3-chloropropane	**18.8**		µg/kg		20.0		94	70-130	1	30
Dibromochloromethane	**18.6**		µg/kg		20.0		93	70-130	2	30
1,2-Dibromoethane (EDB)	**19.7**		µg/kg		20.0		98	70-130	0.4	30
Dibromomethane	**19.9**		µg/kg		20.0		100	70-130	3	30
1,2-Dichlorobenzene	**19.0**		µg/kg		20.0		95	70-130	0.2	30
1,3-Dichlorobenzene	**21.0**		µg/kg		20.0		105	70-130	2	30
1,4-Dichlorobenzene	**18.8**		µg/kg		20.0		94	70-130	4	30
Dichlorodifluoromethane (Freon12)	**17.8**		µg/kg		20.0		89	70-130	3	30
1,1-Dichloroethane	**21.0**		µg/kg		20.0		105	70-130	7	30
1,2-Dichloroethane	**20.1**		µg/kg		20.0		100	70-130	1	30
1,1-Dichloroethene	**20.3**		µg/kg		20.0		101	70-130	5	30
cis-1,2-Dichloroethene	**21.0**		µg/kg		20.0		105	70-130	5	30
trans-1,2-Dichloroethene	**20.2**		µg/kg		20.0		101	70-130	8	30
1,2-Dichloropropane	**19.0**		µg/kg		20.0		95	70-130	0.6	30
1,3-Dichloropropane	**19.5**		µg/kg		20.0		97	70-130	0.1	30

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1714362 - SW846 5035A Soil (low level)										
LCS Dup (1714362-BSD1)					Prepared & Analyzed: 22-Aug-17					
2,2-Dichloropropane	**19.7**		µg/kg		20.0		98	70-130	2	30
1,1-Dichloropropene	**18.8**		µg/kg		20.0		94	70-130	0.2	30
cis-1,3-Dichloropropene	**17.5**		µg/kg		20.0		88	70-130	0.6	30
trans-1,3-Dichloropropene	**17.6**		µg/kg		20.0		88	70-130	0.3	30
Ethylbenzene	**19.5**		µg/kg		20.0		97	70-130	2	30
Hexachlorobutadiene	**19.4**		µg/kg		20.0		97	70-130	2	30
2-Hexanone (MBK)	**16.5**		µg/kg		20.0		83	70-130	1	30
Isopropylbenzene	**20.3**		µg/kg		20.0		102	70-130	2	30
4-Isopropyltoluene	**19.4**		µg/kg		20.0		97	70-130	2	30
Methyl tert-butyl ether	**19.1**		µg/kg		20.0		96	70-130	6	30
4-Methyl-2-pentanone (MIBK)	**16.6**		µg/kg		20.0		83	70-130	0.9	30
Methylene chloride	**19.9**		µg/kg		20.0		100	70-130	5	30
Naphthalene	**15.4**		µg/kg		20.0		77	70-130	2	30
n-Propylbenzene	**19.6**		µg/kg		20.0		98	70-130	2	30
Styrene	**17.4**		µg/kg		20.0		87	70-130	2	30
1,1,1,2-Tetrachloroethane	**19.8**		µg/kg		20.0		99	70-130	1	30
1,1,2,2-Tetrachloroethane	**20.4**		µg/kg		20.0		102	70-130	2	30
Tetrachloroethene	**19.5**		µg/kg		20.0		98	70-130	2	30
Toluene	**18.8**		µg/kg		20.0		94	70-130	2	30
1,2,3-Trichlorobenzene	**17.9**		µg/kg		20.0		89	70-130	0.2	30
1,2,4-Trichlorobenzene	**17.6**		µg/kg		20.0		88	70-130	0.2	30
1,3,5-Trichlorobenzene	**19.2**		µg/kg		20.0		96	70-130	0.9	30
1,1,1-Trichloroethane	**20.4**		µg/kg		20.0		102	70-130	0.7	30
1,1,2-Trichloroethane	**19.6**		µg/kg		20.0		98	70-130	0.9	30
Trichloroethene	**19.9**		µg/kg		20.0		99	70-130	0.4	30
Trichlorofluoromethane (Freon 11)	**22.0**		µg/kg		20.0		110	70-130	9	30
1,2,3-Trichloropropane	**20.7**		µg/kg		20.0		103	70-130	0.6	30
1,2,4-Trimethylbenzene	**19.2**		µg/kg		20.0		96	70-130	0.2	30
1,3,5-Trimethylbenzene	**19.8**		µg/kg		20.0		99	70-130	2	30
Vinyl chloride	**23.8**		µg/kg		20.0		119	70-130	5	30
m,p-Xylene	**19.3**		µg/kg		20.0		97	70-130	1	30
o-Xylene	**20.0**		µg/kg		20.0		100	70-130	2	30
Tetrahydrofuran	**17.8**		µg/kg		20.0		89	70-130	7	30
Ethyl ether	**16.6**		µg/kg		20.0		83	70-130	20	30
Tert-amyl methyl ether	**19.8**		µg/kg		20.0		99	70-130	2	30
Ethyl tert-butyl ether	**19.2**		µg/kg		20.0		96	70-130	5	30
Di-isopropyl ether	**19.7**		µg/kg		20.0		98	70-130	10	30
Tert-Butanol / butyl alcohol	**198**		µg/kg		200		99	70-130	7	30
1,4-Dioxane	**157**		µg/kg		200		79	70-130	9	30
trans-1,4-Dichloro-2-butene	**17.0**		µg/kg		20.0		85	70-130	5	30
Ethanol	**419**		µg/kg		400		105	70-130	0.7	30
Surrogate: 4-Bromofluorobenzene	*53.2*		µg/kg		*50.0*		*106*	*70-130*		
Surrogate: Toluene-d8	*51.2*		µg/kg		*50.0*		*102*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*53.3*		µg/kg		*50.0*		*107*	*70-130*		
Surrogate: Dibromofluoromethane	*54.2*		µg/kg		*50.0*		*108*	*70-130*		

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1714754 - SW846 3546										
Blank (1714754-BLK1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
Acenaphthene	< 66.3		µg/kg wet	66.3						
Acenaphthylene	< 66.3		µg/kg wet	66.3						
Aniline	< 328		µg/kg wet	328						
Anthracene	< 66.3		µg/kg wet	66.3						
Azobenzene/Diphenyldiazene	< 328		µg/kg wet	328						
Benzidine	< 328		µg/kg wet	328						
Benzo (a) anthracene	< 66.3		µg/kg wet	66.3						
Benzo (a) pyrene	< 66.3		µg/kg wet	66.3						
Benzo (b) fluoranthene	< 66.3		µg/kg wet	66.3						
Benzo (g,h,i) perylene	< 66.3		µg/kg wet	66.3						
Benzo (k) fluoranthene	< 66.3		µg/kg wet	66.3						
Benzoic acid	< 328		µg/kg wet	328						
Benzyl alcohol	< 328		µg/kg wet	328						
Bis(2-chloroethoxy)methane	< 328		µg/kg wet	328						
Bis(2-chloroethyl)ether	< 166		µg/kg wet	166						
Bis(2-chloroisopropyl)ether	< 166		µg/kg wet	166						
Bis(2-ethylhexyl)phthalate	< 166		µg/kg wet	166						
4-Bromophenyl phenyl ether	< 328		µg/kg wet	328						
Butyl benzyl phthalate	< 328		µg/kg wet	328						
Carbazole	< 166		µg/kg wet	166						
4-Chloro-3-methylphenol	< 328		µg/kg wet	328						
4-Chloroaniline	< 166		µg/kg wet	166						
2-Chloronaphthalene	< 328		µg/kg wet	328						
2-Chlorophenol	< 166		µg/kg wet	166						
4-Chlorophenyl phenyl ether	< 328		µg/kg wet	328						
Chrysene	< 66.3		µg/kg wet	66.3						
Dibenzo (a,h) anthracene	< 66.3		µg/kg wet	66.3						
Dibenzofuran	< 166		µg/kg wet	166						
1,2-Dichlorobenzene	< 328		µg/kg wet	328						
1,3-Dichlorobenzene	< 328		µg/kg wet	328						
1,4-Dichlorobenzene	< 328		µg/kg wet	328						
3,3´-Dichlorobenzidine	< 328		µg/kg wet	328						
2,4-Dichlorophenol	< 166		µg/kg wet	166						
Diethyl phthalate	< 328		µg/kg wet	328						
Dimethyl phthalate	< 328		µg/kg wet	328						
2,4-Dimethylphenol	< 328		µg/kg wet	328						
Di-n-butyl phthalate	< 328		µg/kg wet	328						
4,6-Dinitro-2-methylphenol	< 328		µg/kg wet	328						
2,4-Dinitrophenol	< 328		µg/kg wet	328						
2,4-Dinitrotoluene	< 166		µg/kg wet	166						
2,6-Dinitrotoluene	< 166		µg/kg wet	166						
Di-n-octyl phthalate	< 328		µg/kg wet	328						
Fluoranthene	< 66.3		µg/kg wet	66.3						
Fluorene	< 66.3		µg/kg wet	66.3						
Hexachlorobenzene	< 166		µg/kg wet	166						
Hexachlorobutadiene	< 166		µg/kg wet	166						
Hexachlorocyclopentadiene	< 166		µg/kg wet	166						
Hexachloroethane	< 166		µg/kg wet	166						
Indeno (1,2,3-cd) pyrene	< 66.3		µg/kg wet	66.3						
Isophorone	< 166		µg/kg wet	166						

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1714754 - SW846 3546										
Blank (1714754-BLK1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
2-Methylnaphthalene	< 66.3		µg/kg wet	66.3						
2-Methylphenol	< 328		µg/kg wet	328						
3 & 4-Methylphenol	< 328		µg/kg wet	328						
Naphthalene	< 66.3		µg/kg wet	66.3						
2-Nitroaniline	< 328		µg/kg wet	328						
3-Nitroaniline	< 328		µg/kg wet	328						
4-Nitroaniline	< 166		µg/kg wet	166						
Nitrobenzene	< 166		µg/kg wet	166						
2-Nitrophenol	< 166		µg/kg wet	166						
4-Nitrophenol	< 1310		µg/kg wet	1310						
N-Nitrosodimethylamine	< 166		µg/kg wet	166						
N-Nitrosodi-n-propylamine	< 166		µg/kg wet	166						
N-Nitrosodiphenylamine	< 328		µg/kg wet	328						
Pentachlorophenol	< 328		µg/kg wet	328						
Phenanthrene	< 66.3		µg/kg wet	66.3						
Phenol	< 328		µg/kg wet	328						
Pyrene	< 66.3		µg/kg wet	66.3						
Pyridine	< 328		µg/kg wet	328						
1,2,4-Trichlorobenzene	< 328		µg/kg wet	328						
1-Methylnaphthalene	< 66.3		µg/kg wet	66.3						
2,4,5-Trichlorophenol	< 328		µg/kg wet	328						
2,4,6-Trichlorophenol	< 166		µg/kg wet	166						
Pentachloronitrobenzene	< 328		µg/kg wet	328						
1,2,4,5-Tetrachlorobenzene	< 328		µg/kg wet	328						
Surrogate: 2-Fluorobiphenyl	*953*		µg/kg wet		*1660*		*57*	*30-130*		
Surrogate: 2-Fluorophenol	*883*		µg/kg wet		*1660*		*53*	*30-130*		
Surrogate: Nitrobenzene-d5	*948*		µg/kg wet		*1660*		*57*	*30-130*		
Surrogate: Phenol-d5	*1000*		µg/kg wet		*1660*		*61*	*30-130*		
Surrogate: Terphenyl-dl4	*1230*		µg/kg wet		*1660*		*74*	*30-130*		
Surrogate: 2,4,6-Tribromophenol	*901*		µg/kg wet		*1660*		*54*	*30-130*		
LCS (1714754-BS1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
Acenaphthene	**1050**		µg/kg wet	66.1	1650		64	40-140		
Acenaphthylene	**1060**		µg/kg wet	66.1	1650		64	40-140		
Aniline	**720**		µg/kg wet	327	1650		44	40-140		
Anthracene	**1210**		µg/kg wet	66.1	1650		74	40-140		
Azobenzene/Diphenyldiazene	**1020**		µg/kg wet	327	1650		62	40-140		
Benzidine	**574**	QC2	µg/kg wet	327	1650		35	40-140		
Benzo (a) anthracene	**1180**		µg/kg wet	66.1	1650		72	40-140		
Benzo (a) pyrene	**1220**		µg/kg wet	66.1	1650		74	40-140		
Benzo (b) fluoranthene	**1150**		µg/kg wet	66.1	1650		70	40-140		
Benzo (g,h,i) perylene	**1090**		µg/kg wet	66.1	1650		66	40-140		
Benzo (k) fluoranthene	**1220**		µg/kg wet	66.1	1650		74	40-140		
Benzoic acid	**253**	QC2	µg/kg wet	327	1650		15	30-130		
Benzyl alcohol	**1100**		µg/kg wet	327	1650		67	40-140		
Bis(2-chloroethoxy)methane	**882**		µg/kg wet	327	1650		53	40-140		
Bis(2-chloroethyl)ether	**865**		µg/kg wet	165	1650		52	40-140		
Bis(2-chloroisopropyl)ether	**673**		µg/kg wet	165	1650		41	40-140		
Bis(2-ethylhexyl)phthalate	**1050**		µg/kg wet	165	1650		64	40-140		
4-Bromophenyl phenyl ether	**1120**		µg/kg wet	327	1650		68	40-140		
Butyl benzyl phthalate	**1140**		µg/kg wet	327	1650		69	40-140		

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1714754 - SW846 3546										
LCS (1714754-BS1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
Carbazole	**1150**		µg/kg wet	165	1650		70	40-140		
4-Chloro-3-methylphenol	**1060**		µg/kg wet	327	1650		64	30-130		
4-Chloroaniline	**827**		µg/kg wet	165	1650		50	40-140		
2-Chloronaphthalene	**1310**		µg/kg wet	327	1650		80	40-140		
2-Chlorophenol	**1060**		µg/kg wet	165	1650		64	30-130		
4-Chlorophenyl phenyl ether	**1030**		µg/kg wet	327	1650		63	40-140		
Chrysene	**1170**		µg/kg wet	66.1	1650		71	40-140		
Dibenzo (a,h) anthracene	**1180**		µg/kg wet	66.1	1650		72	40-140		
Dibenzofuran	**1250**		µg/kg wet	165	1650		76	40-140		
1,2-Dichlorobenzene	**1260**		µg/kg wet	327	1650		76	40-140		
1,3-Dichlorobenzene	**1200**		µg/kg wet	327	1650		73	40-140		
1,4-Dichlorobenzene	**1230**		µg/kg wet	327	1650		74	40-140		
3,3´-Dichlorobenzidine	**1260**		µg/kg wet	327	1650		77	40-140		
2,4-Dichlorophenol	**1100**		µg/kg wet	165	1650		67	30-130		
Diethyl phthalate	**1080**		µg/kg wet	327	1650		65	40-140		
Dimethyl phthalate	**1060**		µg/kg wet	327	1650		64	40-140		
2,4-Dimethylphenol	**1030**		µg/kg wet	327	1650		62	30-130		
Di-n-butyl phthalate	**1200**		µg/kg wet	327	1650		73	40-140		
4,6-Dinitro-2-methylphenol	**1080**		µg/kg wet	327	1650		65	30-130		
2,4-Dinitrophenol	**494**		µg/kg wet	327	1650		30	30-130		
2,4-Dinitrotoluene	**1490**		µg/kg wet	165	1650		90	40-140		
2,6-Dinitrotoluene	**1360**		µg/kg wet	165	1650		82	40-140		
Di-n-octyl phthalate	**1070**		µg/kg wet	327	1650		65	40-140		
Fluoranthene	**1240**		µg/kg wet	66.1	1650		75	40-140		
Fluorene	**1070**		µg/kg wet	66.1	1650		65	40-140		
Hexachlorobenzene	**1430**		µg/kg wet	165	1650		87	40-140		
Hexachlorobutadiene	**1230**		µg/kg wet	165	1650		74	40-140		
Hexachlorocyclopentadiene	**1720**		µg/kg wet	165	1650		104	40-140		
Hexachloroethane	**1290**		µg/kg wet	165	1650		78	40-140		
Indeno (1,2,3-cd) pyrene	**1220**		µg/kg wet	66.1	1650		74	40-140		
Isophorone	**1000**		µg/kg wet	165	1650		61	40-140		
2-Methylnaphthalene	**1250**		µg/kg wet	66.1	1650		76	40-140		
2-Methylphenol	**1020**		µg/kg wet	327	1650		62	30-130		
3 & 4-Methylphenol	**1080**		µg/kg wet	327	1650		66	30-130		
Naphthalene	**1000**		µg/kg wet	66.1	1650		61	40-140		
2-Nitroaniline	**1120**		µg/kg wet	327	1650		68	40-140		
3-Nitroaniline	**979**		µg/kg wet	327	1650		59	40-140		
4-Nitroaniline	**1100**		µg/kg wet	165	1650		66	40-140		
Nitrobenzene	**1220**		µg/kg wet	165	1650		74	40-140		
2-Nitrophenol	**1140**		µg/kg wet	165	1650		69	30-130		
4-Nitrophenol	**1640**		µg/kg wet	1310	1650		99	30-130		
N-Nitrosodimethylamine	**977**		µg/kg wet	165	1650		59	40-140		
N-Nitrosodi-n-propylamine	**890**		µg/kg wet	165	1650		54	40-140		
N-Nitrosodiphenylamine	**1180**		µg/kg wet	327	1650		71	40-140		
Pentachlorophenol	**268**	QC2	µg/kg wet	327	1650		16	30-130		
Phenanthrene	**1130**		µg/kg wet	66.1	1650		68	40-140		
Phenol	**933**		µg/kg wet	327	1650		57	30-130		
Pyrene	**1200**		µg/kg wet	66.1	1650		73	40-140		
Pyridine	**832**		µg/kg wet	327	1650		50	40-140		
1,2,4-Trichlorobenzene	**1290**		µg/kg wet	327	1650		78	40-140		

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1714754 - SW846 3546										
LCS (1714754-BS1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
1-Methylnaphthalene	**1120**		µg/kg wet	66.1	1650		68	40-140		
2,4,5-Trichlorophenol	**1240**		µg/kg wet	327	1650		75	30-130		
2,4,6-Trichlorophenol	**1100**		µg/kg wet	165	1650		66	30-130		
Pentachloronitrobenzene	**1470**		µg/kg wet	327	1650		89	40-140		
1,2,4,5-Tetrachlorobenzene	**1120**		µg/kg wet	327	1650		68	40-140		
Surrogate: 2-Fluorobiphenyl	*1120*		µg/kg wet		*1650*		*68*	*30-130*		
Surrogate: 2-Fluorophenol	*993*		µg/kg wet		*1650*		*60*	*30-130*		
Surrogate: Nitrobenzene-d5	*1110*		µg/kg wet		*1650*		*67*	*30-130*		
Surrogate: Phenol-d5	*1090*		µg/kg wet		*1650*		*66*	*30-130*		
Surrogate: Terphenyl-dl4	*1370*		µg/kg wet		*1650*		*83*	*30-130*		
Surrogate: 2,4,6-Tribromophenol	*1410*		µg/kg wet		*1650*		*85*	*30-130*		
LCS Dup (1714754-BSD1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
Acenaphthene	**1060**		µg/kg wet	65.9	1650		64	40-140	0.6	30
Acenaphthylene	**1050**		µg/kg wet	65.9	1650		64	40-140	0.4	30
Aniline	**718**		µg/kg wet	326	1650		44	40-140	0.3	30
Anthracene	**1180**		µg/kg wet	65.9	1650		72	40-140	3	30
Azobenzene/Diphenyldiazene	**986**		µg/kg wet	326	1650		60	40-140	4	30
Benzidine	**574**	QC2	µg/kg wet	326	1650		35	40-140	0.009	30
Benzo (a) anthracene	**1170**		µg/kg wet	65.9	1650		71	40-140	0.6	30
Benzo (a) pyrene	**1200**		µg/kg wet	65.9	1650		73	40-140	1	30
Benzo (b) fluoranthene	**1170**		µg/kg wet	65.9	1650		71	40-140	1	30
Benzo (g,h,i) perylene	**1070**		µg/kg wet	65.9	1650		65	40-140	2	30
Benzo (k) fluoranthene	**1140**		µg/kg wet	65.9	1650		69	40-140	7	30
Benzoic acid	**236**	QC2	µg/kg wet	326	1650		14	30-130	7	30
Benzyl alcohol	**1060**		µg/kg wet	326	1650		65	40-140	4	30
Bis(2-chloroethoxy)methane	**875**		µg/kg wet	326	1650		53	40-140	0.7	30
Bis(2-chloroethyl)ether	**835**		µg/kg wet	165	1650		51	40-140	4	30
Bis(2-chloroisopropyl)ether	**674**		µg/kg wet	165	1650		41	40-140	0.1	30
Bis(2-ethylhexyl)phthalate	**1060**		µg/kg wet	165	1650		64	40-140	0.6	30
4-Bromophenyl phenyl ether	**1110**		µg/kg wet	326	1650		67	40-140	2	30
Butyl benzyl phthalate	**1180**		µg/kg wet	326	1650		72	40-140	3	30
Carbazole	**1130**		µg/kg wet	165	1650		69	40-140	2	30
4-Chloro-3-methylphenol	**1060**		µg/kg wet	326	1650		64	30-130	0.07	30
4-Chloroaniline	**815**		µg/kg wet	165	1650		50	40-140	2	30
2-Chloronaphthalene	**1290**		µg/kg wet	326	1650		78	40-140	2	30
2-Chlorophenol	**1050**		µg/kg wet	165	1650		64	30-130	0.8	30
4-Chlorophenyl phenyl ether	**997**		µg/kg wet	326	1650		61	40-140	3	30
Chrysene	**1170**		µg/kg wet	65.9	1650		71	40-140	0.1	30
Dibenzo (a,h) anthracene	**1170**		µg/kg wet	65.9	1650		71	40-140	1	30
Dibenzofuran	**1200**		µg/kg wet	165	1650		73	40-140	4	30
1,2-Dichlorobenzene	**1230**		µg/kg wet	326	1650		75	40-140	2	30
1,3-Dichlorobenzene	**1190**		µg/kg wet	326	1650		72	40-140	1	30
1,4-Dichlorobenzene	**1210**		µg/kg wet	326	1650		73	40-140	2	30
3,3´-Dichlorobenzidine	**1270**		µg/kg wet	326	1650		77	40-140	0.8	30
2,4-Dichlorophenol	**1110**		µg/kg wet	165	1650		67	30-130	0.9	30
Diethyl phthalate	**1030**		µg/kg wet	326	1650		63	40-140	4	30
Dimethyl phthalate	**1040**		µg/kg wet	326	1650		63	40-140	2	30
2,4-Dimethylphenol	**994**		µg/kg wet	326	1650		60	30-130	4	30
Di-n-butyl phthalate	**1230**		µg/kg wet	326	1650		75	40-140	2	30
4,6-Dinitro-2-methylphenol	**1010**		µg/kg wet	326	1650		61	30-130	7	30

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1714754 - SW846 3546										
LCS Dup (1714754-BSD1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
2,4-Dinitrophenol	**521**		µg/kg wet	326	1650		32	30-130	5	30
2,4-Dinitrotoluene	**1440**		µg/kg wet	165	1650		87	40-140	3	30
2,6-Dinitrotoluene	**1360**		µg/kg wet	165	1650		83	40-140	0.4	30
Di-n-octyl phthalate	**1050**		µg/kg wet	326	1650		64	40-140	2	30
Fluoranthene	**1160**		µg/kg wet	65.9	1650		70	40-140	7	30
Fluorene	**1020**		µg/kg wet	65.9	1650		62	40-140	4	30
Hexachlorobenzene	**1410**		µg/kg wet	165	1650		85	40-140	2	30
Hexachlorobutadiene	**1240**		µg/kg wet	165	1650		75	40-140	0.9	30
Hexachlorocyclopentadiene	**1680**		µg/kg wet	165	1650		102	40-140	2	30
Hexachloroethane	**1280**		µg/kg wet	165	1650		78	40-140	0.8	30
Indeno (1,2,3-cd) pyrene	**1190**		µg/kg wet	65.9	1650		73	40-140	2	30
Isophorone	**949**		µg/kg wet	165	1650		58	40-140	6	30
2-Methylnaphthalene	**1270**		µg/kg wet	65.9	1650		77	40-140	1	30
2-Methylphenol	**999**		µg/kg wet	326	1650		61	30-130	2	30
3 & 4-Methylphenol	**1060**		µg/kg wet	326	1650		64	30-130	2	30
Naphthalene	**998**		µg/kg wet	65.9	1650		61	40-140	0.6	30
2-Nitroaniline	**1170**		µg/kg wet	326	1650		71	40-140	4	30
3-Nitroaniline	**943**		µg/kg wet	326	1650		57	40-140	4	30
4-Nitroaniline	**1060**		µg/kg wet	165	1650		64	40-140	4	30
Nitrobenzene	**1170**		µg/kg wet	165	1650		71	40-140	4	30
2-Nitrophenol	**1130**		µg/kg wet	165	1650		69	30-130	0.9	30
4-Nitrophenol	**1450**		µg/kg wet	1300	1650		88	30-130	12	30
N-Nitrosodimethylamine	**958**		µg/kg wet	165	1650		58	40-140	2	30
N-Nitrosodi-n-propylamine	**884**		µg/kg wet	165	1650		54	40-140	0.8	30
N-Nitrosodiphenylamine	**1120**		µg/kg wet	326	1650		68	40-140	5	30
Pentachlorophenol	**184**	QC2, QR5	µg/kg wet	326	1650		11	30-130	37	30
Phenanthrene	**1100**		µg/kg wet	65.9	1650		67	40-140	2	30
Phenol	**955**		µg/kg wet	326	1650		58	30-130	2	30
Pyrene	**1210**		µg/kg wet	65.9	1650		74	40-140	0.5	30
Pyridine	**856**		µg/kg wet	326	1650		52	40-140	3	30
1,2,4-Trichlorobenzene	**1300**		µg/kg wet	326	1650		79	40-140	0.8	30
1-Methylnaphthalene	**1140**		µg/kg wet	65.9	1650		69	40-140	1	30
2,4,5-Trichlorophenol	**1190**		µg/kg wet	326	1650		72	30-130	4	30
2,4,6-Trichlorophenol	**1040**		µg/kg wet	165	1650		63	30-130	5	30
Pentachloronitrobenzene	**1430**		µg/kg wet	326	1650		87	40-140	3	30
1,2,4,5-Tetrachlorobenzene	**1080**		µg/kg wet	326	1650		66	40-140	3	30
Surrogate: 2-Fluorobiphenyl	*1070*		µg/kg wet		*1650*		*65*	*30-130*		
Surrogate: 2-Fluorophenol	*983*		µg/kg wet		*1650*		*60*	*30-130*		
Surrogate: Nitrobenzene-d5	*1070*		µg/kg wet		*1650*		*65*	*30-130*		
Surrogate: Phenol-d5	*1070*		µg/kg wet		*1650*		*65*	*30-130*		
Surrogate: Terphenyl-dl4	*1340*		µg/kg wet		*1650*		*82*	*30-130*		
Surrogate: 2,4,6-Tribromophenol	*1350*		µg/kg wet		*1650*		*82*	*30-130*		

Pesticides - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8081B										
Batch 1714757 - SW846 3546										
Blank (1714757-BLK1)					Prepared: 29-Aug-17 Analyzed: 01-Sep-17					
alpha-BHC	< 4.98		µg/kg wet	4.98						
alpha-BHC [2C]	< 4.98		µg/kg wet	4.98						
beta-BHC	< 4.98		µg/kg wet	4.98						
beta-BHC [2C]	< 4.98		µg/kg wet	4.98						
delta-BHC	< 4.98		µg/kg wet	4.98						
delta-BHC [2C]	< 4.98		µg/kg wet	4.98						
gamma-BHC (Lindane)	< 2.99		µg/kg wet	2.99						
gamma-BHC (Lindane) [2C]	< 2.99		µg/kg wet	2.99						
Heptachlor	< 4.98		µg/kg wet	4.98						
Heptachlor [2C]	< 4.98		µg/kg wet	4.98						
Aldrin	< 4.98		µg/kg wet	4.98						
Aldrin [2C]	< 4.98		µg/kg wet	4.98						
Heptachlor epoxide	< 4.98		µg/kg wet	4.98						
Heptachlor epoxide [2C]	< 4.98		µg/kg wet	4.98						
Endosulfan I	< 4.98		µg/kg wet	4.98						
Endosulfan I [2C]	< 4.98		µg/kg wet	4.98						
Dieldrin	< 4.98		µg/kg wet	4.98						
Dieldrin [2C]	< 4.98		µg/kg wet	4.98						
4,4'-DDE (p,p')	< 4.98		µg/kg wet	4.98						
4,4'-DDE (p,p') [2C]	< 4.98		µg/kg wet	4.98						
Endrin	< 7.96		µg/kg wet	7.96						
Endrin [2C]	< 7.96		µg/kg wet	7.96						
Endosulfan II	< 7.96		µg/kg wet	7.96						
Endosulfan II [2C]	< 7.96		µg/kg wet	7.96						
4,4'-DDD (p,p')	< 7.96		µg/kg wet	7.96						
4,4'-DDD (p,p') [2C]	< 7.96		µg/kg wet	7.96						
Endosulfan sulfate	< 7.96		µg/kg wet	7.96						
Endosulfan sulfate [2C]	< 7.96		µg/kg wet	7.96						
4,4'-DDT (p,p')	< 7.96		µg/kg wet	7.96						
4,4'-DDT (p,p') [2C]	< 7.96		µg/kg wet	7.96						
Methoxychlor	< 7.96		µg/kg wet	7.96						
Methoxychlor [2C]	< 7.96		µg/kg wet	7.96						
Endrin ketone	< 7.96		µg/kg wet	7.96						
Endrin ketone [2C]	< 7.96		µg/kg wet	7.96						
Endrin aldehyde	< 7.96		µg/kg wet	7.96						
Endrin aldehyde [2C]	< 7.96		µg/kg wet	7.96						
alpha-Chlordane	< 4.98		µg/kg wet	4.98						
alpha-Chlordane [2C]	< 4.98		µg/kg wet	4.98						
Chlordane (gamma)(trans)	< 4.98		µg/kg wet	4.98						
Chlordane (gamma)(trans) [2C]	< 4.98		µg/kg wet	4.98						
Toxaphene	< 99.5		µg/kg wet	99.5						
Toxaphene [2C]	< 99.5		µg/kg wet	99.5						
Chlordane	< 19.9		µg/kg wet	19.9						
Chlordane [2C]	< 19.9		µg/kg wet	19.9						
Alachlor	< 4.98		µg/kg wet	4.98						
Alachlor [2C]	< 4.98		µg/kg wet	4.98						
Surrogate: 4,4-DB-Octafluorobiphenyl (Sr)	*10.5*		µg/kg wet		*9.95*		*106*	*30-150*		
Surrogate: 4,4-DB-Octafluorobiphenyl (Sr) [2C]	*10.5*		µg/kg wet		*9.95*		*105*	*30-150*		
Surrogate: Decachlorobiphenyl (Sr)	*9.27*		µg/kg wet		*9.95*		*93*	*30-150*		

Pesticides - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8081B										
Batch 1714757 - SW846 3546										
Blank (1714757-BLK1)					Prepared: 29-Aug-17 Analyzed: 01-Sep-17					
Surrogate: Decachlorobiphenyl (Sr) [2C]	*6.86*		µg/kg wet		*9.95*		*69*	*30-150*		
LCS (1714757-BS1)					Prepared: 29-Aug-17 Analyzed: 01-Sep-17					
alpha-BHC	**26.7**		µg/kg wet	4.95	24.7		108	40-140		
alpha-BHC [2C]	**24.8**		µg/kg wet	4.95	24.7		100	40-140		
beta-BHC	**26.6**		µg/kg wet	4.95	24.7		108	40-140		
beta-BHC [2C]	**27.0**		µg/kg wet	4.95	24.7		109	40-140		
delta-BHC	**26.6**		µg/kg wet	4.95	24.7		108	40-140		
delta-BHC [2C]	**24.8**		µg/kg wet	4.95	24.7		100	40-140		
gamma-BHC (Lindane)	**27.5**		µg/kg wet	2.97	24.7		111	40-140		
gamma-BHC (Lindane) [2C]	**25.3**		µg/kg wet	2.97	24.7		102	40-140		
Heptachlor	**27.8**		µg/kg wet	4.95	24.7		112	40-140		
Heptachlor [2C]	**27.5**		µg/kg wet	4.95	24.7		111	40-140		
Aldrin	**26.4**		µg/kg wet	4.95	24.7		107	40-140		
Aldrin [2C]	**27.3**		µg/kg wet	4.95	24.7		110	40-140		
Heptachlor epoxide	**26.8**		µg/kg wet	4.95	24.7		108	40-140		
Heptachlor epoxide [2C]	**26.8**		µg/kg wet	4.95	24.7		108	40-140		
Endosulfan I	**28.1**		µg/kg wet	4.95	24.7		114	40-140		
Endosulfan I [2C]	**28.3**		µg/kg wet	4.95	24.7		114	40-140		
Dieldrin	**27.3**		µg/kg wet	4.95	24.7		110	40-140		
Dieldrin [2C]	**26.8**		µg/kg wet	4.95	24.7		108	40-140		
4,4'-DDE (p,p')	**27.3**		µg/kg wet	4.95	24.7		110	40-140		
4,4'-DDE (p,p') [2C]	**26.6**		µg/kg wet	4.95	24.7		108	40-140		
Endrin	**29.6**		µg/kg wet	7.91	24.7		120	40-140		
Endrin [2C]	**30.7**		µg/kg wet	7.91	24.7		124	40-140		
Endosulfan II	**26.5**		µg/kg wet	7.91	24.7		107	40-140		
Endosulfan II [2C]	**27.6**		µg/kg wet	7.91	24.7		111	40-140		
4,4'-DDD (p,p')	**27.0**		µg/kg wet	7.91	24.7		109	40-140		
4,4'-DDD (p,p') [2C]	**27.5**		µg/kg wet	7.91	24.7		111	40-140		
Endosulfan sulfate	**31.2**		µg/kg wet	7.91	24.7		126	40-140		
Endosulfan sulfate [2C]	**26.5**		µg/kg wet	7.91	24.7		107	40-140		
4,4'-DDT (p,p')	**26.0**		µg/kg wet	7.91	24.7		105	40-140		
4,4'-DDT (p,p') [2C]	**25.1**		µg/kg wet	7.91	24.7		101	40-140		
Methoxychlor	**30.4**		µg/kg wet	7.91	24.7		123	40-140		
Methoxychlor [2C]	**27.8**		µg/kg wet	7.91	24.7		112	40-140		
Endrin ketone	**27.3**		µg/kg wet	7.91	24.7		110	40-140		
Endrin ketone [2C]	**25.1**		µg/kg wet	7.91	24.7		101	40-140		
Endrin aldehyde	**27.5**		µg/kg wet	7.91	24.7		111	40-140		
Endrin aldehyde [2C]	**29.7**		µg/kg wet	7.91	24.7		120	40-140		
alpha-Chlordane	**27.7**		µg/kg wet	4.95	24.7		112	40-140		
alpha-Chlordane [2C]	**27.0**		µg/kg wet	4.95	24.7		109	40-140		
Chlordane (gamma)(trans)	**27.7**		µg/kg wet	4.95	24.7		112	40-140		
Chlordane (gamma)(trans) [2C]	**25.2**		µg/kg wet	4.95	24.7		102	40-140		
Alachlor	**28.1**		µg/kg wet	4.95	24.7		114	40-140		
Alachlor [2C]	**27.8**		µg/kg wet	4.95	24.7		112	40-140		
Surrogate: 4,4-DB-Octafluorobiphenyl (Sr)	*10.6*		µg/kg wet		*9.89*		*107*	*30-150*		
Surrogate: 4,4-DB-Octafluorobiphenyl (Sr) [2C]	*10.7*		µg/kg wet		*9.89*		*108*	*30-150*		
Surrogate: Decachlorobiphenyl (Sr)	*7.42*		µg/kg wet		*9.89*		*75*	*30-150*		
Surrogate: Decachlorobiphenyl (Sr) [2C]	*7.28*		µg/kg wet		*9.89*		*74*	*30-150*		
LCS Dup (1714757-BSD1)					Prepared: 29-Aug-17 Analyzed: 01-Sep-17					

Pesticides - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8081B										
Batch 1714757 - SW846 3546										
LCS Dup (1714757-BSD1)					Prepared: 29-Aug-17 Analyzed: 01-Sep-17					
alpha-BHC	**25.9**		µg/kg wet	4.98	24.9		104	40-140	3	30
alpha-BHC [2C]	**24.2**		µg/kg wet	4.98	24.9		97	40-140	2	30
beta-BHC	**25.7**		µg/kg wet	4.98	24.9		103	40-140	3	30
beta-BHC [2C]	**26.4**		µg/kg wet	4.98	24.9		106	40-140	2	30
delta-BHC	**25.5**		µg/kg wet	4.98	24.9		102	40-140	4	30
delta-BHC [2C]	**24.1**		µg/kg wet	4.98	24.9		97	40-140	3	30
gamma-BHC (Lindane)	**26.7**		µg/kg wet	2.99	24.9		107	40-140	3	30
gamma-BHC (Lindane) [2C]	**24.7**		µg/kg wet	2.99	24.9		99	40-140	2	30
Heptachlor	**27.3**		µg/kg wet	4.98	24.9		110	40-140	2	30
Heptachlor [2C]	**27.1**		µg/kg wet	4.98	24.9		109	40-140	2	30
Aldrin	**25.9**		µg/kg wet	4.98	24.9		104	40-140	2	30
Aldrin [2C]	**26.9**		µg/kg wet	4.98	24.9		108	40-140	2	30
Heptachlor epoxide	**26.0**		µg/kg wet	4.98	24.9		105	40-140	3	30
Heptachlor epoxide [2C]	**26.4**		µg/kg wet	4.98	24.9		106	40-140	1	30
Endosulfan I	**27.5**		µg/kg wet	4.98	24.9		110	40-140	2	30
Endosulfan I [2C]	**27.8**		µg/kg wet	4.98	24.9		112	40-140	2	30
Dieldrin	**26.5**		µg/kg wet	4.98	24.9		106	40-140	3	30
Dieldrin [2C]	**26.2**		µg/kg wet	4.98	24.9		105	40-140	2	30
4,4'-DDE (p,p')	**26.6**		µg/kg wet	4.98	24.9		107	40-140	3	30
4,4'-DDE (p,p') [2C]	**26.2**		µg/kg wet	4.98	24.9		105	40-140	2	30
Endrin	**29.1**		µg/kg wet	7.96	24.9		117	40-140	2	30
Endrin [2C]	**30.1**		µg/kg wet	7.96	24.9		121	40-140	2	30
Endosulfan II	**25.3**		µg/kg wet	7.96	24.9		102	40-140	5	30
Endosulfan II [2C]	**26.6**		µg/kg wet	7.96	24.9		107	40-140	3	30
4,4'-DDD (p,p')	**26.1**		µg/kg wet	7.96	24.9		105	40-140	4	30
4,4'-DDD (p,p') [2C]	**26.7**		µg/kg wet	7.96	24.9		107	40-140	3	30
Endosulfan sulfate	**29.1**		µg/kg wet	7.96	24.9		117	40-140	7	30
Endosulfan sulfate [2C]	**25.4**		µg/kg wet	7.96	24.9		102	40-140	4	30
4,4'-DDT (p,p')	**25.3**		µg/kg wet	7.96	24.9		102	40-140	3	30
4,4'-DDT (p,p') [2C]	**24.4**		µg/kg wet	7.96	24.9		98	40-140	3	30
Methoxychlor	**29.6**		µg/kg wet	7.96	24.9		119	40-140	3	30
Methoxychlor [2C]	**27.2**		µg/kg wet	7.96	24.9		109	40-140	2	30
Endrin ketone	**25.8**		µg/kg wet	7.96	24.9		104	40-140	6	30
Endrin ketone [2C]	**24.2**		µg/kg wet	7.96	24.9		97	40-140	4	30
Endrin aldehyde	**26.1**		µg/kg wet	7.96	24.9		105	40-140	5	30
Endrin aldehyde [2C]	**28.3**		µg/kg wet	7.96	24.9		114	40-140	5	30
alpha-Chlordane	**26.9**		µg/kg wet	4.98	24.9		108	40-140	3	30
alpha-Chlordane [2C]	**26.6**		µg/kg wet	4.98	24.9		107	40-140	2	30
Chlordane (gamma)(trans)	**26.9**		µg/kg wet	4.98	24.9		108	40-140	3	30
Chlordane (gamma)(trans) [2C]	**24.7**		µg/kg wet	4.98	24.9		99	40-140	2	30
Alachlor	**27.1**		µg/kg wet	4.98	24.9		109	40-140	4	30
Alachlor [2C]	**27.1**		µg/kg wet	4.98	24.9		109	40-140	3	30
Surrogate: 4,4-DB-Octafluorobiphenyl (Sr)	*10.4*		µg/kg wet		*9.95*		*104*	*30-150*		
Surrogate: 4,4-DB-Octafluorobiphenyl (Sr) [2C]	*10.4*		µg/kg wet		*9.95*		*104*	*30-150*		
Surrogate: Decachlorobiphenyl (Sr)	*8.01*		µg/kg wet		*9.95*		*80*	*30-150*		
Surrogate: Decachlorobiphenyl (Sr) [2C]	*7.59*		µg/kg wet		*9.95*		*76*	*30-150*		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1714758 - SW846 3546										
Blank (1714758-BLK1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
C9-C18 Aliphatic Hydrocarbons	< 9.92		mg/kg wet	9.92						
C19-C36 Aliphatic Hydrocarbons	< 9.92		mg/kg wet	9.92						
C11-C22 Aromatic Hydrocarbons	< 9.92		mg/kg wet	9.92						
Unadjusted C11-C22 Aromatic Hydrocarbons	< 9.92		mg/kg wet	9.92						
Total Petroleum Hydrocarbons	< 29.8		mg/kg wet	29.8						
Unadjusted Total Petroleum Hydrocarbons	< 29.8		mg/kg wet	29.8						
Naphthalene	< 0.330		mg/kg wet	0.330						
2-Methylnaphthalene	< 0.330		mg/kg wet	0.330						
Acenaphthylene	< 0.330		mg/kg wet	0.330						
Acenaphthene	< 0.330		mg/kg wet	0.330						
Fluorene	< 0.330		mg/kg wet	0.330						
Phenanthrene	< 0.330		mg/kg wet	0.330						
Anthracene	< 0.330		mg/kg wet	0.330						
Fluoranthene	< 0.330		mg/kg wet	0.330						
Pyrene	< 0.330		mg/kg wet	0.330						
Benzo (a) anthracene	< 0.330		mg/kg wet	0.330						
Chrysene	< 0.330		mg/kg wet	0.330						
Benzo (b) fluoranthene	< 0.330		mg/kg wet	0.330						
Benzo (k) fluoranthene	< 0.330		mg/kg wet	0.330						
Benzo (a) pyrene	< 0.330		mg/kg wet	0.330						
Indeno (1,2,3-cd) pyrene	< 0.330		mg/kg wet	0.330						
Dibenzo (a,h) anthracene	< 0.330		mg/kg wet	0.330						
Benzo (g,h,i) perylene	< 0.330		mg/kg wet	0.330						
n-Nonane (C9)	< 0.330		mg/kg wet	0.330						
n-Decane	< 0.330		mg/kg wet	0.330						
n-Dodecane	< 0.330		mg/kg wet	0.330						
n-Tetradecane	< 0.330		mg/kg wet	0.330						
n-Hexadecane	< 0.330		mg/kg wet	0.330						
n-Octadecane	< 0.330		mg/kg wet	0.330						
n-Nonadecane	< 0.330		mg/kg wet	0.330						
n-Eicosane	< 0.330		mg/kg wet	0.330						
n-Docosane	< 0.330		mg/kg wet	0.330						
n-Tetracosane	< 0.330		mg/kg wet	0.330						
n-Hexacosane	< 0.330		mg/kg wet	0.330						
n-Octacosane	< 0.330		mg/kg wet	0.330						
n-Triacontane	< 0.330		mg/kg wet	0.330						
n-Hexatriacontane	< 0.330		mg/kg wet	0.330						
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet							
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet							
Surrogate: 1-Chlorooctadecane	*3.31*		mg/kg wet		*3.31*		*100*	*40-140*		
Surrogate: Ortho-Terphenyl	*1.46*		mg/kg wet		*3.31*		*44*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.65*		mg/kg wet		*2.65*		*62*	*40-140*		
LCS (1714758-BS1)					Prepared: 29-Aug-17 Analyzed: 30-Aug-17					
C9-C18 Aliphatic Hydrocarbons	**20.5**		mg/kg wet	9.88	19.8		104	40-140		
C19-C36 Aliphatic Hydrocarbons	**10.9**		mg/kg wet	9.88	26.4		41	40-140		
Unadjusted C11-C22 Aromatic Hydrocarbons	**148**		mg/kg wet	9.88	179		83	40-140		
Naphthalene	**7.77**		mg/kg wet	0.329	10.5		74	40-140		
2-Methylnaphthalene	**7.83**		mg/kg wet	0.329	10.5		74	40-140		
Acenaphthylene	**7.78**		mg/kg wet	0.329	10.5		74	40-140		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1714758 - SW846 3546										
LCS (1714758-BS1)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
Acenaphthene	**7.55**		mg/kg wet	0.329	10.5		72	40-140		
Fluorene	**8.16**		mg/kg wet	0.329	10.5		77	40-140		
Phenanthrene	**8.66**		mg/kg wet	0.329	10.5		82	40-140		
Anthracene	**7.78**		mg/kg wet	0.329	10.5		74	40-140		
Fluoranthene	**9.06**		mg/kg wet	0.329	10.5		86	40-140		
Pyrene	**9.15**		mg/kg wet	0.329	10.5		87	40-140		
Benzo (a) anthracene	**9.71**		mg/kg wet	0.329	10.5		92	40-140		
Chrysene	**8.88**		mg/kg wet	0.329	10.5		84	40-140		
Benzo (b) fluoranthene	**9.96**		mg/kg wet	0.329	10.5		95	40-140		
Benzo (k) fluoranthene	**8.76**		mg/kg wet	0.329	10.5		83	40-140		
Benzo (a) pyrene	**9.19**		mg/kg wet	0.329	10.5		87	40-140		
Indeno (1,2,3-cd) pyrene	**10.4**		mg/kg wet	0.329	10.5		99	40-140		
Dibenzo (a,h) anthracene	**8.68**		mg/kg wet	0.329	10.5		82	40-140		
Benzo (g,h,i) perylene	**9.40**		mg/kg wet	0.329	10.5		89	40-140		
n-Nonane (C9)	**2.65**		mg/kg wet	0.329	3.29		80	30-140		
n-Decane	**2.78**		mg/kg wet	0.329	3.29		84	40-140		
n-Dodecane	**2.63**		mg/kg wet	0.329	3.29		80	40-140		
n-Tetradecane	**2.55**		mg/kg wet	0.329	3.29		78	40-140		
n-Hexadecane	**2.12**		mg/kg wet	0.329	3.29		64	40-140		
n-Octadecane	**1.43**		mg/kg wet	0.329	3.29		43	40-140		
n-Nonadecane	**1.47**		mg/kg wet	0.329	3.29		45	40-140		
n-Eicosane	**1.63**		mg/kg wet	0.329	3.29		49	40-140		
n-Docosane	**1.42**		mg/kg wet	0.329	3.29		43	40-140		
n-Tetracosane	**1.46**		mg/kg wet	0.329	3.29		44	40-140		
n-Hexacosane	**1.35**		mg/kg wet	0.329	3.29		41	40-140		
n-Octacosane	**1.69**		mg/kg wet	0.329	3.29		51	40-140		
n-Triacontane	**1.63**		mg/kg wet	0.329	3.29		50	40-140		
n-Hexatriacontane	**1.58**		mg/kg wet	0.329	3.29		48	40-140		
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet		10.5			0-200		
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet		10.5			0-200		
Surrogate: 1-Chlorooctadecane	*4.91*		mg/kg wet		*9.88*		*50*	*40-140*		
Surrogate: Ortho-Terphenyl	*10.4*		mg/kg wet		*9.88*		*105*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*8.80*		mg/kg wet		*7.91*		*111*	*40-140*		
LCS (1714758-BS2)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
C9-C18 Aliphatic Hydrocarbons	**13.6**		mg/kg wet	10.0	20.0		68	40-140		
C19-C36 Aliphatic Hydrocarbons	**17.6**		mg/kg wet	10.0	26.7		66	40-140		
Unadjusted C11-C22 Aromatic Hydrocarbons	**77.9**		mg/kg wet	10.0	90.7		86	40-140		
Naphthalene	**5.06**		mg/kg wet	0.333	5.33		95	40-140		
2-Methylnaphthalene	**4.98**		mg/kg wet	0.333	5.33		93	40-140		
Acenaphthylene	**4.81**		mg/kg wet	0.333	5.33		90	40-140		
Acenaphthene	**4.62**		mg/kg wet	0.333	5.33		87	40-140		
Fluorene	**4.73**		mg/kg wet	0.333	5.33		89	40-140		
Phenanthrene	**4.44**		mg/kg wet	0.333	5.33		83	40-140		
Anthracene	**4.21**		mg/kg wet	0.333	5.33		79	40-140		
Fluoranthene	**4.54**		mg/kg wet	0.333	5.33		85	40-140		
Pyrene	**4.61**		mg/kg wet	0.333	5.33		86	40-140		
Benzo (a) anthracene	**4.73**		mg/kg wet	0.333	5.33		89	40-140		
Chrysene	**4.30**		mg/kg wet	0.333	5.33		81	40-140		
Benzo (b) fluoranthene	**4.63**		mg/kg wet	0.333	5.33		87	40-140		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1714758 - SW846 3546										
LCS (1714758-BS2)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
Benzo (k) fluoranthene	**4.47**		mg/kg wet	0.333	5.33		84	40-140		
Benzo (a) pyrene	**4.60**		mg/kg wet	0.333	5.33		86	40-140		
Indeno (1,2,3-cd) pyrene	**4.71**		mg/kg wet	0.333	5.33		88	40-140		
Dibenzo (a,h) anthracene	**4.29**		mg/kg wet	0.333	5.33		80	40-140		
Benzo (g,h,i) perylene	**4.55**		mg/kg wet	0.333	5.33		85	40-140		
n-Nonane (C9)	**3.19**		mg/kg wet	0.333	3.33		96	30-140		
n-Decane	**3.27**		mg/kg wet	0.333	3.33		98	40-140		
n-Dodecane	**3.30**		mg/kg wet	0.333	3.33		99	40-140		
n-Tetradecane	**3.22**		mg/kg wet	0.333	3.33		97	40-140		
n-Hexadecane	**2.87**		mg/kg wet	0.333	3.33		86	40-140		
n-Octadecane	**2.11**		mg/kg wet	0.333	3.33		63	40-140		
n-Nonadecane	**1.70**		mg/kg wet	0.333	3.33		51	40-140		
n-Eicosane	**1.39**		mg/kg wet	0.333	3.33		42	40-140		
n-Docosane	**1.39**		mg/kg wet	0.333	3.33		42	40-140		
n-Tetracosane	**1.55**		mg/kg wet	0.333	3.33		46	40-140		
n-Hexacosane	**1.34**		mg/kg wet	0.333	3.33		40	40-140		
n-Octacosane	**1.55**		mg/kg wet	0.333	3.33		46	40-140		
n-Triacontane	**1.39**		mg/kg wet	0.333	3.33		42	40-140		
n-Hexatriacontane	**1.35**		mg/kg wet	0.333	3.33		41	40-140		
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet		5.33			0-200		
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet		5.33			0-200		
Surrogate: 1-Chlorooctadecane	*2.75*		mg/kg wet		*6.67*		*41*	*40-140*		
Surrogate: Ortho-Terphenyl	*5.41*		mg/kg wet		*6.67*		*81*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*5.55*		mg/kg wet		*5.33*		*104*	*40-140*		
LCS Dup (1714758-BSD1)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
C9-C18 Aliphatic Hydrocarbons	**13.7**	QR2	mg/kg wet	9.92	19.8		69	40-140	40	25
C19-C36 Aliphatic Hydrocarbons	**13.1**		mg/kg wet	9.92	26.4		50	40-140	18	25
Unadjusted C11-C22 Aromatic Hydrocarbons	**88.0**	QR2	mg/kg wet	9.92	89.9		98	40-140	51	25
Naphthalene	**5.27**	QR2	mg/kg wet	0.330	5.29		100	40-140	38	25
2-Methylnaphthalene	**5.18**	QR2	mg/kg wet	0.330	5.29		98	40-140	41	25
Acenaphthylene	**5.10**	QR2	mg/kg wet	0.330	5.29		96	40-140	42	25
Acenaphthene	**4.90**	QR2	mg/kg wet	0.330	5.29		93	40-140	43	25
Fluorene	**5.21**	QR2	mg/kg wet	0.330	5.29		99	40-140	44	25
Phenanthrene	**5.18**	QR2	mg/kg wet	0.330	5.29		98	40-140	50	25
Anthracene	**4.88**	QR2	mg/kg wet	0.330	5.29		92	40-140	46	25
Fluoranthene	**5.41**	QR2	mg/kg wet	0.330	5.29		102	40-140	50	25
Pyrene	**5.46**	QR2	mg/kg wet	0.330	5.29		103	40-140	50	25
Benzo (a) anthracene	**5.69**	QR2	mg/kg wet	0.330	5.29		108	40-140	52	25
Chrysene	**5.33**	QR2	mg/kg wet	0.330	5.29		101	40-140	50	25
Benzo (b) fluoranthene	**6.03**	QR2	mg/kg wet	0.330	5.29		114	40-140	49	25
Benzo (k) fluoranthene	**5.26**	QR2	mg/kg wet	0.330	5.29		99	40-140	50	25
Benzo (a) pyrene	**5.42**	QR2	mg/kg wet	0.330	5.29		102	40-140	52	25
Indeno (1,2,3-cd) pyrene	**5.57**	QR2	mg/kg wet	0.330	5.29		105	40-140	60	25
Dibenzo (a,h) anthracene	**5.06**	QR2	mg/kg wet	0.330	5.29		96	40-140	53	25
Benzo (g,h,i) perylene	**5.40**	QR2	mg/kg wet	0.330	5.29		102	40-140	54	25
n-Nonane (C9)	**2.48**		mg/kg wet	0.330	3.31		75	30-140	7	25
n-Decane	**2.64**		mg/kg wet	0.330	3.31		80	40-140	5	25
n-Dodecane	**2.49**		mg/kg wet	0.330	3.31		75	40-140	5	25
n-Tetradecane	**2.46**		mg/kg wet	0.330	3.31		74	40-140	4	25

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1714758 - SW846 3546										
LCS Dup (1714758-BSD1)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
n-Hexadecane	**2.39**		mg/kg wet	0.330	3.31		72	40-140	12	25
n-Octadecane	**2.30**	QR2	mg/kg wet	0.330	3.31		70	40-140	46	25
n-Nonadecane	**2.09**	QR2	mg/kg wet	0.330	3.31		63	40-140	35	25
n-Eicosane	**1.86**		mg/kg wet	0.330	3.31		56	40-140	13	25
n-Docosane	**1.34**		mg/kg wet	0.330	3.31		41	40-140	6	25
n-Tetracosane	**1.46**		mg/kg wet	0.330	3.31		44	40-140	0.2	25
n-Hexacosane	**1.43**		mg/kg wet	0.330	3.31		43	40-140	5	25
n-Octacosane	**1.45**		mg/kg wet	0.330	3.31		44	40-140	15	25
n-Triacontane	**1.43**		mg/kg wet	0.330	3.31		43	40-140	13	25
n-Hexatriacontane	**1.35**		mg/kg wet	0.330	3.31		41	40-140	15	25
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet		5.29			0-200		200
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet		5.29			0-200		200
Surrogate: 1-Chlorooctadecane	*2.77*		mg/kg wet		*6.61*		*42*	*40-140*		
Surrogate: Ortho-Terphenyl	*6.30*		mg/kg wet		*6.61*		*95*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*5.78*		mg/kg wet		*5.29*		*109*	*40-140*		
SW846 8100Mod.										
Batch 1714755 - SW846 3546										
Blank (1714755-BLK1)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
Gasoline	< 26.4		mg/kg wet	26.4						
Fuel Oil #2	< 26.4		mg/kg wet	26.4						
Fuel Oil #4	< 26.4		mg/kg wet	26.4						
Fuel Oil #6	< 26.4		mg/kg wet	26.4						
Motor Oil	< 26.4		mg/kg wet	26.4						
Ligroin	< 26.4		mg/kg wet	26.4						
Aviation Fuel	< 26.4		mg/kg wet	26.4						
Hydraulic Oil	< 26.4		mg/kg wet	26.4						
Dielectric Fluid	< 26.4		mg/kg wet	26.4						
Unidentified	< 26.4		mg/kg wet	26.4						
Other Oil	< 26.4		mg/kg wet	26.4						
Total Petroleum Hydrocarbons	< 26.4		mg/kg wet	26.4						
Surrogate: 1-Chlorooctadecane	*2.92*		mg/kg wet		*3.31*		*88*	*40-140*		
LCS (1714755-BS2)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
Fuel Oil #2	**149**		mg/kg wet	26.5	133		112	40-140		
Surrogate: 1-Chlorooctadecane	*2.96*		mg/kg wet		*3.33*		*89*	*40-140*		
LCS Dup (1714755-BSD2)						Prepared: 29-Aug-17 Analyzed: 30-Aug-17				
Fuel Oil #2	**153**		mg/kg wet	26.4	132		116	40-140	3	30
Surrogate: 1-Chlorooctadecane	*2.82*		mg/kg wet		*3.31*		*85*	*40-140*		

Total Metals by EPA 6000/7000 Series Methods - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 6010C										
Batch 1714358 - SW846 3051A										
Blank (1714358-BLK1)					Prepared: 24-Aug-17 Analyzed: 25-Aug-17					
Lead	< 1.39		mg/kg wet	1.39						
Zinc	< 0.925		mg/kg wet	0.925						
Arsenic	< 1.39		mg/kg wet	1.39						
Cadmium	< 0.463		mg/kg wet	0.463						
Chromium	< 0.925		mg/kg wet	0.925						
Copper	< 0.925		mg/kg wet	0.925						
Nickel	< 0.925		mg/kg wet	0.925						
Duplicate (1714358-DUP1)			**Source: SC38320-01**		Prepared: 24-Aug-17 Analyzed: 25-Aug-17					
Copper	**8.43**		mg/kg dry	1.10		8.50			0.9	20
Nickel	**6.44**		mg/kg dry	1.10		5.84			10	20
Chromium	**7.39**		mg/kg dry	1.10		6.44			14	20
Cadmium	**0.594**		mg/kg dry	0.548		0.513			15	20
Arsenic	**3.30**	QR6	mg/kg dry	1.64		2.45			29	20
Zinc	**25.4**		mg/kg dry	1.10		25.9			2	20
Lead	**8.76**		mg/kg dry	1.64		8.81			0.6	20
Matrix Spike (1714358-MS1)			**Source: SC38320-01**		Prepared: 24-Aug-17 Analyzed: 29-Aug-17					
Zinc	**152**		mg/kg dry	1.11	138	25.9	91	75-125		
Arsenic	**144**		mg/kg dry	1.66	138	2.45	103	75-125		
Cadmium	**147**		mg/kg dry	0.553	138	0.513	106	75-125		
Chromium	**149**		mg/kg dry	1.11	138	6.44	103	75-125		
Copper	**157**		mg/kg dry	1.11	138	8.50	107	75-125		
Nickel	**148**		mg/kg dry	1.11	138	5.84	103	75-125		
Lead	**144**		mg/kg dry	1.66	138	8.81	97	75-125		
Matrix Spike Dup (1714358-MSD1)			**Source: SC38320-01**		Prepared: 24-Aug-17 Analyzed: 25-Aug-17					
Copper	**155**		mg/kg dry	1.12	139	8.50	105	75-125	0.7	20
Zinc	**159**		mg/kg dry	1.12	139	25.9	96	75-125	5	20
Nickel	**148**		mg/kg dry	1.12	139	5.84	102	75-125	0.2	20
Chromium	**152**		mg/kg dry	1.12	139	6.44	104	75-125	2	20
Cadmium	**147**		mg/kg dry	0.558	139	0.513	105	75-125	0.1	20
Arsenic	**146**		mg/kg dry	1.67	139	2.45	103	75-125	1	20
Lead	**140**		mg/kg dry	1.67	139	8.81	94	75-125	3	20
Post Spike (1714358-PS1)			**Source: SC38320-01**		Prepared: 24-Aug-17 Analyzed: 25-Aug-17					
Copper	**149**		mg/kg dry	1.12	140	8.50	101	80-120		
Zinc	**156**		mg/kg dry	1.12	140	25.9	93	80-120		
Nickel	**147**		mg/kg dry	1.12	140	5.84	101	80-120		
Chromium	**148**		mg/kg dry	1.12	140	6.44	101	80-120		
Cadmium	**145**		mg/kg dry	0.559	140	0.513	104	80-120		
Arsenic	**144**		mg/kg dry	1.68	140	2.45	101	80-120		
Lead	**136**		mg/kg dry	1.68	140	8.81	91	80-120		
Reference (1714358-SRM1)					Prepared: 24-Aug-17 Analyzed: 25-Aug-17					
Arsenic	**14.7**		mg/kg wet	1.50	15.2		96	70.3-130.1		
Lead	**65.3**		mg/kg wet	1.50	71.5		91	82-117.3		
Nickel	**67.1**		mg/kg wet	1.00	66.4		101	82.9-117.1		
Copper	**79.0**		mg/kg wet	1.00	78.7		100	81.7-117.6		
Cadmium	**38.0**		mg/kg wet	0.500	36.8		103	83.1-116.9		
Zinc	**102**		mg/kg wet	1.00	115		89	83-117		

Total Metals by EPA 6000/7000 Series Methods - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 6010C										
Batch 1714358 - SW846 3051A										
Reference (1714358-SRM1)						Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Chromium	**51.0**		mg/kg wet	1.00	52.5		97	80.1-119.6		
Reference (1714358-SRM2)						Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Copper	**74.2**		mg/kg wet	1.00	77.3		96	81.7-117.6		
Lead	**62.8**		mg/kg wet	1.50	70.3		89	82-117.3		
Nickel	**63.8**		mg/kg wet	1.00	65.2		98	82.9-117.1		
Zinc	**98.0**		mg/kg wet	1.00	113		87	83-117		
Arsenic	**14.3**		mg/kg wet	1.50	15.0		96	70.3-130.1		
Cadmium	**37.5**		mg/kg wet	0.500	36.1		104	83.1-116.9		
Chromium	**49.1**		mg/kg wet	1.00	51.6		95	80.1-119.6		
SW846 7471B										
Batch 1714359 - EPA200/SW7000 Series										
Blank (1714359-BLK1)						Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Mercury	< 0.0266		mg/kg wet	0.0266						
Duplicate (1714359-DUP1)			**Source: SC38320-01**			Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Mercury	< 0.0345		mg/kg dry	0.0345		BRL				20
Matrix Spike (1714359-MS1)			**Source: SC38320-01**			Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Mercury	**0.258**		mg/kg dry	0.0316	0.219	BRL	118	75-125		
Matrix Spike Dup (1714359-MSD1)			**Source: SC38320-01**			Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Mercury	**0.276**		mg/kg dry	0.0341	0.237	BRL	116	75-125	7	20
Post Spike (1714359-PS1)			**Source: SC38320-01**			Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Mercury	**0.239**		mg/kg dry	0.0322	0.223	BRL	107	80-120		
Reference (1714359-SRM1)						Prepared: 24-Aug-17 Analyzed: 25-Aug-17				
Mercury	**2.44**	D	mg/kg wet	0.600	2.40		102	72.1-128.1		

General Chemistry Parameters - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SM22 2510B										
Batch 1714384 - General Preparation										
LCS (1714384-BS1)						Prepared & Analyzed: 23-Aug-17				
Specific Conductance (EC)	**1010**		uS/cm	10.0	997		101	95-105		
Duplicate (1714384-DUP1)			**Source: SC38320-01**			Prepared & Analyzed: 23-Aug-17				
Specific Conductance (EC)	**150**		uS/cm	10.0		150			0.4	5
MRL Check (1714384-MRL1)						Prepared & Analyzed: 23-Aug-17				
Specific Conductance (EC)	**10.4**		uS/cm	10.0	9.97		104	70-130		
Reference (1714384-SRM1)						Prepared & Analyzed: 23-Aug-17				
Specific Conductance (EC)	**101**		uS/cm	10.0	100		101	90-110		
SM2540 G (11) Mod.										
Batch 1714386 - General Preparation										
Duplicate (1714386-DUP2)			**Source: SC38320-01**			Prepared & Analyzed: 22-Aug-17				
% Solids	**86.6**		%			86.5			0.1	5
SM2540 G (11) Mod. calculation										
Batch 1714390 - General Preparation										
Duplicate (1714390-DUP1)			**Source: SC38320-01**			Prepared & Analyzed: 22-Aug-17				
Moisture	**13.4**		%			13.5			1	20

Toxicity Characteristics - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
ASTM D422										
Batch 1714539 - General Preparation										
Duplicate (1714539-DUP1)			**Source: SC38320-01**			Prepared: 24-Aug-17 Analyzed: 01-Sep-17				
Fractional % Sieve #4 (>4750µm)	**7.76**		% Retained			7.52			3	35
Fractional % Sieve #10 (4750-2000µm)	**20.5**		% Retained			19.9			3	35
Fractional % Sieve #20 (2000-850µm)	**18.4**		% Retained			18.3			0.4	35
Fractional % Sieve #40 (850-425µm)	**14.9**		% Retained			8.74			52	35
Fractional % Sieve #60 (425-250µm)	**14.4**		% Retained			20.8			37	35
Fractional % Sieve #100 (250-150µm)	**8.42**		% Retained			8.59			2	35
Fractional % Sieve #200 (150-75µm)	**8.09**		% Retained			8.32			3	35
Fractional % Sieve #230 (less than 75µm)	**7.53**		% Retained			7.75			3	35
SW846 Ch. 7.3										
Batch 1714405 - General Preparation										
Blank (1714405-BLK1)						Prepared & Analyzed: 22-Aug-17				
Reactivity	**See Narrative**		mg/kg wet							
Reactive Cyanide	< 25.0		mg/kg wet	25.0						
Reactive Sulfide	< 50.0		mg/kg wet	50.0						
Reference (1714405-SRM1)						Prepared & Analyzed: 22-Aug-17				
Reactive Cyanide	< 25.0		mg/kg wet	25.0	200		0	0-200		
Reference (1714405-SRM2)						Prepared & Analyzed: 22-Aug-17				
Reactive Sulfide	< 50.0		mg/kg wet	50.0	13400		0	0-200		

Subcontracted Analyses - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW8151A										
Batch 398809A - 398809-										
BLK (BY88203-BLK)						Prepared: 22-Aug-17 Analyzed: 23-Aug-17				
2,4-DB	< 1700		ug/Kg	1700				-		
MCPP	< 25000		ug/Kg	25000				-		
MCPA	< 25000		ug/Kg	25000				-		
Dinoseb	< 170		ug/Kg	170				-		
Dichloroprop	**ND**		ug/Kg	170				-		
Dalapon	< 83		ug/Kg	83				-		
2,4-D	< 170		ug/Kg	170				-		
2,4,5-TP (Silvex)	< 83		ug/Kg	83				-		
2,4,5-T	< 83		ug/Kg	83				-		
Dicamba	**ND**		ug/Kg	83				-		
Surrogate: % DCAA	*53*		ug/Kg		*1000*			*30-150*		
LCS (BY88203-LCS)						Prepared: 22-Aug-17 Analyzed: 23-Aug-17				
Dalapon	**62.87**		ug/Kg	83	100		63	40-140		30
Dicamba	**74.37**		ug/Kg	83	100		74	40-140		30
MCPA	**21780**		ug/Kg	25000	30000		73	40-140		30
Dinoseb	**66.44**	r	ug/Kg	170	100		66	10-110		20
MCPP	**29590**		ug/Kg	25000	30000		99	40-140		30
2,4-DB	**742.1**		ug/Kg	1700	1000		74	40-140		30
2,4-D	**140.7**		ug/Kg	170	200		70	40-140		30
2,4,5-TP (Silvex)	**75.61**		ug/Kg	83	100		76	40-140		30
2,4,5-T	**68.60**		ug/Kg	83	100		69	40-140		30
Dichloroprop	**170.3**		ug/Kg	170	200		85	40-140		30
Surrogate: % DCAA	*545.2*		ug/Kg		*1000*		*55*	*30-150*		
LCSD (BY88203-LCSD)						Prepared: 22-Aug-17 Analyzed: 23-Aug-17				
2,4-D	**140.3**		ug/Kg	%	200		70	40-140	0.0	30
MCPP	**26360**		ug/Kg	%	30000		88	40-140	11.8	30
MCPA	**21960**		ug/Kg	%	30000		73	40-140	0.0	30
Dinoseb	**102.7**	r	ug/Kg	%	100		103	10-110	43.8	20
Dichloroprop	**174.8**		ug/Kg	%	200		87	40-140	2.3	30
Dicamba	**71.23**		ug/Kg	%	100		71	40-140	4.1	30
2,4-DB	**854.2**		ug/Kg	%	1000		85	40-140	13.8	30
2,4,5-TP (Silvex)	**71.52**		ug/Kg	%	100		72	40-140	5.4	30
2,4,5-T	**73.95**		ug/Kg	%	100		74	40-140	7.0	30
Dalapon	**53.76**		ug/Kg	%	100		54	40-140	15.4	30
Surrogate: % DCAA	*528.5*		ug/Kg		*1000*		*53*	*30-150*		
MS (BY88203-MS)			**Source: BY88203**			Prepared: 22-Aug-17 Analyzed: 23-Aug-17				
2,4,5-TP (Silvex)	**70.99**		ug/Kg	83	100		71	30-150		30
MCPA	**20350**		ug/Kg	25000	30000		68	30-150		30
Dinoseb	**62.22**	r	ug/Kg	170	100		62	10-110		20
Dichloroprop	**180.2**		ug/Kg	170	200		90	30-150		30
MCPP	**23990**		ug/Kg	25000	30000		80	30-150		30
Dicamba	**69.35**		ug/Kg	83	100		69	30-150		30
2,4-D	**129.3**		ug/Kg	170	200		65	30-150		30
2,4,5-T	**72.54**		ug/Kg	83	100		73	30-150		30
Dalapon	**54.17**		ug/Kg	83	100		54	30-150		30
2,4-DB	**712.8**		ug/Kg	1700	1000		71	30-150		30
Surrogate: % DCAA	*518.2*		ug/Kg		*1000*		*52*	*30-150*		
MSD (BY88203-MSD)			**Source: BY88203**			Prepared: 22-Aug-17 Analyzed: 23-Aug-17				
2,4,5-TP (Silvex)	**74.16**		%	%	100		74	30-150	4.1	30

Subcontracted Analyses - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW8151A										
Batch 398809A - 398809-										
MSD (BY88203-MSD)			**Source: BY88203**			Prepared: 22-Aug-17 Analyzed: 23-Aug-17				
MCPA	**19140**		%	%	30000		64	30-150	6.1	30
MCPP	**26400**		%	%	30000		88	30-150	9.5	30
Dichloroprop	**200.5**		%	%	200		100	30-150	10.5	30
Dicamba	**74.92**		%	%	100		75	30-150	8.3	30
Dalapon	**65.61**		%	%	100		66	30-150	20.0	30
2,4-D	**138.3**		%	%	200		69	30-150	6.0	30
2,4,5-T	**69.56**		%	%	100		70	30-150	4.2	30
Dinoseb	**98.05**	r	%	%	100		98	10-110	45.0	20
2,4-DB	**803.3**		%	%	1000		80	30-150	11.9	30
Surrogate: % DCAA	*584.5*		%		*1000*		*58*	*30-150*		
SW9060A/L. Kahn										
Batch 398998A - 398998-SW9060A/										
BLK (BY84585-BLK)						Prepared: Analyzed: 23-Aug-17				
Tot.Org.Carbon	< 100	c2	mg/kg	100				-		
DUP (BY84585-DUP)			**Source: BY84585**			Prepared: Analyzed: 23-Aug-17				
Tot.Org.Carbon	**31000**	c2	mg/kg					-	NC	30
LCS (BY84585-LCS)						Prepared: Analyzed: 23-Aug-17				
Tot.Org.Carbon	**ND**	c2	mg/kg	100			91.7	75-125		30

Extractable Petroleum Hydrocarbons - CCV Evaluation Report

Analyte(s)	Average RF	CCRF	% D		Limit
Batch S707729					
Calibration Check (S707729-CCV1)					
C9-C18 Aliphatic Hydrocarbons	246108.3	271308.1	12.6		25
C19-C36 Aliphatic Hydrocarbons	334013.4	229314.7	13.5		25
Unadjusted C11-C22 Aromatic Hydrocarbons	212040.5	158132.9	5.1		20
Naphthalene	147591.1	147719.8	0.09		20
2-Methylnaphthalene	143063.7	139069.3	-2.8		20
Acenaphthylene	147456.6	136545.3	-7.4		20
Acenaphthene	155709.3	142808.2	-8.3		20
Fluorene	141394.2	129937.7	-8.1		20
Phenanthrene	133399.1	123108.1	-8.2		20
Anthracene	131785.3	121808.3	-7.6		20
Fluoranthene	125798.6	119419.1	-5.1		20
Pyrene	129825.3	124250.5	-4.3		20
Benzo (a) anthracene	112043.2	117685.6	5.0		20
Chrysene	124517.9	119715.7	-3.9		20
Benzo (b) fluoranthene	110872.6	106897.5	-3.6		20
Benzo (k) fluoranthene	122812.7	116218.5	-5.4		20
Benzo (a) pyrene	111334.7	108130.2	-2.9		20
Indeno (1,2,3-cd) pyrene	106604.5	104822.5	-1.7		20
Dibenzo (a,h) anthracene	122872.7	110403	-10.1		20
Benzo (g,h,i) perylene	107707	104688.5	-2.8		20
n-Nonane (C9)	178759.4	192397.8	7.6		30
n-Decane	178164.4	174169	-2.2		25
n-Dodecane	178467.5	196473.1	10.1		25
n-Tetradecane	177176	208151.4	17.5		25
n-Hexadecane	172955.6	214272.4	23.9		25
n-Octadecane	166541.9	207684.8	24.7		25
n-Nonadecane	161405.6	189444.8	17.4		25
n-Eicosane	156259.5	167698.7	7.3		25
n-Docosane	148423	143352.1	-3.4		25
n-Tetracosane	143394.1	134578.2	-6.1		25
n-Hexacosane	138907	130615.6	-6.0		25
n-Octacosane	135909.6	126604.2	-6.8		25
n-Triacontane	135346.5	123263.3	-8.9		25
n-Hexatriacontane	124811.2	99474.46	-20.3		25
Naphthalene (aliphatic fraction)	178410.1				
2-Methylnaphthalene (aliphatic fraction)	175120				
Calibration Check (S707729-CCV2)					
C9-C18 Aliphatic Hydrocarbons	246108.3	275863.4	14.5		25
C19-C36 Aliphatic Hydrocarbons	334013.4	203446.3	-3.5		25
Unadjusted C11-C22 Aromatic Hydrocarbons	212040.5	127673.6	-17.3		20
Naphthalene	147591.1	134350.5	-9.0		20
2-Methylnaphthalene	143063.7	124719.2	-12.8		20
Acenaphthylene	147456.6	118951.9	-19.3		20
Acenaphthene	155709.3	123733.5	-20.5	#	20
Fluorene	141394.2	109777.5	-22.4	#	20
Phenanthrene	133399.1	105635	-21.2	#	20
Anthracene	131785.3	106911.9	-18.9		20
Fluoranthene	125798.6	106715.1	-15.2		20
Pyrene	129825.3	99744.06	-23.2	#	20
Benzo (a) anthracene	112043.2	90492.42	-19.2		20
Chrysene	124517.9	98823.8	-20.6	#	20

Extractable Petroleum Hydrocarbons - CCV Evaluation Report

Analyte(s)	Average RF	CCRF	% D		Limit
Batch S707729					
Calibration Check (S707729-CCV2)					
Benzo (b) fluoranthene	110872.6	87887.06	-20.7	#	20
Benzo (k) fluoranthene	122812.7	108971.8	-11.3		20
Benzo (a) pyrene	111334.7	91785.26	-17.6		20
Indeno (1,2,3-cd) pyrene	106604.5	89367.86	-16.2		20
Dibenzo (a,h) anthracene	122872.7	96319.46	-21.6	#	20
Benzo (g,h,i) perylene	107707	93346.6	-13.3		20
n-Nonane (C9)	178759.4	163899.6	-8.3		30
n-Decane	178164.4	210760	18.3		25
n-Dodecane	178467.5	205735.4	15.3		25
n-Tetradecane	177176	158515.1	-10.5		25
n-Hexadecane	172955.6	167658.1	-3.1		25
n-Octadecane	166541.9	134849.6	-19.0		25
n-Nonadecane	161405.6	188530.9	16.8		25
n-Eicosane	156259.5	194639.7	24.6		25
n-Docosane	148423	183769.5	23.8		25
n-Tetracosane	143394.1	171386.3	19.5		25
n-Hexacosane	138907	163762.3	17.9		25
n-Octacosane	135909.6	157164.8	15.6		25
n-Triacontane	135346.5	151539.5	12.0		25
n-Hexatriacontane	124811.2	100270.5	-19.7		25
Naphthalene (aliphatic fraction)	178410.1				
2-Methylnaphthalene (aliphatic fraction)	175120				
Calibration Check (S707729-CCV3)					
C9-C18 Aliphatic Hydrocarbons	246108.3	300911.1	24.9		25
C19-C36 Aliphatic Hydrocarbons	334013.4	208434.7	-0.3		25
Unadjusted C11-C22 Aromatic Hydrocarbons	212040.5	152895.5	1.3		20
Naphthalene	147591.1	134298	-9.0		20
2-Methylnaphthalene	143063.7	124322.5	-13.1		20
Acenaphthylene	147456.6	115434	-21.7	#	20
Acenaphthene	155709.3	119703.6	-23.1	#	20
Fluorene	141394.2	143936.5	1.8		20
Phenanthrene	133399.1	103342.1	-22.9	#	20
Anthracene	131785.3	113781.9	-13.7		20
Fluoranthene	125798.6	137890.2	9.6		20
Pyrene	129825.3	102088.4	-21.4	#	20
Benzo (a) anthracene	112043.2	96264.68	-14.1		20
Chrysene	124517.9	122470.8	-1.6		20
Benzo (b) fluoranthene	110872.6	94843.88	-14.5		20
Benzo (k) fluoranthene	122812.7	109869.8	-10.5		20
Benzo (a) pyrene	111334.7	110823.9	-0.5		20
Indeno (1,2,3-cd) pyrene	106604.5	89548.62	-16.0		20
Dibenzo (a,h) anthracene	122872.7	97894.34	-20.3	#	20
Benzo (g,h,i) perylene	107707	92491.92	-14.1		20
n-Nonane (C9)	178759.4	348211.4	94.8	#	30
n-Decane	178164.4	386512	117	#	25
n-Dodecane	178467.5	380856	113	#	25
n-Tetradecane	177176	341902.2	93.0	#	25
n-Hexadecane	172955.6	188149.2	8.8		25
n-Octadecane	166541.9	189748.7	13.9		25
n-Nonadecane	161405.6	155632.9	-3.6		25
n-Eicosane	156259.5	132204.9	-15.4		25

Extractable Petroleum Hydrocarbons - CCV Evaluation Report

Analyte(s)	Average RF	CCRF	% D	Limit
Batch S707729				
Calibration Check (S707729-CCV3)				
n-Docosane	148423	116540.1	-21.5	25
n-Tetracosane	143394.1	115544.8	-19.4	25
n-Hexacosane	138907	116664.8	-16.0	25
n-Octacosane	135909.6	108505.1	-20.2	25
n-Triacontane	135346.5	107593	-20.5	25
n-Hexatriacontane	124811.2	105014	-15.9	25
Naphthalene (aliphatic fraction)	178410.1			
2-Methylnaphthalene (aliphatic fraction)	175120			
Batch S707828				
Calibration Check (S707828-CCV1)				
C9-C18 Aliphatic Hydrocarbons	705447.3	627565.7	-11.0	25
C19-C36 Aliphatic Hydrocarbons	652122.9	531801.3	0.9	25
Unadjusted C11-C22 Aromatic Hydrocarbons	21.98022	17.13391	-6.9	20
Naphthalene	7.24765	5.997684	-17.2	20
2-Methylnaphthalene	4.684746	3.77086	-19.5	20
Acenaphthylene	6.563902	5.896978	-10.2	20
Acenaphthene	4.904046	4.157266	-15.2	20
Fluorene	4.802603	4.104824	-14.5	20
Phenanthrene	7.001391	5.929388	-15.3	20
Anthracene	6.661871	5.493268	-17.5	20
Fluoranthene	7.242662	6.301806	-13.0	20
Pyrene	7.595097	6.668615	-12.2	20
Benzo (a) anthracene	5.908094	5.90461	-0.06	20
Chrysene	6.504452	5.797766	-10.9	20
Benzo (b) fluoranthene	6.233875	5.526793	-11.3	20
Benzo (k) fluoranthene	6.342187	6.318633	-0.4	20
Benzo (a) pyrene	5.56877	5.911084	-1.8	20
Indeno (1,2,3-cd) pyrene	7.761405	7.552303	-10.0	20
Dibenzo (a,h) anthracene	6.50214	6.233828	-9.3	20
Benzo (g,h,i) perylene	6.493468	6.163884	-8.6	20
n-Nonane (C9)	607056	605605.4	-0.2	30
n-Decane	615079.9	623786.4	1.4	25
n-Dodecane	616500	627938.4	1.9	25
n-Tetradecane	613009.5	620127.2	1.2	25
n-Hexadecane	594816	602893.8	1.4	25
n-Octadecane	562309.4	583661.8	3.8	25
n-Nonadecane	542397.9	573705.8	5.8	25
n-Eicosane	526142.5	565881	7.6	25
n-Docosane	502920.8	555897.2	10.5	25
n-Tetracosane	493103.2	543044	10.1	25
n-Hexacosane	488990.5	535621.2	9.5	25
n-Octacosane	488334.1	534452.8	9.4	25
n-Triacontane	493979.5	536933	8.7	25
n-Hexatriacontane	474606.4	408208.2	-14.0	25
Naphthalene (aliphatic fraction)	763480.8			
2-Methylnaphthalene (aliphatic fraction)	752253.7			
Calibration Check (S707828-CCV2)				
C9-C18 Aliphatic Hydrocarbons	705447.3	603018.7	-14.5	25
C19-C36 Aliphatic Hydrocarbons	652122.9	541431.3	2.8	25
Unadjusted C11-C22 Aromatic Hydrocarbons	21.98022	18.77748	3.4	20
Naphthalene	7.24765	6.124717	-15.5	20

Extractable Petroleum Hydrocarbons - CCV Evaluation Report

Analyte(s)	Average RF	CCRF	% D	Limit
Batch S707828				
Calibration Check (S707828-CCV2)				
2-Methylnaphthalene	4.684746	4.044818	-13.7	20
Acenaphthylene	6.563902	6.340647	-3.4	20
Acenaphthene	4.904046	4.328614	-11.7	20
Fluorene	4.802603	4.400379	-8.4	20
Phenanthrene	7.001391	6.379225	-8.9	20
Anthracene	6.661871	5.534839	-16.9	20
Fluoranthene	7.242662	6.938118	-4.2	20
Pyrene	7.595097	7.265735	-4.3	20
Benzo (a) anthracene	5.908094	6.470038	9.5	20
Chrysene	6.504452	6.428273	-1.2	20
Benzo (b) fluoranthene	6.233875	6.857808	10.0	20
Benzo (k) fluoranthene	6.342187	6.421804	1.3	20
Benzo (a) pyrene	5.56877	6.586925	9.4	20
Indeno (1,2,3-cd) pyrene	7.761405	8.435847	0.7	20
Dibenzo (a,h) anthracene	6.50214	6.949049	1.4	20
Benzo (g,h,i) perylene	6.493468	6.825465	1.2	20
n-Nonane (C9)	607056	588547	-3.0	30
n-Decane	615079.9	605289.6	-1.6	25
n-Dodecane	616500	607261.4	-1.5	25
n-Tetradecane	613009.5	597221.6	-2.6	25
n-Hexadecane	594816	578128	-2.8	25
n-Octadecane	562309.4	553336.8	-1.6	25
n-Nonadecane	542397.9	539493.8	-0.5	25
n-Eicosane	526142.5	528482.2	0.4	25
n-Docosane	502920.8	518078.6	3.0	25
n-Tetracosane	493103.2	503131.6	2.0	25
n-Hexacosane	488990.5	490702.2	0.4	25
n-Octacosane	488334.1	487167.6	-0.2	25
n-Triacontane	493979.5	489230.8	-1.0	25
n-Hexatriacontane	474606.4	377136	-20.5	25
Naphthalene (aliphatic fraction)	763480.8			
2-Methylnaphthalene (aliphatic fraction)	752253.7			

Pesticides - Pesticide Breakdown Report

Analyte(s)	Column	% Breakdown		Limit
Batch S707806				
Performance Mix (S707806-PEM1)				
4,4'-DDT (p,p')	1	5.4		15.0
Endrin	1	121	#	15.0
4,4'-DDT (p,p')	2	2.2		15.0
Endrin	2	10.1		15.0
Performance Mix (S707806-PEM2)				
4,4'-DDT (p,p')	1	5.1		15.0
Endrin	1	3.1		15.0
4,4'-DDT (p,p')	2	4.9		15.0
Endrin	2	2.4		15.0

The following list indicates the date and time low-level VOC soil/sediment samples were placed in the freezer at the lab:

SC38320-01	*BRP2*	8/21/2017 1:45 PM
SC38320-02	*BRP3*	8/21/2017 1:45 PM
SC38320-03	*BRP4*	8/21/2017 1:45 PM

Notes and Definitions

*TPH	Calculated as
c2	MS is not reported due to high sample concentration.
D	Data reported from a dilution
QC2	Analyte out of acceptance range in QC spike but no reportable concentration present in sample.
QR2	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on percent recoveries and completeness of QC data.
QR5	RPD out of acceptance range.
QR6	The RPD exceeded the QC control limits; however precision is demonstrated with acceptable RPD values for MS/MSD.
r	This parameter is outside laboratory rpd specified recovery limits.
S02	The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.
Z-2	The method allows for a closing CCV to fail for up to four analytes.
Z-2a	The method allows for a surrogate to fail high as long as there are no reportable target compounds in the sample.
dry	Sample results reported on a dry weight basis
NR	Not Reported
RPD	Relative Percent Difference

Interpretation of Total Petroleum Hydrocarbon Report

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from analyses of various petroleum products. Possible match categories are as follows:

Gasoline - includes regular, unleaded, premium, etc.
Fuel Oil #2 - includes home heating oil, #2 fuel oil, and diesel
Fuel Oil #4 - includes #4 fuel oil
Fuel Oil #6 - includes #6 fuel oil and bunker "C" oil
Motor Oil - includes virgin and waste automobile oil
Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha
Aviation Fuel - includes kerosene, Jet A and JP-4
Other Oil - includes lubricating and cutting oil, and silicon oil

At times, the unidentified petroleum product is quantified using a calibration that most closely approximates the distribution of compounds in the sample. When this occurs, the result is qualified as Calculated as.

Laboratory Control Sample (LCS): A known matrix spiked with compound(s) representative of the target analytes, which is used to document laboratory performance.

Matrix Duplicate: An intra-laboratory split sample which is used to document the precision of a method in a given sample matrix.

Matrix Spike: An aliquot of a sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Method Blank: An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

Method Detection Limit (MDL): The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.

Reportable Detection Limit (RDL): The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. For many analytes the RDL analyte concentration is selected as the lowest non-zero standard in the calibration curve. While the RDL is approximately 5 to 10 times the MDL, the RDL for each sample takes into account the sample volume/weight, extract/digestate volume, cleanup procedures and, if applicable, dry weight correction. Sample RDLs are highly matrix-dependent.

Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. These compounds are spiked into all blanks, standards, and samples prior to analysis. Percent recoveries are calculated for each surrogate.

Continuing Calibration Verification: The calibration relationship established during the initial calibration must be verified at periodic intervals. Concentrations, intervals, and criteria are method specific.

SC 38320 .8

SPECTRUM ANALYTICAL, INC.
Featuring
HANIBAL TECHNOLOGY

CHAIN OF CUSTODY RECORD

Page 1 of 1

Special Handling:
- [x] Standard TAT - 7 to 10 business days
- [ ] Rush TAT - Date Needed: _____

All TATs subject to laboratory approval
Min. 24-hr notification needed for rushes
Samples disposed after 60 days unless otherwise instructed.

Report To: GZA GeoEnvironmental, Inc
1350 Main St (Suite 1400)
Springfield, MA 01089

Telephone #:
Project Mgr: Steve Spink

Invoice To: SAME

P.O No.: _____ Quote/RQN: _____

Project No: 01.0173025.00
Site Name: Bay Rd
Location: Hadley, State: MA
Sampler(s): Adam Cole / Seth Taylor

F=Field Filtered **1**=$Na_2S_2O_3$ **2**=HCl **3**=H_2SO_4 **4**=HNO_3 **5**=NaOH **6**=Ascorbic Acid
7=CH_3OH **8**=$NaHSO_4$ **9**=Deionized Water **10**=H_3PO_4 **11**=Net Present (ice) **12**=_____

DW=Dinking Water **GW**=Groundwater **SW**=Surface Water **WW**=Waste Water
O=Oil **SO**=Soil **SL**=Sludge **A**=Indoor/Ambient Air **SG**=Soil Gas
X1=_____ **X2**=_____ **X3**=_____

G= Grab **C**=Compsite

Lab ID:	Sample ID:	Date:	Time:	Type	Matrix	# of VOA Vials	# of Amber Glass	# of Clear Glass	# of Plastic	Containers: Total Oxygen Cubes	Analysis: Gain Size	As, Cd, Cr, Pb, Hg, Zn, Cu	VOCs by 8260	TPH by Modified 8100	MA EPH	SVOCs by 8270	VOA% Solid	Rush Herb, Nes + Conductivity	Check if chlorinated
SC38320-01	BRP2	8/21/17	900	G	S	3	6			X	X	X	X	X	X	X	X	X	☐
02	BRP3		930			3	6			X	X	X	X	X	X	X	X	X	☐
03	BRP4		1030			3	6			X	X	X	X	X	X	X	X	X	☐
																			☐
																			☐
																			☐
																			☐
																			☐
																			☐
																			☐

List Preservative Code below:
NP | NP | 7,9 | NP | NP | NP | NP

QA/QC Reporting Notes:
* additional charges may appply

MA DEP MCP CAM Report? [x] Yes [ ] No
CT DPH RCP Report? [ ] Yes [ ] No
[ ] Standard [ ] No QC
[ ] DQA*
[ ] ASP A* [ ] ASP B*
[ ] NJ Reduced* [ ] NJ Full*
[ ] Tier II* [ ] Tier IV*
[ ] Other: _____
State-specific reporting standards:

- Hold for TCLP
- Also H_2O % to be run for all samples
- TOC by 9060
- Gradation by D50 and D84 per ASTM 422

Relinquished by:	Received by:	Date:	Time:	Temp °C
Seth Taylor		8/21/17	1345	Observed -0.2
				Correction Factor 0
				Corrected -0.2
				IR ID # 01

[ ] EDD format: _____
[x] E-mail to: stephen.spink@gza.com

Condition upon receipt: Custody Seals: [ ] Present [ ] Intact [ ] Broken
[ ] Ambient [x] Iced [ ] Refrigerated [ ] DI VOA Frozen [ ] Soil Jar Frozen

Proposal No. 608460-130088

A00804 - 150

TEST RESUL

Opening Size	Percent Finer
~~3~~	~~100.0~~
~~2~~	~~96.7~~
~~1.5~~	~~89.5~~
1	83.2
.75	79.2
0.5	74.1
.375	70.5
#4	64.1
#10	57.8
#20	45.7
#40	34.0
#60	26.1
#100	20.6
#200	13.7

From: Elie Makhoul [mailto:ElieMakhoul@eurofinsUS.com]
Sent: Monday, August 21, 2017 3:45 PM
To: Stephen Spink <stephen.spink@gza.com>
Cc: Adam Cote <adam.cote@gza.com>; Kathryn Wilkinson <KathrynWilkinson@eurofinsUS.com>; SpectrumSample@EurofinsUS.com; Nathaniel Russell <Nathaniel.Russell@gza.com>; Seth Taylor <Seth.Taylor@gza.com>; Christina White <ChristinaWhite@eurofinsUS.com>
Subject: RE: MassDOT Bay Rd Bridge - Scour and WQC Samples

Stephen,
Our set-up only allows for 7 pans so we use the bottom 7 in the list. We don't do 0.5 or 0.375 inches. You are right it wouldn't be the hydrometer analysis because those are larger grain sizes.

We could do all of these sizes but it would take two runs, which would cost more. We don't have the graph that we can plug the numbers into so we can't do that. You would have to do that yourselves.

Please let us know how you would like us to proceed.

Regards,
Elie

From: Stephen Spink [mailto:stephen.spink@gza.com]
Sent: Monday, August 21, 2017 3:13 PM
To: Seth Taylor; Elie Makhoul
Cc: Adam Cote; Kathryn Wilkinson; !US38_Spectrum_Sample; Nathaniel Russell
Subject: RE: MassDOT Bay Rd Bridge - Scour and WQC Samples

Seth,
As long as a typical particle-size gradation curve per ASTM D422 is provided (similar to the attached), that will work for us. Since the samples collected are predominantly granular (I'm assuming), a hydrometer analysis is not necessary.

MassDOT specifically requested D_{50} and D_{84} to use in their scour analysis software models. D_{85} is a common output, but if we can present D_{84} on the lab report that would be great. Otherwise we can just pull the value for the particle size corresponding to 84% finer off the particle-size distribution plot.

Batch Summary

'[none]'

Subcontracted Analyses

SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714358

Total Metals by EPA 6000/7000 Series Methods

1714358-BLK1
1714358-DUP1
1714358-MS1
1714358-MSD1
1714358-PS1
1714358-SRM1
1714358-SRM2
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714359

Total Metals by EPA 6000/7000 Series Methods

1714359-BLK1
1714359-DUP1
1714359-MS1
1714359-MSD1
1714359-PS1
1714359-SRM1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714362

Volatile Organic Compounds

1714362-BLK1
1714362-BS1
1714362-BSD1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714384

General Chemistry Parameters

1714384-BS1
1714384-DUP1
1714384-MRL1
1714384-SRM1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714386

General Chemistry Parameters

1714386-DUP2
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714390

General Chemistry Parameters

1714390-DUP1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714405

Toxicity Characteristics

1714405-BLK1
1714405-SRM1
1714405-SRM2
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714539

Toxicity Characteristics

1714539-DUP1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714754

Semivolatile Organic Compounds by GCMS

1714754-BLK1
1714754-BS1
1714754-BSD1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714755

Extractable Petroleum Hydrocarbons

1714755-BLK1
1714755-BS2
1714755-BSD2
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714757

Pesticides

1714757-BLK1
1714757-BS1
1714757-BSD1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

1714758

Extractable Petroleum Hydrocarbons

1714758-BLK1
1714758-BS1
1714758-BS2
1714758-BSD1
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

398809A

Subcontracted Analyses

BY88203-BLK
BY88203-LCS
BY88203-LCSD
BY88203-MS
BY88203-MSD
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

398998A

Subcontracted Analyses

BY84585-BLK
BY84585-DUP
BY84585-LCS
SC38320-01 (BRP2)
SC38320-02 (BRP3)
SC38320-03 (BRP4)

S602716

Extractable Petroleum Hydrocarbons

S602716-CAL9
S602716-CALA
S602716-CALB
S602716-CALC
S602716-CALD
S602716-CALE
S602716-CALF
S602716-CALG
S602716-CALH
S602716-CALI
S602716-CALJ
S602716-CALK
S602716-CALL
S602716-CALM
S602716-ICV2
S602716-LCV2

S608497

Extractable Petroleum Hydrocarbons

S608497-CAL9
S608497-CALA
S608497-CALB
S608497-CALC
S608497-CALD
S608497-CALE
S608497-CALF
S608497-CALG
S608497-CALH
S608497-CALI
S608497-CALJ
S608497-CALK
S608497-CALL
S608497-CALM
S608497-ICV2
S608497-LCV2

S706393

Semivolatile Organic Compounds by GCMS

S706393-CAL1
S706393-CAL2
S706393-CAL3
S706393-CAL4
S706393-CAL5
S706393-CAL6
S706393-CAL7
S706393-CAL8
S706393-CAL9
S706393-CALA
S706393-ICV1
S706393-LCV1
S706393-LCV2
S706393-TUN1

S706407

Extractable Petroleum Hydrocarbons

S706407-CAL1
S706407-CAL2
S706407-CAL3
S706407-CAL4
S706407-CAL5
S706407-CAL6
S706407-CAL7
S706407-CAL8
S706407-CAL9
S706407-CALA
S706407-CALB
S706407-CALC
S706407-CALD
S706407-CALE
S706407-CALF
S706407-CALG
S706407-CALH
S706407-CALI
S706407-CALJ
S706407-ICV1
S706407-ICV2
S706407-ICV3
S706407-LCV1
S706407-LCV2
S706407-TUN1

S706487

Extractable Petroleum Hydrocarbons

S706487-CAL1
S706487-CAL2
S706487-CAL3
S706487-CAL4
S706487-CAL5
S706487-CAL6
S706487-CAL7
S706487-CAL8
S706487-CAL9
S706487-CALA
S706487-CALB
S706487-CALC
S706487-CALD
S706487-ICV1
S706487-ICV2
S706487-LCV1

S707410

Volatile Organic Compounds

S707410-CAL1
S707410-CAL2
S707410-CAL3
S707410-CAL4
S707410-CAL5
S707410-CAL6
S707410-CAL7
S707410-CAL8
S707410-CAL9
S707410-ICV1
S707410-LCV1
S707410-TUN1

S707454

Volatile Organic Compounds

S707454-CCV1
S707454-TUN1

S707696

Extractable Petroleum Hydrocarbons

S707696-CCV1
S707696-CCV3

S707697

Extractable Petroleum Hydrocarbons

S707697-CCV1

S707708

Semivolatile Organic Compounds by GCMS

S707708-CCV1
S707708-TUN1

S707710

Semivolatile Organic Compounds by GCMS

S707710-CAL1
S707710-CAL2
S707710-CAL3
S707710-CAL4
S707710-CAL5
S707710-CAL6
S707710-CAL7
S707710-CAL8
S707710-CAL9
S707710-CALA
S707710-ICV1
S707710-LCV1
S707710-LCV2
S707710-TUN1

S707713

Pesticides

S707713-CAL1
S707713-CAL2
S707713-CAL3
S707713-CAL4
S707713-CAL5
S707713-CAL6
S707713-CAL7
S707713-CAL8
S707713-CAL9
S707713-CALA
S707713-CALB
S707713-CALC
S707713-CALD
S707713-CALE
S707713-CALF
S707713-ICV1
S707713-ICV2
S707713-ICV3
S707713-LCV1
S707713-LCV2
S707713-LCV3

S707729

Extractable Petroleum Hydrocarbons

S707729-CCV1
S707729-CCV2
S707729-CCV3

S707798

Semivolatile Organic Compounds by GCMS

S707798-CCV1
S707798-TUN1

S707806

Pesticides

S707806-CCV1
S707806-CCV2
S707806-CCV3
S707806-CCV4
S707806-CCV5
S707806-CCV6
S707806-IBL1
S707806-IBL2
S707806-PEM1
S707806-PEM2

S707828

Extractable Petroleum Hydrocarbons

S707828-CCV1
S707828-CCV2
S707828-TUN1

eurofins | Spectrum Analytical

☑ Final Report
☐ Revised Report

Report Date:
10-Oct-17 16:11

Laboratory Report
SC39680

GZA GeoEnvironmental, Inc.
1350 Main St; Suite 1400
Springfield, MA 01103
Attn: Stephen Spink

Project: Bay Rd - Hadley, MA
Project #: 01.0173025.00

I attest that the information contained within the report has been reviewed for accuracy and checked against the quality control requirements for each method. These results relate only to the sample(s) as received.
All applicable NELAC requirements have been met.

Massachusetts # M-MA138/MA1110
Connecticut # PH-0777
Florida # E87936
Maine # MA138
New Hampshire # 2972/2538
New Jersey # MA011
New York # 11393
Pennsylvania # 68-04426/68-02924
Rhode Island # LAO00348
USDA # P330-15-00375
Vermont # VT-11393

Authorized by:

Dawn Wojcik
Laboratory Director

Dawn E Wojcik

Eurofins Spectrum Analytical holds primary certification in the State of Massachusetts for the analytes as indicated with an X in the "Cert." column within this report. Please note that the State of Massachusetts does not offer certification for all analytes. Please refer to our website for specific certification holdings in each state.
Please note that this report contains 79 pages of analytical data plus Chain of Custody document(s). When the Laboratory Report is indicated as revised, this report supersedes any previously dated reports for the laboratory ID(s) referenced above. Where this report identifies subcontracted analyses, copies of the subcontractor's test report are available upon request. This report may not be reproduced, except in full, without written approval from Eurofins Spectrum Analytical, Inc.

Eurofins Spectrum Analytical, Inc. is a NELAC accredited laboratory organization and meets NELAC testing standards. Use of the NELAC logo however does not insure that Eurofins Spectrum Analytical, Inc. is currently accredited for the specific method or analyte indicated. Please refer to our Quality web page at www.spectrum-analytical.com for a full listing of our current certifications and fields of accreditation. States in which Eurofins Spectrum Analytical, Inc. holds NELAC certification are New York, New Hampshire, New Jersey, Pennsylvania and Florida. All analytical work for Volatile Organic and Air analysis are transferred to and conducted at our 830 Silver Street location (PA-68-04426).

Please contact the Laboratory or Technical Director at 800-789-9115 with any questions regarding the data contained in this laboratory report.

Sample Summary

Work Order: SC39680

Project: Bay Rd - Hadley, MA

Project Number: 01.0173025.00

Laboratory ID	Client Sample ID	Matrix	Date Sampled	Date Received
SC39680-01	BRUS-A	Soil	25-Sep-17 10:20	26-Sep-17 10:50
SC39680-02	BRUS-B	Soil	25-Sep-17 11:50	26-Sep-17 10:50
SC39680-03	BRUS-C	Soil	25-Sep-17 13:15	26-Sep-17 10:50
SC39680-04	BRD5	Soil	25-Sep-17 14:00	26-Sep-17 10:50

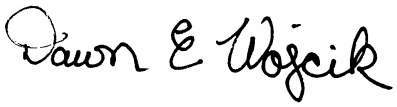
The following outlines the condition of all EPH samples contained within this report upon laboratory receipt.

Matrices	Soil
Containers	✓ Satisfactory
Aqueous Preservative	✓ N/A pH≤2 pH>2 pH adjusted to <2 in lab
Temperature	✓ Received on ice Received at 4 ± 2 ºC ✓ Other: 1.8ºC

Were all QA/QC procedures followed as required by the EPH method? *Yes*
Were any significant modifications made to the EPH method as specified in Section 11.3? *No*
Were all performance/acceptance standards for required QA/QC procedures achieved? *Yes*

I attest that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Authorized by:



Dawn E. Wojcik
Laboratory Director

MassDEP Analytical Protocol Certification Form

Laboratory Name: Eurofins Spectrum Analytical, Inc.	**Project #:** 01.0173025.00
Project Location: Bay Rd - Hadley, MA	**RTN:**
This form provides certifications for the following data set:	SC39680-01 through SC39680-04
Matrices: Soil	

CAM Protocol

✓ 8260 VOC CAM II A	✓ 7470/7471 Hg CAM III B	MassDEP VPH CAM IV A	✓ 8081 Pesticides CAM V B	7196 Hex Cr CAM VI B	MassDEP APH CAM IX A
✓ 8270 SVOC CAM II B	7010 Metals CAM III C	✓ MassDEP EPH CAM IV B	✓ 8151 Herbicides CAM V C	8330 Explosives CAM VIII A	TO-15 VOC CAM IX B
✓ 6010 Metals CAM III A	6020 Metals CAM III D	8082 PCB CAM V A	9012 Total Cyanide/PAC CAM VI A	9014 Total Cyanide/PAC CAM VI A	6860 Perchlorate CAM VIII B

Affirmative responses to questions A through F are required for Presumptive Certainty status

A	Were all samples received in a condition consistent with those described on the Chain of Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	✓ Yes No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	✓ Yes No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	✓ Yes No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	✓ Yes No
E	a. VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	✓ Yes No Yes No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to questions A through E)?	✓ Yes No

Responses to questions G, H and I below are required for Presumptive Certainty status

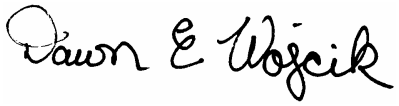
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	Yes ✓ No

***Data User Note:* Data that achieve Presumptive Certainty status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**

H	Were all QC performance standards specified in the CAM protocol(s) achieved?	Yes ✓ No
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ✓ No

All negative responses are addressed in a case narrative on the cover page of this report.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.



Dawn E. Wojcik
Laboratory Director
Date: 10/10/2017

CASE NARRATIVE:

Data has been reported to the RDL. This report excludes estimated concentrations detected below the RDL and above the MDL (J-Flag).

All non-detects and all results below the reporting limit are reported as "<" (less than) the reporting limit in this report.

The samples were received 1.8 degrees Celsius, please refer to the Chain of Custody for details specific to temperature upon receipt. An infrared thermometer with a tolerance of +/- 1.0 degrees Celsius was used immediately upon receipt of the samples.

If a Matrix Spike (MS), Matrix Spike Duplicate (MSD) or Duplicate (DUP) was not requested on the Chain of Custody, method criteria may have been fulfilled with a source sample not of this Sample Delivery Group. If method or program required MS/MSD/Dup were not performed, sufficient sample was not provided to the laboratory.

MADEP has published a list of analytical methods (CAM) which provides a series of recommended protocols for the acquisition, analysis and reporting of analytical data in support of MCP decisions. "Presumptive Certainty" can be established only for those methods published by the MADEP in the MCP CAM. The compounds and/or elements reported were specifically requested by the client on the Chain of Custody and in some cases may not include the full analyte list as defined in the method. Regulatory limits may not be achieved if specific method and/or technique was not requested on the Chain of Custody.

According to WSC-CAM 5/2009 Rev.1, Table 11 A-1, recovery for some VOC analytes have been deemed potentially difficult. Although they may still be within the recommended recovery range, a range has been set based on historical control limits.

Some target analytes which are not listed as exceptions in the Summary of CAM Reporting Limits may exceed the recommended RL based on sample initial volume or weight provided, % moisture content, or responsiveness of a particular analyte to purge and trap instrumentation.

All VOC soils samples submitted and analyzed in methanol will have a minimum dilution factor of 50. This is the minimum amount of solvent allowed on the instrumentation without causing interference. Soils are run on a manual load instrument. 100ug of sample (MEOH) is spiked into 5ml DI water along with the surrogate and added directly onto the instrument. Additional dilution factors may be required to keep analyte concentration within instrument calibration range.

Method SW846 5035A is designed to use on samples containing low levels of VOCs, ranging from 0.5 to 200 ug/Kg. Target analytes that are less responsive to purge and trap may be present at concentrations over 200ug/Kg but may not be reportable in the methanol preserved vial (SW846 5030). This is the result of the inherent dilution factor required for the methanol preservation.

Reactivity (40 CFR 261.23) Case Narrative:

These samples do not exhibit the characteristics of reactivity as defined in 40 CFR 261.23, sections (1), (2) and (4); however, Eurofins Spectrum Analytical, Inc. does not test for detonation, explosive reaction or potential, or forbidden explosives as defined in 40 CFR 261.23, sections (3), (6), (7) and (8).

Reactive sulfide and cyanide are tested at a pH of 2 and not tested at all conditions between pH 2 and12.5 as stated in 40 CFR 261.23, section (5); thus reactive cyanide and sulfide results as reported in this document can not be used to support the nonreactive properties of these samples.

The responsibility falls on the generator to use knowledge of the waste to determine if the waste meets or does not meet the descriptive, prose definition of reactivity.

TOC via Lloyd Kahn Case Narrative:

Following the acidification via a 1:1 phosphoric acid solution to remove the inorganic carbon, the sample is dried in a 100°C oven for 10-15 minutes. A homogenous sample is then weighed into the platinum boat and tested, on a dry weight basis, for TOC using the Lloyd Kahn method.

See below for any non-conformances and issues relating to quality control samples and/or sample analysis/matrix.

MADEP EPH 5/2004 R

Calibration:

MADEP EPH 5/2004 R

Calibration:

S708751-CCV2

The method allows for up to four analytes to fail in a closing CCV.

Anthracene
Fluorene
Naphthalene
Phenanthrene

Laboratory Control Samples:

1716783 BSD

Benzo (g,h,i) perylene RPD 27% (25%) is outside individual acceptance criteria.

Indeno (1,2,3-cd) pyrene RPD 29% (25%) is outside individual acceptance criteria.

Naphthalene RPD 26% (25%) is outside individual acceptance criteria.

Samples:

S708751-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

Acenaphthene (23.7%)
Acenaphthylene (23.6%)
Anthracene (22.8%)
Benzo (a) pyrene (23.4%)
Benzo (g,h,i) perylene (24.4%)
Benzo (k) fluoranthene (20.8%)
Indeno (1,2,3-cd) pyrene (24.6%)
Naphthalene (21.2%)
Phenanthrene (24.9%)

This affected the following samples:

1716783-BS2

S708751-CCV2

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

2-Methylnaphthalene (23.3%)
Anthracene (40.3%)
Dibenzo (a,h) anthracene (-23.6%)
Fluoranthene (21.7%)
Fluorene (43.0%)
Indeno (1,2,3-cd) pyrene (-21.4%)
Naphthalene (63.6%)
Phenanthrene (39.8%)

This affected the following samples:

1716783-BS2

S708805-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

Acenaphthene (20.1%)
Acenaphthylene (22.5%)
Naphthalene (24.2%)

MADEP EPH 5/2004 R

Samples:

S708805-CCV1

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

Unadjusted C11-C22 Aromatic Hydrocarbons (23.9%)

This affected the following samples:

1716783-BLK1
1716783-BS1
1716783-BSD1
BRUS-A
BRUS-B
BRUS-C

S708805-CCV2

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

2-Methylnaphthalene (24.9%)
Acenaphthylene (20.4%)
Benzo (a) pyrene (-20.8%)
Benzo (b) fluoranthene (-20.9%)
Benzo (g,h,i) perylene (-20.6%)
Dibenzo (a,h) anthracene (-24.7%)
Indeno (1,2,3-cd) pyrene (-23.1%)
Naphthalene (22.7%)

This affected the following samples:

1716783-BLK1
1716783-BS1
1716783-BSD1
BRUS-A
BRUS-B
BRUS-C

S708831-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

2-Methylnaphthalene (24.9%)
Acenaphthylene (20.4%)
Benzo (a) pyrene (-20.8%)
Benzo (b) fluoranthene (-20.9%)
Benzo (g,h,i) perylene (-20.6%)
Dibenzo (a,h) anthracene (-24.7%)
Indeno (1,2,3-cd) pyrene (-23.1%)
Naphthalene (22.7%)

This affected the following samples:

BRD5

S708831-CCV2

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

2-Methylnaphthalene (24.8%)
Acenaphthene (24.2%)
Fluorene (24.8%)
Phenanthrene (21.8%)

MADEP EPH 5/2004 R

Samples:

S708831-CCV2

This affected the following samples:

BRD5

SW6010C

Samples:

SC39680-01 *BRUS-A*

Present in blank, no bias suspected.

Zinc

SC39680-02 *BRUS-B*

Present in blank, no bias suspected.

Zinc

SC39680-03 *BRUS-C*

Present in blank, no bias suspected.

Zinc

SC39680-04 *BRD5*

Present in blank, no bias suspected.

Zinc

SW8081B

Laboratory Control Samples:

403367A BS

Alachlor percent recovery NA (40-140) is outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

Toxaphene percent recovery NA (40-140) is outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

BZ10746-LCS

SW8081B

Laboratory Control Samples:

BZ10746-LCS

Alpha and gamma chlordane were spiked and analyzed instead of technical chlordane. Gamma chlordane recovery is reported as chlordane in the LCS, LCSD, MS and MSD.

% DCBP
% TCMX
4,4' -DDD
4,4' -DDE
4,4' -DDT
a-BHC
Alachlor
Aldrin
b-BHC
Chlordane
d-BHC
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
g-BHC
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Methoxychlor
Toxaphene

BZ10746-BLK

Alpha and gamma chlordane were spiked and analyzed instead of technical chlordane. Gamma chlordane recovery is reported as chlordane in the LCS, LCSD, MS and MSD.

% DCBP
% TCMX
4,4' -DDD
4,4' -DDE
4,4' -DDT
a-BHC
Alachlor
Aldrin
b-BHC
Chlordane
d-BHC
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
g-BHC
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Methoxychlor
Toxaphene

BZ10746-LCSD

SW8081B

BZ10746-LCSD

Alpha and gamma chlordane were spiked and analyzed instead of technical chlordane. Gamma chlordane recovery is reported as chlordane in the LCS, LCSD, MS and MSD.

% DCBP
% TCMX
4,4' -DDD
4,4' -DDE
4,4' -DDT
a-BHC
Alachlor
Aldrin
b-BHC
Chlordane
d-BHC
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
g-BHC
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Methoxychlor
Toxaphene

BZ10746-MS

Alpha and gamma chlordane were spiked and analyzed instead of technical chlordane. Gamma chlordane recovery is reported as chlordane in the LCS, LCSD, MS and MSD.

% DCBP
% TCMX
4,4' -DDD
4,4' -DDE
4,4' -DDT
a-BHC
Alachlor
Aldrin
b-BHC
Chlordane
d-BHC
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
g-BHC
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Methoxychlor
Toxaphene

BZ10746-MSD

SW8081B

BZ10746-MSD

Alpha and gamma chlordane were spiked and analyzed instead of technical chlordane. Gamma chlordane recovery is reported as chlordane in the LCS, LCSD, MS and MSD.

% DCBP
% TCMX
4,4' -DDD
4,4' -DDE
4,4' -DDT
a-BHC
Alachlor
Aldrin
b-BHC
Chlordane
d-BHC
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
g-BHC
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Methoxychlor
Toxaphene

SW8151A

Laboratory Control Samples:

BZ11322-LCS

This parameter is outside laboratory rpd specified recovery limits.

MCPP

BZ11322-LCSD

This parameter is outside laboratory rpd specified recovery limits.

MCPP

BZ11322-MS

This parameter is outside laboratory rpd specified recovery limits.

2,4-D
MCPP

BZ11322-MSD

This parameter is outside laboratory rpd specified recovery limits.

2,4-D
MCPP

SW846 8260C

Calibration:

1710003

SW846 8260C

Calibration:

1710003

Analyte quantified by quadratic equation type calibration.

1,4-Dioxane
2-Hexanone (MBK)
Naphthalene
trans-1,4-Dichloro-2-butene

This affected the following samples:

1716596-BLK1
1716596-BS1
1716596-BSD1
1716738-BLK1
1716738-BS1
1716738-BSD1
BRD5
BRUS-A
BRUS-B
BRUS-C
S708614-CCV1
S708676-CCV1
S708708-ICV1

Laboratory Control Samples:

1716596 BS/BSD

Acetone percent recoveries (135/121) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially high bias:

BRD5
BRUS-A
BRUS-C

Samples:

S708614-CCV1

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

Acetone (28.0%)

This affected the following samples:

1716596-BLK1
1716596-BS1
1716596-BSD1
BRD5
BRUS-A
BRUS-C

S708676-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

Tert-Butanol / butyl alcohol (-22.5%)
Tetrahydrofuran (-21.2%)

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

2-Hexanone (MBK) (-33.1%)
Naphthalene (-22.1%)
trans-1,4-Dichloro-2-butene (-21.5%)

SW846 8260C

Samples:

S708676-CCV1

This affected the following samples:

1716738-BLK1
1716738-BS1
1716738-BSD1
BRUS-B

SW846 8270D

Calibration:

1709033

Analyte quantified by quadratic equation type calibration.

2,4-Dinitrophenol
4,6-Dinitro-2-methylphenol
Benzoic acid
Carbazole

This affected the following samples:

S708282-ICV1

Laboratory Control Samples:

1716889 BS/BSD

4-Chloroaniline percent recoveries (35/34) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

Aniline percent recoveries (35/34) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

Benzoic acid percent recoveries (15/12) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

Bis(2-chloroethoxy)methane percent recoveries (35/33) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

SW846 8270D

Laboratory Control Samples:

1716889 BS/BSD

Bis(2-chloroisopropyl)ether percent recoveries (35/33) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

Pentachlorophenol percent recoveries (33/28) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

Pyridine percent recoveries (33/31) are outside individual acceptance criteria, but within overall method allowances. All reported results of the following samples are considered to have a potentially low bias:

BRD5
BRUS-A
BRUS-B
BRUS-C

Samples:

S708896-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

4-Nitrophenol (20.5%)
Aniline (-26.9%)

This affected the following samples:

1716889-BLK1
1716889-BS1
1716889-BSD1

S708957-CCV1

Analyte percent difference is outside individual acceptance criteria (20), but within overall method allowances.

2,4,5-Trichlorophenol (23.2%)
4-Chlorophenyl phenyl ether (20.8%)
Benzidine (-64.0%)
Diethyl phthalate (21.8%)
Dimethyl phthalate (25.1%)
Hexachlorocyclopentadiene (20.9%)
N-Nitrosodimethylamine (-22.6%)
Pyridine (-26.5%)

Analyte percent drift is outside individual acceptance criteria (20), but within overall method allowances.

Carbazole (-24.5%)

This affected the following samples:

BRD5
BRUS-A
BRUS-B
BRUS-C

SW9060A/L. Kahn

Samples:

SC39680-01 *BRUS-A*

This parameter is not certified by MA for this matrix.

Tot.Org.Carbon

SC39680-02 *BRUS-B*

This parameter is not certified by MA for this matrix.

Tot.Org.Carbon

SC39680-03 *BRUS-C*

This parameter is not certified by MA for this matrix.

Tot.Org.Carbon

SC39680-04 *BRD5*

This parameter is not certified by MA for this matrix.

Tot.Org.Carbon

Sample Acceptance Check Form

Client:	GZA GeoEnvironmental, Inc. - Springfield, MA
Project:	Bay Rd - Hadley, MA / 01.0173025.00
Work Order:	SC39680
Sample(s) received on:	9/26/2017

The following outlines the condition of samples for the attached Chain of Custody upon receipt.

	Yes	No	N/A
Were custody seals present?	☐	☑	☐
Were custody seals intact?	☐	☐	☑
Were samples received at a temperature of ≤ 6°C?	☑	☐	☐
Were samples cooled on ice upon transfer to laboratory representative?	☑	☐	☐
Were sample containers received intact?	☑	☐	☐
Were samples properly labeled (labels affixed to sample containers and include sample ID, site location, and/or project number and the collection date)?	☑	☐	☐
Were samples accompanied by a Chain of Custody document?	☑	☐	☐
Does Chain of Custody document include proper, full, and complete documentation, which shall include sample ID, site location, and/or project number, date and time of collection, collector's name, preservation type, sample matrix and any special remarks concerning the sample?	☐	☑	☐
Did sample container labels agree with Chain of Custody document?	☑	☐	☐
Were samples received within method-specific holding times?	☑	☐	☐

Summary of Hits

Lab ID: SC39680-01 **Client ID:** BRUS-A

Parameter	Result	Flag	Reporting Limit	Units	Analytical Method
Specific Conductance (EC)	35.1		10.0	uS/cm	SM22 2510B
Arsenic	1.90		0.80	mg/Kg	SW6010C
Chromium	12.4		0.40	mg/Kg	SW6010C
Copper	9.75		0.40	mg/Kg	SW6010C
Lead	8.73		0.40	mg/Kg	SW6010C
Nickel	10.2		0.40	mg/Kg	SW6010C
Zinc	46.1	Q1	0.40	mg/Kg	SW6010C
Other Oil	Calculated as		30.1	mg/kg	SW846 8100Mod.
Total Petroleum Hydrocarbons	70.7		30.1	mg/kg	SW846 8100Mod.
Unidentified	70.7		30.1	mg/kg	SW846 8100Mod.
Tot.Org.Carbon	6900	Q1a	100	mg/kg	SW9060A/L. Kahn

Lab ID: SC39680-02 **Client ID:** BRUS-B

Parameter	Result	Flag	Reporting Limit	Units	Analytical Method
Specific Conductance (EC)	46.5		10.0	uS/cm	SM22 2510B
Arsenic	1.21		0.75	mg/Kg	SW6010C
Chromium	5.61		0.38	mg/Kg	SW6010C
Copper	3.05		0.38	mg/Kg	SW6010C
Lead	6.87		0.38	mg/Kg	SW6010C
Nickel	4.69		0.38	mg/Kg	SW6010C
Zinc	23.1	Q1	0.38	mg/Kg	SW6010C
Mercury	0.09		0.03	mg/Kg	SW7471B
Other Oil	Calculated as		33.2	mg/kg	SW846 8100Mod.
Total Petroleum Hydrocarbons	85.6		33.2	mg/kg	SW846 8100Mod.
Unidentified	85.6		33.2	mg/kg	SW846 8100Mod.
Tot.Org.Carbon	8100	Q1a	100	mg/kg	SW9060A/L. Kahn

Lab ID: SC39680-03 **Client ID:** BRUS-C

Parameter	Result	Flag	Reporting Limit	Units	Analytical Method
Specific Conductance (EC)	38.8		10.0	uS/cm	SM22 2510B
Arsenic	3.46		0.87	mg/Kg	SW6010C
Chromium	23.5		0.43	mg/Kg	SW6010C
Copper	18.3		0.43	mg/Kg	SW6010C
Lead	15.2		0.43	mg/Kg	SW6010C
Nickel	17.4		0.43	mg/Kg	SW6010C
Zinc	82.1	Q1	0.43	mg/Kg	SW6010C
Other Oil	Calculated as		35.6	mg/kg	SW846 8100Mod.
Total Petroleum Hydrocarbons	75.7		35.6	mg/kg	SW846 8100Mod.
Unidentified	75.7		35.6	mg/kg	SW846 8100Mod.
Tot.Org.Carbon	10000	Q1a	100	mg/kg	SW9060A/L. Kahn

Lab ID: SC39680-04 **Client ID:** BRD5

Parameter	Result	Flag	Reporting Limit	Units	Analytical Method
Specific Conductance (EC)	67.1		10.0	uS/cm	SM22 2510B
Arsenic	2.93		0.74	mg/Kg	SW6010C
Chromium	4.48		0.37	mg/Kg	SW6010C
Copper	3.74		0.37	mg/Kg	SW6010C
Lead	2.86		0.37	mg/Kg	SW6010C
Nickel	4.10		0.37	mg/Kg	SW6010C
Zinc	20.9	Q1	0.37	mg/Kg	SW6010C
Mercury	0.07		0.03	mg/Kg	SW7471B
Other Oil	Calculated as		31.8	mg/kg	SW846 8100Mod.
Fluoranthene	86.1		80.1	µg/kg	SW846 8270D
Tot.Org.Carbon	2100	Q1a	100	mg/kg	SW9060A/L. Kahn

Please note that because there are no reporting limits associated with hazardous waste characterizations or micro analyses, this summary does not include hits from these analyses if included in this work order.

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-A SC39680-01	01.0173025.00	Soil	25-Sep-17 10:20	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Prepared by method Volatiles													
	VOC Extraction	**Field extracted**		N/A			1	VOC Soil Extraction			MBR	1716565	
Volatile Organic Compounds by SW846 8260													
Prepared by method SW846 5035A Soil (low level)							Initial weight: 7.79 g						
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	< 4.34		µg/kg dry	4.34	2.20	1	SW846 8260C	28-Sep-17	29-Sep-17	MP	1716596	
67-64-1	Acetone	< 43.4		µg/kg dry	43.4	17.4	1	"	"	"	"	"	
107-13-1	Acrylonitrile	< 4.34		µg/kg dry	4.34	4.17	1	"	"	"	"	"	
71-43-2	Benzene	< 4.34		µg/kg dry	4.34	1.15	1	"	"	"	"	"	
108-86-1	Bromobenzene	< 4.34		µg/kg dry	4.34	1.16	1	"	"	"	"	"	
74-97-5	Bromochloromethane	< 4.34		µg/kg dry	4.34	2.19	1	"	"	"	"	"	
75-27-4	Bromodichloromethane	< 4.34		µg/kg dry	4.34	2.89	1	"	"	"	"	"	
75-25-2	Bromoform	< 4.34		µg/kg dry	4.34	4.14	1	"	"	"	"	"	
74-83-9	Bromomethane	< 8.68		µg/kg dry	8.68	3.92	1	"	"	"	"	"	
78-93-3	2-Butanone (MEK)	< 8.68		µg/kg dry	8.68	7.76	1	"	"	"	"	"	
104-51-8	n-Butylbenzene	< 4.34		µg/kg dry	4.34	1.24	1	"	"	"	"	"	
135-98-8	sec-Butylbenzene	< 4.34		µg/kg dry	4.34	0.79	1	"	"	"	"	"	
98-06-6	tert-Butylbenzene	< 4.34		µg/kg dry	4.34	0.97	1	"	"	"	"	"	
75-15-0	Carbon disulfide	< 8.68		µg/kg dry	8.68	2.78	1	"	"	"	"	"	
56-23-5	Carbon tetrachloride	< 4.34		µg/kg dry	4.34	3.55	1	"	"	"	"	"	
108-90-7	Chlorobenzene	< 4.34		µg/kg dry	4.34	1.36	1	"	"	"	"	"	
75-00-3	Chloroethane	< 8.68		µg/kg dry	8.68	2.41	1	"	"	"	"	"	
67-66-3	Chloroform	< 4.34		µg/kg dry	4.34	2.33	1	"	"	"	"	"	
74-87-3	Chloromethane	< 8.68		µg/kg dry	8.68	1.79	1	"	"	"	"	"	
95-49-8	2-Chlorotoluene	< 4.34		µg/kg dry	4.34	1.08	1	"	"	"	"	"	
106-43-4	4-Chlorotoluene	< 4.34		µg/kg dry	4.34	1.02	1	"	"	"	"	"	
96-12-8	1,2-Dibromo-3-chloropropane	< 8.68		µg/kg dry	8.68	6.27	1	"	"	"	"	"	
124-48-1	Dibromochloromethane	< 4.34		µg/kg dry	4.34	2.94	1	"	"	"	"	"	
106-93-4	1,2-Dibromoethane (EDB)	< 4.34		µg/kg dry	4.34	2.91	1	"	"	"	"	"	
74-95-3	Dibromomethane	< 4.34		µg/kg dry	4.34	2.26	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 4.34		µg/kg dry	4.34	1.13	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 4.34		µg/kg dry	4.34	0.94	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 4.34		µg/kg dry	4.34	1.28	1	"	"	"	"	"	
75-71-8	Dichlorodifluoromethane (Freon12)	< 8.68		µg/kg dry	8.68	1.64	1	"	"	"	"	"	
75-34-3	1,1-Dichloroethane	< 4.34		µg/kg dry	4.34	1.14	1	"	"	"	"	"	
107-06-2	1,2-Dichloroethane	< 4.34		µg/kg dry	4.34	1.55	1	"	"	"	"	"	
75-35-4	1,1-Dichloroethene	< 4.34		µg/kg dry	4.34	2.27	1	"	"	"	"	"	
156-59-2	cis-1,2-Dichloroethene	< 4.34		µg/kg dry	4.34	1.61	1	"	"	"	"	"	
156-60-5	trans-1,2-Dichloroethene	< 4.34		µg/kg dry	4.34	2.30	1	"	"	"	"	"	
78-87-5	1,2-Dichloropropane	< 4.34		µg/kg dry	4.34	2.27	1	"	"	"	"	"	
142-28-9	1,3-Dichloropropane	< 4.34		µg/kg dry	4.34	2.25	1	"	"	"	"	"	
594-20-7	2,2-Dichloropropane	< 4.34		µg/kg dry	4.34	2.05	1	"	"	"	"	"	
563-58-6	1,1-Dichloropropene	< 4.34		µg/kg dry	4.34	1.40	1	"	"	"	"	"	
10061-01-5	cis-1,3-Dichloropropene	< 4.34		µg/kg dry	4.34	2.62	1	"	"	"	"	"	
10061-02-6	trans-1,3-Dichloropropene	< 4.34		µg/kg dry	4.34	2.28	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-A SC39680-01	01.0173025.00	Soil	25-Sep-17 10:20	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Volatile Organic Compounds by SW846 8260													
							Initial weight: 7.79 g						
100-41-4	Ethylbenzene	< 4.34		µg/kg dry	4.34	0.62	1	SW846 8260C	28-Sep-17	29-Sep-17	MP	1716596	
87-68-3	Hexachlorobutadiene	< 4.34		µg/kg dry	4.34	2.18	1	"	"	"	"	"	
591-78-6	2-Hexanone (MBK)	< 8.68		µg/kg dry	8.68	5.32	1	"	"	"	"	"	
98-82-8	Isopropylbenzene	< 4.34		µg/kg dry	4.34	0.85	1	"	"	"	"	"	
99-87-6	4-Isopropyltoluene	< 4.34		µg/kg dry	4.34	0.93	1	"	"	"	"	"	
1634-04-4	Methyl tert-butyl ether	< 4.34		µg/kg dry	4.34	1.60	1	"	"	"	"	"	
108-10-1	4-Methyl-2-pentanone (MIBK)	< 8.68		µg/kg dry	8.68	2.23	1	"	"	"	"	"	
75-09-2	Methylene chloride	< 8.68		µg/kg dry	8.68	1.72	1	"	"	"	"	"	
91-20-3	Naphthalene	< 4.34		µg/kg dry	4.34	2.58	1	"	"	"	"	"	
103-65-1	n-Propylbenzene	< 4.34		µg/kg dry	4.34	0.70	1	"	"	"	"	"	
100-42-5	Styrene	< 4.34		µg/kg dry	4.34	0.87	1	"	"	"	"	"	
630-20-6	1,1,1,2-Tetrachloroethane	< 4.34		µg/kg dry	4.34	3.69	1	"	"	"	"	"	
79-34-5	1,1,2,2-Tetrachloroethane	< 4.34		µg/kg dry	4.34	3.67	1	"	"	"	"	"	
127-18-4	Tetrachloroethene	< 4.34		µg/kg dry	4.34	1.48	1	"	"	"	"	"	
108-88-3	Toluene	< 4.34		µg/kg dry	4.34	1.41	1	"	"	"	"	"	
87-61-6	1,2,3-Trichlorobenzene	< 4.34		µg/kg dry	4.34	1.52	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 4.34		µg/kg dry	4.34	3.20	1	"	"	"	"	"	
108-70-3	1,3,5-Trichlorobenzene	< 4.34		µg/kg dry	4.34	1.36	1	"	"	"	"	"	
71-55-6	1,1,1-Trichloroethane	< 4.34		µg/kg dry	4.34	1.44	1	"	"	"	"	"	
79-00-5	1,1,2-Trichloroethane	< 4.34		µg/kg dry	4.34	3.15	1	"	"	"	"	"	
79-01-6	Trichloroethene	< 4.34		µg/kg dry	4.34	1.18	1	"	"	"	"	"	
75-69-4	Trichlorofluoromethane (Freon 11)	< 4.34		µg/kg dry	4.34	2.34	1	"	"	"	"	"	
96-18-4	1,2,3-Trichloropropane	< 4.34		µg/kg dry	4.34	3.25	1	"	"	"	"	"	
95-63-6	1,2,4-Trimethylbenzene	< 4.34		µg/kg dry	4.34	1.05	1	"	"	"	"	"	
108-67-8	1,3,5-Trimethylbenzene	< 4.34		µg/kg dry	4.34	0.75	1	"	"	"	"	"	
75-01-4	Vinyl chloride	< 4.34		µg/kg dry	4.34	1.47	1	"	"	"	"	"	
179601-23-1	m,p-Xylene	< 8.68		µg/kg dry	8.68	0.78	1	"	"	"	"	"	
95-47-6	o-Xylene	< 4.34		µg/kg dry	4.34	1.21	1	"	"	"	"	"	
109-99-9	Tetrahydrofuran	< 8.68		µg/kg dry	8.68	6.84	1	"	"	"	"	"	
60-29-7	Ethyl ether	< 4.34		µg/kg dry	4.34	3.93	1	"	"	"	"	"	
994-05-8	Tert-amyl methyl ether	< 4.34		µg/kg dry	4.34	1.45	1	"	"	"	"	"	
637-92-3	Ethyl tert-butyl ether	< 4.34		µg/kg dry	4.34	2.34	1	"	"	"	"	"	
108-20-3	Di-isopropyl ether	< 4.34		µg/kg dry	4.34	0.81	1	"	"	"	"	"	
75-65-0	Tert-Butanol / butyl alcohol	< 43.4		µg/kg dry	43.4	28.4	1	"	"	"	"	"	
123-91-1	1,4-Dioxane	< 86.8		µg/kg dry	86.8	75.4	1	"	"	"	"	"	
110-57-6	trans-1,4-Dichloro-2-butene	< 21.7		µg/kg dry	21.7	9.90	1	"	"	"	"	"	
64-17-5	Ethanol	< 868		µg/kg dry	868	162	1	"	"	"	"	"	
Surrogate recoveries:													
460-00-4	*4-Bromofluorobenzene*	*97*			*70-130 %*			"	"	"	"	"	
2037-26-5	*Toluene-d8*	*99*			*70-130 %*			"	"	"	"	"	
17060-07-0	*1,2-Dichloroethane-d4*	*119*			*70-130 %*			"	"	"	"	"	
1868-53-7	*Dibromofluoromethane*	*101*			*70-130 %*			"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-A SC39680-01	01.0173025.00	Soil	25-Sep-17 10:20	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds Prepared by method SW846 3546													
83-32-9	Acenaphthene	< 75.3		µg/kg dry	75.3	37.5	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
208-96-8	Acenaphthylene	< 75.3		µg/kg dry	75.3	37.2	1	"	"	"	"	"	
62-53-3	Aniline	< 373		µg/kg dry	373	26.8	1	"	"	"	"	"	
120-12-7	Anthracene	< 75.3		µg/kg dry	75.3	36.0	1	"	"	"	"	"	
103-33-3	Azobenzene/Diphenyldiazene	< 373		µg/kg dry	373	36.7	1	"	"	"	"	"	
92-87-5	Benzidine	< 373		µg/kg dry	373	75.0	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 75.3		µg/kg dry	75.3	39.8	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 75.3		µg/kg dry	75.3	28.0	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 75.3		µg/kg dry	75.3	36.5	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 75.3		µg/kg dry	75.3	30.3	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 75.3		µg/kg dry	75.3	29.5	1	"	"	"	"	"	
65-85-0	Benzoic acid	< 373		µg/kg dry	373	78.3	1	"	"	"	"	"	
100-51-6	Benzyl alcohol	< 373		µg/kg dry	373	30.5	1	"	"	"	"	"	
111-91-1	Bis(2-chloroethoxy)methane	< 373		µg/kg dry	373	33.1	1	"	"	"	"	"	
111-44-4	Bis(2-chloroethyl)ether	< 189		µg/kg dry	189	27.0	1	"	"	"	"	"	
108-60-1	Bis(2-chloroisopropyl)ether	< 189		µg/kg dry	189	29.0	1	"	"	"	"	"	
117-81-7	Bis(2-ethylhexyl)phthalate	< 189		µg/kg dry	189	46.5	1	"	"	"	"	"	
101-55-3	4-Bromophenyl phenyl ether	< 373		µg/kg dry	373	34.9	1	"	"	"	"	"	
85-68-7	Butyl benzyl phthalate	< 373		µg/kg dry	373	43.5	1	"	"	"	"	"	
86-74-8	Carbazole	< 189		µg/kg dry	189	105	1	"	"	"	"	"	
59-50-7	4-Chloro-3-methylphenol	< 373		µg/kg dry	373	35.6	1	"	"	"	"	"	
106-47-8	4-Chloroaniline	< 189		µg/kg dry	189	40.8	1	"	"	"	"	"	
91-58-7	2-Chloronaphthalene	< 373		µg/kg dry	373	34.5	1	"	"	"	"	"	
95-57-8	2-Chlorophenol	< 189		µg/kg dry	189	33.5	1	"	"	"	"	"	
7005-72-3	4-Chlorophenyl phenyl ether	< 373		µg/kg dry	373	44.3	1	"	"	"	"	"	
218-01-9	Chrysene	< 75.3		µg/kg dry	75.3	37.6	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 75.3		µg/kg dry	75.3	28.9	1	"	"	"	"	"	
132-64-9	Dibenzofuran	< 189		µg/kg dry	189	28.7	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 373		µg/kg dry	373	32.5	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 373		µg/kg dry	373	32.5	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 373		µg/kg dry	373	34.6	1	"	"	"	"	"	
91-94-1	3,3´-Dichlorobenzidine	< 373		µg/kg dry	373	56.7	1	"	"	"	"	"	
120-83-2	2,4-Dichlorophenol	< 189		µg/kg dry	189	35.3	1	"	"	"	"	"	
84-66-2	Diethyl phthalate	< 373		µg/kg dry	373	46.1	1	"	"	"	"	"	
131-11-3	Dimethyl phthalate	< 373		µg/kg dry	373	40.8	1	"	"	"	"	"	
105-67-9	2,4-Dimethylphenol	< 373		µg/kg dry	373	26.7	1	"	"	"	"	"	
84-74-2	Di-n-butyl phthalate	< 373		µg/kg dry	373	39.5	1	"	"	"	"	"	
534-52-1	4,6-Dinitro-2-methylphenol	< 373		µg/kg dry	373	47.9	1	"	"	"	"	"	
51-28-5	2,4-Dinitrophenol	< 373		µg/kg dry	373	38.0	1	"	"	"	"	"	
121-14-2	2,4-Dinitrotoluene	< 189		µg/kg dry	189	73.0	1	"	"	"	"	"	
606-20-2	2,6-Dinitrotoluene	< 189		µg/kg dry	189	42.5	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-A SC39680-01	01.0173025.00	Soil	25-Sep-17 10:20	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds													
117-84-0	Di-n-octyl phthalate	< 373		µg/kg dry	373	42.1	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
206-44-0	Fluoranthene	< 75.3		µg/kg dry	75.3	39.8	1	"	"	"	"	"	
86-73-7	Fluorene	< 75.3		µg/kg dry	75.3	38.3	1	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 189		µg/kg dry	189	37.1	1	"	"	"	"	"	
87-68-3	Hexachlorobutadiene	< 189		µg/kg dry	189	45.1	1	"	"	"	"	"	
77-47-4	Hexachlorocyclopentadiene	< 189		µg/kg dry	189	25.6	1	"	"	"	"	"	
67-72-1	Hexachloroethane	< 189		µg/kg dry	189	40.7	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 75.3		µg/kg dry	75.3	27.1	1	"	"	"	"	"	
78-59-1	Isophorone	< 189		µg/kg dry	189	35.4	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 75.3		µg/kg dry	75.3	45.5	1	"	"	"	"	"	
95-48-7	2-Methylphenol	< 373		µg/kg dry	373	31.7	1	"	"	"	"	"	
108-39-4, 106-44-5	3 & 4-Methylphenol	< 373		µg/kg dry	373	36.0	1	"	"	"	"	"	
91-20-3	Naphthalene	< 75.3		µg/kg dry	75.3	35.1	1	"	"	"	"	"	
88-74-4	2-Nitroaniline	< 373		µg/kg dry	373	31.6	1	"	"	"	"	"	
99-09-2	3-Nitroaniline	< 373		µg/kg dry	373	50.9	1	"	"	"	"	"	
100-01-6	4-Nitroaniline	< 189		µg/kg dry	189	58.1	1	"	"	"	"	"	
98-95-3	Nitrobenzene	< 189		µg/kg dry	189	34.3	1	"	"	"	"	"	
88-75-5	2-Nitrophenol	< 189		µg/kg dry	189	31.3	1	"	"	"	"	"	
100-02-7	4-Nitrophenol	< 1490		µg/kg dry	1490	60.2	1	"	"	"	"	"	
62-75-9	N-Nitrosodimethylamine	< 189		µg/kg dry	189	35.0	1	"	"	"	"	"	
621-64-7	N-Nitrosodi-n-propylamine	< 189		µg/kg dry	189	36.7	1	"	"	"	"	"	
86-30-6	N-Nitrosodiphenylamine	< 373		µg/kg dry	373	40.4	1	"	"	"	"	"	
87-86-5	Pentachlorophenol	< 373		µg/kg dry	373	39.8	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 75.3		µg/kg dry	75.3	35.1	1	"	"	"	"	"	
108-95-2	Phenol	< 373		µg/kg dry	373	24.5	1	"	"	"	"	"	
129-00-0	Pyrene	< 75.3		µg/kg dry	75.3	42.0	1	"	"	"	"	"	
110-86-1	Pyridine	< 373		µg/kg dry	373	55.6	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 373		µg/kg dry	373	36.9	1	"	"	"	"	"	
90-12-0	1-Methylnaphthalene	< 75.3		µg/kg dry	75.3	37.0	1	"	"	"	"	"	
95-95-4	2,4,5-Trichlorophenol	< 373		µg/kg dry	373	33.5	1	"	"	"	"	"	
88-06-2	2,4,6-Trichlorophenol	< 189		µg/kg dry	189	33.6	1	"	"	"	"	"	
82-68-8	Pentachloronitrobenzene	< 373		µg/kg dry	373	58.8	1	"	"	"	"	"	
95-94-3	1,2,4,5-Tetrachlorobenzene	< 373		µg/kg dry	373	36.1	1	"	"	"	"	"	
Surrogate recoveries:													
321-60-8	*2-Fluorobiphenyl*	*75*			*30-130 %*			"	"	"	"	"	
367-12-4	*2-Fluorophenol*	*66*			*30-130 %*			"	"	"	"	"	
4165-60-0	*Nitrobenzene-d5*	*63*			*30-130 %*			"	"	"	"	"	
4165-62-2	*Phenol-d5*	*72*			*30-130 %*			"	"	"	"	"	
1718-51-0	*Terphenyl-dl4*	*95*			*30-130 %*			"	"	"	"	"	
118-79-6	*2,4,6-Tribromophenol*	*87*			*30-130 %*			"	"	"	"	"	
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-A SC39680-01	01.0173025.00	Soil	25-Sep-17 10:20	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													
	C9-C18 Aliphatic Hydrocarbons	< 11.2		mg/kg dry	11.2	2.28	1	MADEP EPH 5/2004 R	02-Oct-17	05-Oct-17	EDT	1716783	
	C19-C36 Aliphatic Hydrocarbons	< 11.2		mg/kg dry	11.2	3.02	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	< 11.2		mg/kg dry	11.2	4.70	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	< 11.2		mg/kg dry	11.2	4.70	1	"	"	"	"	"	
91-20-3	Naphthalene	< 0.372		mg/kg dry	0.372	0.137	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 0.372		mg/kg dry	0.372	0.125	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.372		mg/kg dry	0.372	0.141	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.372		mg/kg dry	0.372	0.142	1	"	"	"	"	"	
86-73-7	Fluorene	< 0.372		mg/kg dry	0.372	0.141	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 0.372		mg/kg dry	0.372	0.135	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.372		mg/kg dry	0.372	0.136	1	"	"	"	"	"	
206-44-0	Fluoranthene	< 0.372		mg/kg dry	0.372	0.141	1	"	"	"	"	"	
129-00-0	Pyrene	< 0.372		mg/kg dry	0.372	0.143	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.372		mg/kg dry	0.372	0.160	1	"	"	"	"	"	
218-01-9	Chrysene	< 0.372		mg/kg dry	0.372	0.152	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.372		mg/kg dry	0.372	0.192	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.372		mg/kg dry	0.372	0.197	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.372		mg/kg dry	0.372	0.198	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.372		mg/kg dry	0.372	0.240	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.372		mg/kg dry	0.372	0.239	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.372		mg/kg dry	0.372	0.232	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*60*			*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*61*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*57*			*40-140 %*			"	"	"	"	"	
Fingerprinting by GC													
8006-61-9	Gasoline	< 30.1		mg/kg dry	30.1	30.1	1	SW846 8100Mod.	04-Oct-17	06-Oct-17	SM	1716919	
68476-30-2	Fuel Oil #2	< 30.1		mg/kg dry	30.1	20.1	1	"	"	"	"	"	
68476-31-3	Fuel Oil #4	< 30.1		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
68553-00-4	Fuel Oil #6	< 30.1		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
M09800000	Motor Oil	< 30.1		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
8032-32-4	Ligroin	< 30.1		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
J00100000	Aviation Fuel	< 30.1		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
	Hydraulic Oil	< 30.1		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
	Dielectric Fluid	< 30.1		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
	Unidentified	**70.7**		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
	Other Oil	**Calculated as**		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	**70.7**		mg/kg dry	30.1	30.1	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*138*			*40-140 %*			"	"	"	"	"	

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Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-A SC39680-01	01.0173025.00	Soil	25-Sep-17 10:20	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
General Chemistry Parameters													
	% Solids	**87.9**		%			1	SM2540 G (11) Mod.	27-Sep-17	27-Sep-17	MBR	1716554	
	Specific Conductance (EC)	**35.1**		uS/cm	10.0	10.0	1	SM22 2510B	28-Sep-17	28-Sep-17	BD	1716586	
Prepared by method General Preparation SVOC													
	Moisture	**12.1**		%			1	SM2540 G (11) Mod. calculation	27-Sep-17	28-Sep-17	CMB	1716555	
Toxicity Characteristics													
Reactivity Cyanide/Sulfide													
	Reactivity	**See Narrative**		mg/kg dry			1	SW846 Ch. 7.3	29-Sep-17	29-Sep-17	TN	1716697	
57-12-5	Reactive Cyanide	< 24.5		mg/kg dry	24.5	24.5	1	"	"	"	"	"	
18496-25-8	Reactive Sulfide	< 48.9		mg/kg dry	48.9	48.9	1	"	"	"	"	"	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 404410-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7440-38-2	Arsenic	**1.90**		mg/Kg	0.80	0.80	1	SW6010C	05-Oct-17	06-Oct-17 22:17	M-CT007	404410A	
7440-43-9	Cadmium	< 0.40		mg/Kg	0.40	0.40	1	"	"	"	"	"	
7440-47-3	Chromium	**12.4**		mg/Kg	0.40	0.40	1	"	"	"	"	"	
7440-50-8	Copper	**9.75**		mg/Kg	0.40	0.40	1	"	"	"	"	"	
7439-92-1	Lead	**8.73**		mg/Kg	0.40	0.40	1	"	"	"	"	"	
7440-02-0	Nickel	**10.2**		mg/Kg	0.40	0.40	1	"	"	"	"	"	
7440-66-6	Zinc	**46.1**	Q1	mg/Kg	0.40	0.40	1	"	"	"	"	"	
Prepared by method 404534-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7439-97-6	Mercury	< 0.03		mg/Kg	0.03	0.03	1	SW7471B	09-Oct-17	09-Oct-17 08:41	M-CT007	404534A	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 403367-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
72-54-8	4,4' -DDD	< 7.5		ug/Kg	7.5	7.5	2	SW8081B	28-Sep-17	29-Sep-17 19:02	M-CT007	403367A	
72-55-9	4,4' -DDE	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
50-29-3	4,4' -DDT	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
319-84-6	a-BHC	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
15972-60-8	Alachlor	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
309-00-2	Aldrin	< 3.8		ug/Kg	3.8	3.8	2	"	"	"	"	"	
319-85-7	b-BHC	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
57-74-9	Chlordane	< 38		ug/Kg	38	38	2	"	"	"	"	"	
319-86-8	d-BHC	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
60-57-1	Dieldrin	< 3.8		ug/Kg	3.8	3.8	2	"	"	"	"	"	
959-98-8	Endosulfan I	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
33213-65-9	Endosulfan II	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
1031-07-8	Endosulfan sulfate	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
72-20-8	Endrin	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
7421-93-4	Endrin aldehyde	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
53494-70-5	Endrin ketone	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-A SC39680-01	01.0173025.00	Soil	25-Sep-17 10:20	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Subcontracted Analyses													
Subcontracted Analyses													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
58-89-9	g-BHC	< 1.5		ug/Kg	1.5	1.5	2	SW8081B	28-Sep-17	29-Sep-17 19:02	M-CT007	403367A	
76-44-8	Heptachlor	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
1024-57-3	Heptachlor epoxide	< 7.5		ug/Kg	7.5	7.5	2	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 3.8		ug/Kg	3.8	3.8	2	"	"	"	"	"	
72-43-5	Methoxychlor	< 38		ug/Kg	38	38	2	"	"	"	"	"	
8001-35-2	Toxaphene	< 150		ug/Kg	150	150	2	"	"	"	"	"	
Surrogate recoveries:													
2051-24-3	*% DCBP*	*75*			*30-150 %*			"	"	"	"	"	
877-09-8	*% TCMX*	*72*			*30-150 %*			"	"	"	"	"	
Subcontracted Analyses													
Prepared by method 403427-										Methylation date: 28-Sep-17			
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
93-76-5	2,4,5-T	< 94		ug/Kg	94	94	10	SW8151A	"	29-Sep-17 23:43	M-CT007	403427A	
93-72-1	2,4,5-TP (Silvex)	< 94		ug/Kg	94	94	10	"	"	"	"	"	
94-75-7	2,4-D	< 190		ug/Kg	190	190	10	"	"	"	"	"	
94-82-6	2,4-DB	< 940		ug/Kg	940	940	10	"	"	"	"	"	
75-99-0	Dalapon	< 94		ug/Kg	94	94	10	"	"	"	"	"	
1918-00-9	Dicamba	< 94		ug/Kg	94	94	10	"	"	"	"	"	
120-36-5	Dichloroprop	< 140		ug/Kg	140	140	10	"	"	"	"	"	
88-85-7	Dinoseb	< 94		ug/Kg	94	94	10	"	"	"	"	"	
94-74-6	MCPA	< 28000		ug/Kg	28000	28000	10	"	"	"	"	"	
7085-19-0	MCPP	< 28000		ug/Kg	28000	28000	10	"	"	"	"	"	
Surrogate recoveries:													
19719-28-9	*% DCAA*	*103*			*30-150 %*			"	"	"	"	"	
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Percent Solid	**88**		%			1	SW846-%Solid	25-Sep-17 10:20	28-Sep-17 21:50	M-CT007	'[none]'	
Prepared by method 403834-SW9060A/													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Tot.Org.Carbon	**6,900**	Q1a	mg/kg	100	100	1	SW9060A/L. Kahn	"	02-Oct-17 17:08	M-CT007	403834A	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-B SC39680-02	01.0173025.00	Soil	25-Sep-17 11:50	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Prepared by method Volatiles													
	VOC Extraction	**Field extracted**		N/A			1	VOC Soil Extraction			MBR	1716565	
Volatile Organic Compounds by SW846 8260													
Prepared by method SW846 5035A Soil (low level)							Initial weight: 7.41 g						
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	< 5.53		µg/kg dry	5.53	2.80	1	SW846 8260C	02-Oct-17	02-Oct-17	MP	1716738	
67-64-1	Acetone	< 55.3		µg/kg dry	55.3	22.1	1	"	"	"	"	"	
107-13-1	Acrylonitrile	< 5.53		µg/kg dry	5.53	5.31	1	"	"	"	"	"	
71-43-2	Benzene	< 5.53		µg/kg dry	5.53	1.46	1	"	"	"	"	"	
108-86-1	Bromobenzene	< 5.53		µg/kg dry	5.53	1.48	1	"	"	"	"	"	
74-97-5	Bromochloromethane	< 5.53		µg/kg dry	5.53	2.79	1	"	"	"	"	"	
75-27-4	Bromodichloromethane	< 5.53		µg/kg dry	5.53	3.69	1	"	"	"	"	"	
75-25-2	Bromoform	< 5.53		µg/kg dry	5.53	5.27	1	"	"	"	"	"	
74-83-9	Bromomethane	< 11.1		µg/kg dry	11.1	4.99	1	"	"	"	"	"	
78-93-3	2-Butanone (MEK)	< 11.1		µg/kg dry	11.1	9.88	1	"	"	"	"	"	
104-51-8	n-Butylbenzene	< 5.53		µg/kg dry	5.53	1.58	1	"	"	"	"	"	
135-98-8	sec-Butylbenzene	< 5.53		µg/kg dry	5.53	1.01	1	"	"	"	"	"	
98-06-6	tert-Butylbenzene	< 5.53		µg/kg dry	5.53	1.24	1	"	"	"	"	"	
75-15-0	Carbon disulfide	< 11.1		µg/kg dry	11.1	3.54	1	"	"	"	"	"	
56-23-5	Carbon tetrachloride	< 5.53		µg/kg dry	5.53	4.52	1	"	"	"	"	"	
108-90-7	Chlorobenzene	< 5.53		µg/kg dry	5.53	1.73	1	"	"	"	"	"	
75-00-3	Chloroethane	< 11.1		µg/kg dry	11.1	3.07	1	"	"	"	"	"	
67-66-3	Chloroform	< 5.53		µg/kg dry	5.53	2.97	1	"	"	"	"	"	
74-87-3	Chloromethane	< 11.1		µg/kg dry	11.1	2.28	1	"	"	"	"	"	
95-49-8	2-Chlorotoluene	< 5.53		µg/kg dry	5.53	1.38	1	"	"	"	"	"	
106-43-4	4-Chlorotoluene	< 5.53		µg/kg dry	5.53	1.30	1	"	"	"	"	"	
96-12-8	1,2-Dibromo-3-chloropropane	< 11.1		µg/kg dry	11.1	7.99	1	"	"	"	"	"	
124-48-1	Dibromochloromethane	< 5.53		µg/kg dry	5.53	3.75	1	"	"	"	"	"	
106-93-4	1,2-Dibromoethane (EDB)	< 5.53		µg/kg dry	5.53	3.71	1	"	"	"	"	"	
74-95-3	Dibromomethane	< 5.53		µg/kg dry	5.53	2.87	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 5.53		µg/kg dry	5.53	1.44	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 5.53		µg/kg dry	5.53	1.20	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 5.53		µg/kg dry	5.53	1.64	1	"	"	"	"	"	
75-71-8	Dichlorodifluoromethane (Freon12)	< 11.1		µg/kg dry	11.1	2.09	1	"	"	"	"	"	
75-34-3	1,1-Dichloroethane	< 5.53		µg/kg dry	5.53	1.45	1	"	"	"	"	"	
107-06-2	1,2-Dichloroethane	< 5.53		µg/kg dry	5.53	1.98	1	"	"	"	"	"	
75-35-4	1,1-Dichloroethene	< 5.53		µg/kg dry	5.53	2.89	1	"	"	"	"	"	
156-59-2	cis-1,2-Dichloroethene	< 5.53		µg/kg dry	5.53	2.05	1	"	"	"	"	"	
156-60-5	trans-1,2-Dichloroethene	< 5.53		µg/kg dry	5.53	2.93	1	"	"	"	"	"	
78-87-5	1,2-Dichloropropane	< 5.53		µg/kg dry	5.53	2.90	1	"	"	"	"	"	
142-28-9	1,3-Dichloropropane	< 5.53		µg/kg dry	5.53	2.86	1	"	"	"	"	"	
594-20-7	2,2-Dichloropropane	< 5.53		µg/kg dry	5.53	2.61	1	"	"	"	"	"	
563-58-6	1,1-Dichloropropene	< 5.53		µg/kg dry	5.53	1.78	1	"	"	"	"	"	
10061-01-5	cis-1,3-Dichloropropene	< 5.53		µg/kg dry	5.53	3.33	1	"	"	"	"	"	
10061-02-6	trans-1,3-Dichloropropene	< 5.53		µg/kg dry	5.53	2.90	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-B	01.0173025.00	Soil	25-Sep-17 11:50	26-Sep-17
SC39680-02				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Volatile Organic Compounds by SW846 8260													
							Initial weight: 7.41 g						
100-41-4	Ethylbenzene	< 5.53		µg/kg dry	5.53	0.80	1	SW846 8260C	02-Oct-17	02-Oct-17	MP	1716738	
87-68-3	Hexachlorobutadiene	< 5.53		µg/kg dry	5.53	2.77	1	"	"	"	"	"	
591-78-6	2-Hexanone (MBK)	< 11.1		µg/kg dry	11.1	6.78	1	"	"	"	"	"	
98-82-8	Isopropylbenzene	< 5.53		µg/kg dry	5.53	1.09	1	"	"	"	"	"	
99-87-6	4-Isopropyltoluene	< 5.53		µg/kg dry	5.53	1.19	1	"	"	"	"	"	
1634-04-4	Methyl tert-butyl ether	< 5.53		µg/kg dry	5.53	2.03	1	"	"	"	"	"	
108-10-1	4-Methyl-2-pentanone (MIBK)	< 11.1		µg/kg dry	11.1	2.84	1	"	"	"	"	"	
75-09-2	Methylene chloride	< 11.1		µg/kg dry	11.1	2.19	1	"	"	"	"	"	
91-20-3	Naphthalene	< 5.53		µg/kg dry	5.53	3.29	1	"	"	"	"	"	
103-65-1	n-Propylbenzene	< 5.53		µg/kg dry	5.53	0.90	1	"	"	"	"	"	
100-42-5	Styrene	< 5.53		µg/kg dry	5.53	1.11	1	"	"	"	"	"	
630-20-6	1,1,1,2-Tetrachloroethane	< 5.53		µg/kg dry	5.53	4.70	1	"	"	"	"	"	
79-34-5	1,1,2,2-Tetrachloroethane	< 5.53		µg/kg dry	5.53	4.68	1	"	"	"	"	"	
127-18-4	Tetrachloroethene	< 5.53		µg/kg dry	5.53	1.89	1	"	"	"	"	"	
108-88-3	Toluene	< 5.53		µg/kg dry	5.53	1.79	1	"	"	"	"	"	
87-61-6	1,2,3-Trichlorobenzene	< 5.53		µg/kg dry	5.53	1.94	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 5.53		µg/kg dry	5.53	4.07	1	"	"	"	"	"	
108-70-3	1,3,5-Trichlorobenzene	< 5.53		µg/kg dry	5.53	1.74	1	"	"	"	"	"	
71-55-6	1,1,1-Trichloroethane	< 5.53		µg/kg dry	5.53	1.83	1	"	"	"	"	"	
79-00-5	1,1,2-Trichloroethane	< 5.53		µg/kg dry	5.53	4.01	1	"	"	"	"	"	
79-01-6	Trichloroethene	< 5.53		µg/kg dry	5.53	1.51	1	"	"	"	"	"	
75-69-4	Trichlorofluoromethane (Freon 11)	< 5.53		µg/kg dry	5.53	2.98	1	"	"	"	"	"	
96-18-4	1,2,3-Trichloropropane	< 5.53		µg/kg dry	5.53	4.14	1	"	"	"	"	"	
95-63-6	1,2,4-Trimethylbenzene	< 5.53		µg/kg dry	5.53	1.34	1	"	"	"	"	"	
108-67-8	1,3,5-Trimethylbenzene	< 5.53		µg/kg dry	5.53	0.95	1	"	"	"	"	"	
75-01-4	Vinyl chloride	< 5.53		µg/kg dry	5.53	1.87	1	"	"	"	"	"	
179601-23-1	m,p-Xylene	< 11.1		µg/kg dry	11.1	0.99	1	"	"	"	"	"	
95-47-6	o-Xylene	< 5.53		µg/kg dry	5.53	1.55	1	"	"	"	"	"	
109-99-9	Tetrahydrofuran	< 11.1		µg/kg dry	11.1	8.71	1	"	"	"	"	"	
60-29-7	Ethyl ether	< 5.53		µg/kg dry	5.53	5.01	1	"	"	"	"	"	
994-05-8	Tert-amyl methyl ether	< 5.53		µg/kg dry	5.53	1.85	1	"	"	"	"	"	
637-92-3	Ethyl tert-butyl ether	< 5.53		µg/kg dry	5.53	2.98	1	"	"	"	"	"	
108-20-3	Di-isopropyl ether	< 5.53		µg/kg dry	5.53	1.03	1	"	"	"	"	"	
75-65-0	Tert-Butanol / butyl alcohol	< 55.3		µg/kg dry	55.3	36.2	1	"	"	"	"	"	
123-91-1	1,4-Dioxane	< 111		µg/kg dry	111	96.0	1	"	"	"	"	"	
110-57-6	trans-1,4-Dichloro-2-butene	< 27.6		µg/kg dry	27.6	12.6	1	"	"	"	"	"	
64-17-5	Ethanol	< 1110		µg/kg dry	1110	206	1	"	"	"	"	"	
Surrogate recoveries:													
460-00-4	*4-Bromofluorobenzene*	*100*			*70-130 %*			"	"	"	"	"	
2037-26-5	*Toluene-d8*	*99*			*70-130 %*			"	"	"	"	"	
17060-07-0	*1,2-Dichloroethane-d4*	*107*			*70-130 %*			"	"	"	"	"	
1868-53-7	*Dibromofluoromethane*	*98*			*70-130 %*			"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-B SC39680-02	01.0173025.00	Soil	25-Sep-17 11:50	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds Prepared by method SW846 3546													
83-32-9	Acenaphthene	< 83.1		µg/kg dry	83.1	41.4	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
208-96-8	Acenaphthylene	< 83.1		µg/kg dry	83.1	41.0	1	"	"	"	"	"	
62-53-3	Aniline	< 411		µg/kg dry	411	29.5	1	"	"	"	"	"	
120-12-7	Anthracene	< 83.1		µg/kg dry	83.1	39.8	1	"	"	"	"	"	
103-33-3	Azobenzene/Diphenyldiazene	< 411		µg/kg dry	411	40.4	1	"	"	"	"	"	
92-87-5	Benzidine	< 411		µg/kg dry	411	82.8	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 83.1		µg/kg dry	83.1	43.9	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 83.1		µg/kg dry	83.1	30.9	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 83.1		µg/kg dry	83.1	40.3	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 83.1		µg/kg dry	83.1	33.4	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 83.1		µg/kg dry	83.1	32.5	1	"	"	"	"	"	
65-85-0	Benzoic acid	< 411		µg/kg dry	411	86.4	1	"	"	"	"	"	
100-51-6	Benzyl alcohol	< 411		µg/kg dry	411	33.7	1	"	"	"	"	"	
111-91-1	Bis(2-chloroethoxy)methane	< 411		µg/kg dry	411	36.5	1	"	"	"	"	"	
111-44-4	Bis(2-chloroethyl)ether	< 208		µg/kg dry	208	29.8	1	"	"	"	"	"	
108-60-1	Bis(2-chloroisopropyl)ether	< 208		µg/kg dry	208	32.0	1	"	"	"	"	"	
117-81-7	Bis(2-ethylhexyl)phthalate	< 208		µg/kg dry	208	51.3	1	"	"	"	"	"	
101-55-3	4-Bromophenyl phenyl ether	< 411		µg/kg dry	411	38.5	1	"	"	"	"	"	
85-68-7	Butyl benzyl phthalate	< 411		µg/kg dry	411	48.0	1	"	"	"	"	"	
86-74-8	Carbazole	< 208		µg/kg dry	208	116	1	"	"	"	"	"	
59-50-7	4-Chloro-3-methylphenol	< 411		µg/kg dry	411	39.3	1	"	"	"	"	"	
106-47-8	4-Chloroaniline	< 208		µg/kg dry	208	45.0	1	"	"	"	"	"	
91-58-7	2-Chloronaphthalene	< 411		µg/kg dry	411	38.0	1	"	"	"	"	"	
95-57-8	2-Chlorophenol	< 208		µg/kg dry	208	37.0	1	"	"	"	"	"	
7005-72-3	4-Chlorophenyl phenyl ether	< 411		µg/kg dry	411	48.9	1	"	"	"	"	"	
218-01-9	Chrysene	< 83.1		µg/kg dry	83.1	41.5	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 83.1		µg/kg dry	83.1	31.9	1	"	"	"	"	"	
132-64-9	Dibenzofuran	< 208		µg/kg dry	208	31.7	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 411		µg/kg dry	411	35.9	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 411		µg/kg dry	411	35.9	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 411		µg/kg dry	411	38.1	1	"	"	"	"	"	
91-94-1	3,3´-Dichlorobenzidine	< 411		µg/kg dry	411	62.6	1	"	"	"	"	"	
120-83-2	2,4-Dichlorophenol	< 208		µg/kg dry	208	38.9	1	"	"	"	"	"	
84-66-2	Diethyl phthalate	< 411		µg/kg dry	411	50.8	1	"	"	"	"	"	
131-11-3	Dimethyl phthalate	< 411		µg/kg dry	411	45.0	1	"	"	"	"	"	
105-67-9	2,4-Dimethylphenol	< 411		µg/kg dry	411	29.4	1	"	"	"	"	"	
84-74-2	Di-n-butyl phthalate	< 411		µg/kg dry	411	43.6	1	"	"	"	"	"	
534-52-1	4,6-Dinitro-2-methylphenol	< 411		µg/kg dry	411	52.8	1	"	"	"	"	"	
51-28-5	2,4-Dinitrophenol	< 411		µg/kg dry	411	41.9	1	"	"	"	"	"	
121-14-2	2,4-Dinitrotoluene	< 208		µg/kg dry	208	80.5	1	"	"	"	"	"	
606-20-2	2,6-Dinitrotoluene	< 208		µg/kg dry	208	46.9	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-B	01.0173025.00	Soil	25-Sep-17 11:50	26-Sep-17
SC39680-02				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds													
117-84-0	Di-n-octyl phthalate	< 411		µg/kg dry	411	46.5	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
206-44-0	Fluoranthene	< 83.1		µg/kg dry	83.1	43.9	1	"	"	"	"	"	
86-73-7	Fluorene	< 83.1		µg/kg dry	83.1	42.2	1	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 208		µg/kg dry	208	41.0	1	"	"	"	"	"	
87-68-3	Hexachlorobutadiene	< 208		µg/kg dry	208	49.7	1	"	"	"	"	"	
77-47-4	Hexachlorocyclopentadiene	< 208		µg/kg dry	208	28.3	1	"	"	"	"	"	
67-72-1	Hexachloroethane	< 208		µg/kg dry	208	44.9	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 83.1		µg/kg dry	83.1	29.9	1	"	"	"	"	"	
78-59-1	Isophorone	< 208		µg/kg dry	208	39.0	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 83.1		µg/kg dry	83.1	50.2	1	"	"	"	"	"	
95-48-7	2-Methylphenol	< 411		µg/kg dry	411	35.0	1	"	"	"	"	"	
108-39-4, 106-44-5	3 & 4-Methylphenol	< 411		µg/kg dry	411	39.8	1	"	"	"	"	"	
91-20-3	Naphthalene	< 83.1		µg/kg dry	83.1	38.8	1	"	"	"	"	"	
88-74-4	2-Nitroaniline	< 411		µg/kg dry	411	34.9	1	"	"	"	"	"	
99-09-2	3-Nitroaniline	< 411		µg/kg dry	411	56.2	1	"	"	"	"	"	
100-01-6	4-Nitroaniline	< 208		µg/kg dry	208	64.1	1	"	"	"	"	"	
98-95-3	Nitrobenzene	< 208		µg/kg dry	208	37.9	1	"	"	"	"	"	
88-75-5	2-Nitrophenol	< 208		µg/kg dry	208	34.5	1	"	"	"	"	"	
100-02-7	4-Nitrophenol	< 1650		µg/kg dry	1650	66.5	1	"	"	"	"	"	
62-75-9	N-Nitrosodimethylamine	< 208		µg/kg dry	208	38.6	1	"	"	"	"	"	
621-64-7	N-Nitrosodi-n-propylamine	< 208		µg/kg dry	208	40.5	1	"	"	"	"	"	
86-30-6	N-Nitrosodiphenylamine	< 411		µg/kg dry	411	44.6	1	"	"	"	"	"	
87-86-5	Pentachlorophenol	< 411		µg/kg dry	411	43.9	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 83.1		µg/kg dry	83.1	38.7	1	"	"	"	"	"	
108-95-2	Phenol	< 411		µg/kg dry	411	27.1	1	"	"	"	"	"	
129-00-0	Pyrene	< 83.1		µg/kg dry	83.1	46.4	1	"	"	"	"	"	
110-86-1	Pyridine	< 411		µg/kg dry	411	61.3	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 411		µg/kg dry	411	40.8	1	"	"	"	"	"	
90-12-0	1-Methylnaphthalene	< 83.1		µg/kg dry	83.1	40.9	1	"	"	"	"	"	
95-95-4	2,4,5-Trichlorophenol	< 411		µg/kg dry	411	37.0	1	"	"	"	"	"	
88-06-2	2,4,6-Trichlorophenol	< 208		µg/kg dry	208	37.1	1	"	"	"	"	"	
82-68-8	Pentachloronitrobenzene	< 411		µg/kg dry	411	64.9	1	"	"	"	"	"	
95-94-3	1,2,4,5-Tetrachlorobenzene	< 411		µg/kg dry	411	39.9	1	"	"	"	"	"	
Surrogate recoveries:													
321-60-8	*2-Fluorobiphenyl*	*57*			*30-130 %*			"	"	"	"	"	
367-12-4	*2-Fluorophenol*	*50*			*30-130 %*			"	"	"	"	"	
4165-60-0	*Nitrobenzene-d5*	*48*			*30-130 %*			"	"	"	"	"	
4165-62-2	*Phenol-d5*	*59*			*30-130 %*			"	"	"	"	"	
1718-51-0	*Terphenyl-dl4*	*82*			*30-130 %*			"	"	"	"	"	
118-79-6	*2,4,6-Tribromophenol*	*73*			*30-130 %*			"	"	"	"	"	
Extractable Petroleum Hydrocarbons													
MADEP EPH													
Prepared by method SW846 3546													

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-B SC39680-02	01.0173025.00	Soil	25-Sep-17 11:50	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													
	C9-C18 Aliphatic Hydrocarbons	< 12.3		mg/kg dry	12.3	2.52	1	MADEP EPH 5/2004 R	02-Oct-17	05-Oct-17	EDT	1716783	
	C19-C36 Aliphatic Hydrocarbons	< 12.3		mg/kg dry	12.3	3.33	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	< 12.3		mg/kg dry	12.3	5.19	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	< 12.3		mg/kg dry	12.3	5.19	1	"	"	"	"	"	
91-20-3	Naphthalene	< 0.410		mg/kg dry	0.410	0.152	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 0.410		mg/kg dry	0.410	0.138	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.410		mg/kg dry	0.410	0.155	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.410		mg/kg dry	0.410	0.157	1	"	"	"	"	"	
86-73-7	Fluorene	< 0.410		mg/kg dry	0.410	0.155	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 0.410		mg/kg dry	0.410	0.149	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.410		mg/kg dry	0.410	0.150	1	"	"	"	"	"	
206-44-0	Fluoranthene	< 0.410		mg/kg dry	0.410	0.155	1	"	"	"	"	"	
129-00-0	Pyrene	< 0.410		mg/kg dry	0.410	0.158	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.410		mg/kg dry	0.410	0.176	1	"	"	"	"	"	
218-01-9	Chrysene	< 0.410		mg/kg dry	0.410	0.168	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.410		mg/kg dry	0.410	0.212	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.410		mg/kg dry	0.410	0.217	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.410		mg/kg dry	0.410	0.218	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.410		mg/kg dry	0.410	0.265	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.410		mg/kg dry	0.410	0.264	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.410		mg/kg dry	0.410	0.256	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*54*			*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*50*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*52*			*40-140 %*			"	"	"	"	"	
Fingerprinting by GC													
8006-61-9	Gasoline	< 33.2		mg/kg dry	33.2	33.2	1	SW846 8100Mod.	04-Oct-17	06-Oct-17	SM	1716919	
68476-30-2	Fuel Oil #2	< 33.2		mg/kg dry	33.2	22.1	1	"	"	"	"	"	
68476-31-3	Fuel Oil #4	< 33.2		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
68553-00-4	Fuel Oil #6	< 33.2		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
M09800000	Motor Oil	< 33.2		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
8032-32-4	Ligroin	< 33.2		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
J00100000	Aviation Fuel	< 33.2		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
	Hydraulic Oil	< 33.2		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
	Dielectric Fluid	< 33.2		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
	Unidentified	**85.6**		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
	Other Oil	**Calculated as**		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	**85.6**		mg/kg dry	33.2	33.2	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*133*			*40-140 %*			"	"	"	"	"	

This laboratory report is not valid without an authorized signature on the cover page.

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-B SC39680-02	01.0173025.00	Soil	25-Sep-17 11:50	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
General Chemistry Parameters													
	% Solids	**79.6**		%			1	SM2540 G (11) Mod.	27-Sep-17	27-Sep-17	MBR	1716554	
	Specific Conductance (EC)	**46.5**		uS/cm	10.0	10.0	1	SM22 2510B	28-Sep-17	28-Sep-17	BD	1716586	
Prepared by method General Preparation SVOC													
	Moisture	**20.4**		%			1	SM2540 G (11) Mod. calculation	27-Sep-17	28-Sep-17	CMB	1716555	
Toxicity Characteristics													
Reactivity Cyanide/Sulfide													
	Reactivity	**See Narrative**		mg/kg dry			1	SW846 Ch. 7.3	29-Sep-17	29-Sep-17	TN	1716697	
57-12-5	Reactive Cyanide	< 24.9		mg/kg dry	24.9	24.9	1	"	"	"	"	"	
18496-25-8	Reactive Sulfide	< 49.8		mg/kg dry	49.8	49.8	1	"	"	"	"	"	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 404410-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7440-38-2	Arsenic	**1.21**		mg/Kg	0.75	0.75	1	SW6010C	05-Oct-17	06-Oct-17 22:50	M-CT007	404410A	
7440-43-9	Cadmium	< 0.38		mg/Kg	0.38	0.38	1	"	"	"	"	"	
7440-47-3	Chromium	**5.61**		mg/Kg	0.38	0.38	1	"	"	"	"	"	
7440-50-8	Copper	**3.05**		mg/Kg	0.38	0.38	1	"	"	"	"	"	
7439-92-1	Lead	**6.87**		mg/Kg	0.38	0.38	1	"	"	"	"	"	
7440-02-0	Nickel	**4.69**		mg/Kg	0.38	0.38	1	"	"	"	"	"	
7440-66-6	Zinc	**23.1**	Q1	mg/Kg	0.38	0.38	1	"	"	"	"	"	
Prepared by method 404534-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7439-97-6	Mercury	**0.09**		mg/Kg	0.03	0.03	1	SW7471B	09-Oct-17	09-Oct-17 08:44	M-CT007	404534A	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 403367-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
72-54-8	4,4' -DDD	< 2.1		ug/Kg	2.1	2.1	2	SW8081B	28-Sep-17	29-Sep-17 19:58	M-CT007	403367A	
72-55-9	4,4' -DDE	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
50-29-3	4,4' -DDT	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
319-84-6	a-BHC	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
15972-60-8	Alachlor	< 8.4		ug/Kg	8.4	8.4	2	"	"	"	"	"	
309-00-2	Aldrin	< 4.2		ug/Kg	4.2	4.2	2	"	"	"	"	"	
319-85-7	b-BHC	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
57-74-9	Chlordane	< 42		ug/Kg	42	42	2	"	"	"	"	"	
319-86-8	d-BHC	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
60-57-1	Dieldrin	< 4.2		ug/Kg	4.2	4.2	2	"	"	"	"	"	
959-98-8	Endosulfan I	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
33213-65-9	Endosulfan II	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
1031-07-8	Endosulfan sulfate	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
72-20-8	Endrin	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
7421-93-4	Endrin aldehyde	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
53494-70-5	Endrin ketone	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-B SC39680-02	01.0173025.00	Soil	25-Sep-17 11:50	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Subcontracted Analyses													
Subcontracted Analyses													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
58-89-9	g-BHC	< 1.7		ug/Kg	1.7	1.7	2	SW8081B	28-Sep-17	29-Sep-17 19:58	M-CT007	403367A	
76-44-8	Heptachlor	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
1024-57-3	Heptachlor epoxide	< 2.1		ug/Kg	2.1	2.1	2	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 4.2		ug/Kg	4.2	4.2	2	"	"	"	"	"	
72-43-5	Methoxychlor	< 42		ug/Kg	42	42	2	"	"	"	"	"	
8001-35-2	Toxaphene	< 170		ug/Kg	170	170	2	"	"	"	"	"	
Surrogate recoveries:													
2051-24-3	*% DCBP*	*78*			*30-150 %*			"	"	"	"	"	
877-09-8	*% TCMX*	*76*			*30-150 %*			"	"	"	"	"	
Subcontracted Analyses													
Prepared by method 403427-										Methylation date: 28-Sep-17			
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
93-76-5	2,4,5-T	< 110		ug/Kg	110	110	10	SW8151A	"	30-Sep-17 00:40	M-CT007	403427A	
93-72-1	2,4,5-TP (Silvex)	< 110		ug/Kg	110	110	10	"	"	"	"	"	
94-75-7	2,4-D	< 220		ug/Kg	220	220	10	"	"	"	"	"	
94-82-6	2,4-DB	< 1100		ug/Kg	1100	1100	10	"	"	"	"	"	
75-99-0	Dalapon	< 110		ug/Kg	110	110	10	"	"	"	"	"	
1918-00-9	Dicamba	< 110		ug/Kg	110	110	10	"	"	"	"	"	
120-36-5	Dichloroprop	< 160		ug/Kg	160	160	10	"	"	"	"	"	
88-85-7	Dinoseb	< 110		ug/Kg	110	110	10	"	"	"	"	"	
94-74-6	MCPA	< 32000		ug/Kg	32000	32000	10	"	"	"	"	"	
7085-19-0	MCPP	< 32000		ug/Kg	32000	32000	10	"	"	"	"	"	
Surrogate recoveries:													
19719-28-9	*% DCAA*	*53*			*30-150 %*			"	"	"	"	"	
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Percent Solid	**77**		%			1	SW846-%Solid	25-Sep-17 11:50	28-Sep-17 21:50	M-CT007	'[none]'	
Prepared by method 403834-SW9060A/													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Tot.Org.Carbon	**8,100**	Q1a	mg/kg	100	100	1	SW9060A/L. Kahn	"	02-Oct-17 17:08	M-CT007	403834A	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-C SC39680-03	01.0173025.00	Soil	25-Sep-17 13:15	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Prepared by method Volatiles													
	VOC Extraction	**Field extracted**		N/A			1	VOC Soil Extraction			MBR	1716565	
Volatile Organic Compounds by SW846 8260													
Prepared by method SW846 5035A Soil (low level)							Initial weight: 7.09 g						
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	< 6.53		µg/kg dry	6.53	3.31	1	SW846 8260C	28-Sep-17	29-Sep-17	MP	1716596	
67-64-1	Acetone	< 65.3		µg/kg dry	65.3	26.1	1	"	"	"	"	"	
107-13-1	Acrylonitrile	< 6.53		µg/kg dry	6.53	6.27	1	"	"	"	"	"	
71-43-2	Benzene	< 6.53		µg/kg dry	6.53	1.73	1	"	"	"	"	"	
108-86-1	Bromobenzene	< 6.53		µg/kg dry	6.53	1.74	1	"	"	"	"	"	
74-97-5	Bromochloromethane	< 6.53		µg/kg dry	6.53	3.30	1	"	"	"	"	"	
75-27-4	Bromodichloromethane	< 6.53		µg/kg dry	6.53	4.35	1	"	"	"	"	"	
75-25-2	Bromoform	< 6.53		µg/kg dry	6.53	6.23	1	"	"	"	"	"	
74-83-9	Bromomethane	< 13.1		µg/kg dry	13.1	5.89	1	"	"	"	"	"	
78-93-3	2-Butanone (MEK)	< 13.1		µg/kg dry	13.1	11.7	1	"	"	"	"	"	
104-51-8	n-Butylbenzene	< 6.53		µg/kg dry	6.53	1.87	1	"	"	"	"	"	
135-98-8	sec-Butylbenzene	< 6.53		µg/kg dry	6.53	1.19	1	"	"	"	"	"	
98-06-6	tert-Butylbenzene	< 6.53		µg/kg dry	6.53	1.46	1	"	"	"	"	"	
75-15-0	Carbon disulfide	< 13.1		µg/kg dry	13.1	4.18	1	"	"	"	"	"	
56-23-5	Carbon tetrachloride	< 6.53		µg/kg dry	6.53	5.34	1	"	"	"	"	"	
108-90-7	Chlorobenzene	< 6.53		µg/kg dry	6.53	2.04	1	"	"	"	"	"	
75-00-3	Chloroethane	< 13.1		µg/kg dry	13.1	3.62	1	"	"	"	"	"	
67-66-3	Chloroform	< 6.53		µg/kg dry	6.53	3.50	1	"	"	"	"	"	
74-87-3	Chloromethane	< 13.1		µg/kg dry	13.1	2.70	1	"	"	"	"	"	
95-49-8	2-Chlorotoluene	< 6.53		µg/kg dry	6.53	1.63	1	"	"	"	"	"	
106-43-4	4-Chlorotoluene	< 6.53		µg/kg dry	6.53	1.53	1	"	"	"	"	"	
96-12-8	1,2-Dibromo-3-chloropropane	< 13.1		µg/kg dry	13.1	9.43	1	"	"	"	"	"	
124-48-1	Dibromochloromethane	< 6.53		µg/kg dry	6.53	4.42	1	"	"	"	"	"	
106-93-4	1,2-Dibromoethane (EDB)	< 6.53		µg/kg dry	6.53	4.38	1	"	"	"	"	"	
74-95-3	Dibromomethane	< 6.53		µg/kg dry	6.53	3.39	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 6.53		µg/kg dry	6.53	1.70	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 6.53		µg/kg dry	6.53	1.42	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 6.53		µg/kg dry	6.53	1.93	1	"	"	"	"	"	
75-71-8	Dichlorodifluoromethane (Freon12)	< 13.1		µg/kg dry	13.1	2.47	1	"	"	"	"	"	
75-34-3	1,1-Dichloroethane	< 6.53		µg/kg dry	6.53	1.71	1	"	"	"	"	"	
107-06-2	1,2-Dichloroethane	< 6.53		µg/kg dry	6.53	2.34	1	"	"	"	"	"	
75-35-4	1,1-Dichloroethene	< 6.53		µg/kg dry	6.53	3.41	1	"	"	"	"	"	
156-59-2	cis-1,2-Dichloroethene	< 6.53		µg/kg dry	6.53	2.42	1	"	"	"	"	"	
156-60-5	trans-1,2-Dichloroethene	< 6.53		µg/kg dry	6.53	3.46	1	"	"	"	"	"	
78-87-5	1,2-Dichloropropane	< 6.53		µg/kg dry	6.53	3.42	1	"	"	"	"	"	
142-28-9	1,3-Dichloropropane	< 6.53		µg/kg dry	6.53	3.38	1	"	"	"	"	"	
594-20-7	2,2-Dichloropropane	< 6.53		µg/kg dry	6.53	3.08	1	"	"	"	"	"	
563-58-6	1,1-Dichloropropene	< 6.53		µg/kg dry	6.53	2.10	1	"	"	"	"	"	
10061-01-5	cis-1,3-Dichloropropene	< 6.53		µg/kg dry	6.53	3.94	1	"	"	"	"	"	
10061-02-6	trans-1,3-Dichloropropene	< 6.53		µg/kg dry	6.53	3.43	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-C SC39680-03	01.0173025.00	Soil	25-Sep-17 13:15	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Volatile Organic Compounds by SW846 8260													
						Initial weight: 7.09 g							
100-41-4	Ethylbenzene	< 6.53		µg/kg dry	6.53	0.94	1	SW846 8260C	28-Sep-17	29-Sep-17	MP	1716596	
87-68-3	Hexachlorobutadiene	< 6.53		µg/kg dry	6.53	3.28	1	"	"	"	"	"	
591-78-6	2-Hexanone (MBK)	< 13.1		µg/kg dry	13.1	8.01	1	"	"	"	"	"	
98-82-8	Isopropylbenzene	< 6.53		µg/kg dry	6.53	1.29	1	"	"	"	"	"	
99-87-6	4-Isopropyltoluene	< 6.53		µg/kg dry	6.53	1.40	1	"	"	"	"	"	
1634-04-4	Methyl tert-butyl ether	< 6.53		µg/kg dry	6.53	2.40	1	"	"	"	"	"	
108-10-1	4-Methyl-2-pentanone (MIBK)	< 13.1		µg/kg dry	13.1	3.35	1	"	"	"	"	"	
75-09-2	Methylene chloride	< 13.1		µg/kg dry	13.1	2.59	1	"	"	"	"	"	
91-20-3	Naphthalene	< 6.53		µg/kg dry	6.53	3.88	1	"	"	"	"	"	
103-65-1	n-Propylbenzene	< 6.53		µg/kg dry	6.53	1.06	1	"	"	"	"	"	
100-42-5	Styrene	< 6.53		µg/kg dry	6.53	1.31	1	"	"	"	"	"	
630-20-6	1,1,1,2-Tetrachloroethane	< 6.53		µg/kg dry	6.53	5.55	1	"	"	"	"	"	
79-34-5	1,1,2,2-Tetrachloroethane	< 6.53		µg/kg dry	6.53	5.52	1	"	"	"	"	"	
127-18-4	Tetrachloroethene	< 6.53		µg/kg dry	6.53	2.23	1	"	"	"	"	"	
108-88-3	Toluene	< 6.53		µg/kg dry	6.53	2.11	1	"	"	"	"	"	
87-61-6	1,2,3-Trichlorobenzene	< 6.53		µg/kg dry	6.53	2.29	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 6.53		µg/kg dry	6.53	4.81	1	"	"	"	"	"	
108-70-3	1,3,5-Trichlorobenzene	< 6.53		µg/kg dry	6.53	2.05	1	"	"	"	"	"	
71-55-6	1,1,1-Trichloroethane	< 6.53		µg/kg dry	6.53	2.17	1	"	"	"	"	"	
79-00-5	1,1,2-Trichloroethane	< 6.53		µg/kg dry	6.53	4.73	1	"	"	"	"	"	
79-01-6	Trichloroethene	< 6.53		µg/kg dry	6.53	1.78	1	"	"	"	"	"	
75-69-4	Trichlorofluoromethane (Freon 11)	< 6.53		µg/kg dry	6.53	3.52	1	"	"	"	"	"	
96-18-4	1,2,3-Trichloropropane	< 6.53		µg/kg dry	6.53	4.89	1	"	"	"	"	"	
95-63-6	1,2,4-Trimethylbenzene	< 6.53		µg/kg dry	6.53	1.59	1	"	"	"	"	"	
108-67-8	1,3,5-Trimethylbenzene	< 6.53		µg/kg dry	6.53	1.12	1	"	"	"	"	"	
75-01-4	Vinyl chloride	< 6.53		µg/kg dry	6.53	2.21	1	"	"	"	"	"	
179601-23-1	m,p-Xylene	< 13.1		µg/kg dry	13.1	1.17	1	"	"	"	"	"	
95-47-6	o-Xylene	< 6.53		µg/kg dry	6.53	1.83	1	"	"	"	"	"	
109-99-9	Tetrahydrofuran	< 13.1		µg/kg dry	13.1	10.3	1	"	"	"	"	"	
60-29-7	Ethyl ether	< 6.53		µg/kg dry	6.53	5.91	1	"	"	"	"	"	
994-05-8	Tert-amyl methyl ether	< 6.53		µg/kg dry	6.53	2.18	1	"	"	"	"	"	
637-92-3	Ethyl tert-butyl ether	< 6.53		µg/kg dry	6.53	3.52	1	"	"	"	"	"	
108-20-3	Di-isopropyl ether	< 6.53		µg/kg dry	6.53	1.21	1	"	"	"	"	"	
75-65-0	Tert-Butanol / butyl alcohol	< 65.3		µg/kg dry	65.3	42.7	1	"	"	"	"	"	
123-91-1	1,4-Dioxane	< 131		µg/kg dry	131	113	1	"	"	"	"	"	
110-57-6	trans-1,4-Dichloro-2-buten e	< 32.6		µg/kg dry	32.6	14.9	1	"	"	"	"	"	
64-17-5	Ethanol	< 1310		µg/kg dry	1310	243	1	"	"	"	"	"	
Surrogate recoveries:													
460-00-4	*4-Bromofluorobenzene*	*91*			*70-130 %*			"	"	"	"	"	
2037-26-5	*Toluene-d8*	*98*			*70-130 %*			"	"	"	"	"	
17060-07-0	*1,2-Dichloroethane-d4*	*111*			*70-130 %*			"	"	"	"	"	
1868-53-7	*Dibromofluoromethane*	*100*			*70-130 %*			"	"	"	"	"	

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BRUS-C SC39680-03	01.0173025.00	Soil	25-Sep-17 13:15	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds Prepared by method SW846 3546													
83-32-9	Acenaphthene	< 89.9		µg/kg dry	89.9	44.7	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
208-96-8	Acenaphthylene	< 89.9		µg/kg dry	89.9	44.3	1	"	"	"	"	"	
62-53-3	Aniline	< 445		µg/kg dry	445	31.9	1	"	"	"	"	"	
120-12-7	Anthracene	< 89.9		µg/kg dry	89.9	43.0	1	"	"	"	"	"	
103-33-3	Azobenzene/Diphenyldiazene	< 445		µg/kg dry	445	43.7	1	"	"	"	"	"	
92-87-5	Benzidine	< 445		µg/kg dry	445	89.5	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 89.9		µg/kg dry	89.9	47.4	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 89.9		µg/kg dry	89.9	33.5	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 89.9		µg/kg dry	89.9	43.5	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 89.9		µg/kg dry	89.9	36.1	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 89.9		µg/kg dry	89.9	35.2	1	"	"	"	"	"	
65-85-0	Benzoic acid	< 445		µg/kg dry	445	93.4	1	"	"	"	"	"	
100-51-6	Benzyl alcohol	< 445		µg/kg dry	445	36.4	1	"	"	"	"	"	
111-91-1	Bis(2-chloroethoxy)methane	< 445		µg/kg dry	445	39.5	1	"	"	"	"	"	
111-44-4	Bis(2-chloroethyl)ether	< 225		µg/kg dry	225	32.2	1	"	"	"	"	"	
108-60-1	Bis(2-chloroisopropyl)ether	< 225		µg/kg dry	225	34.6	1	"	"	"	"	"	
117-81-7	Bis(2-ethylhexyl)phthalate	< 225		µg/kg dry	225	55.5	1	"	"	"	"	"	
101-55-3	4-Bromophenyl phenyl ether	< 445		µg/kg dry	445	41.7	1	"	"	"	"	"	
85-68-7	Butyl benzyl phthalate	< 445		µg/kg dry	445	51.9	1	"	"	"	"	"	
86-74-8	Carbazole	< 225		µg/kg dry	225	126	1	"	"	"	"	"	
59-50-7	4-Chloro-3-methylphenol	< 445		µg/kg dry	445	42.4	1	"	"	"	"	"	
106-47-8	4-Chloroaniline	< 225		µg/kg dry	225	48.6	1	"	"	"	"	"	
91-58-7	2-Chloronaphthalene	< 445		µg/kg dry	445	41.1	1	"	"	"	"	"	
95-57-8	2-Chlorophenol	< 225		µg/kg dry	225	40.0	1	"	"	"	"	"	
7005-72-3	4-Chlorophenyl phenyl ether	< 445		µg/kg dry	445	52.8	1	"	"	"	"	"	
218-01-9	Chrysene	< 89.9		µg/kg dry	89.9	44.9	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 89.9		µg/kg dry	89.9	34.5	1	"	"	"	"	"	
132-64-9	Dibenzofuran	< 225		µg/kg dry	225	34.2	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 445		µg/kg dry	445	38.8	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 445		µg/kg dry	445	38.8	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 445		µg/kg dry	445	41.2	1	"	"	"	"	"	
91-94-1	3,3´-Dichlorobenzidine	< 445		µg/kg dry	445	67.6	1	"	"	"	"	"	
120-83-2	2,4-Dichlorophenol	< 225		µg/kg dry	225	42.1	1	"	"	"	"	"	
84-66-2	Diethyl phthalate	< 445		µg/kg dry	445	55.0	1	"	"	"	"	"	
131-11-3	Dimethyl phthalate	< 445		µg/kg dry	445	48.6	1	"	"	"	"	"	
105-67-9	2,4-Dimethylphenol	< 445		µg/kg dry	445	31.8	1	"	"	"	"	"	
84-74-2	Di-n-butyl phthalate	< 445		µg/kg dry	445	47.2	1	"	"	"	"	"	
534-52-1	4,6-Dinitro-2-methylphenol	< 445		µg/kg dry	445	57.1	1	"	"	"	"	"	
51-28-5	2,4-Dinitrophenol	< 445		µg/kg dry	445	45.3	1	"	"	"	"	"	
121-14-2	2,4-Dinitrotoluene	< 225		µg/kg dry	225	87.0	1	"	"	"	"	"	
606-20-2	2,6-Dinitrotoluene	< 225		µg/kg dry	225	50.7	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-C SC39680-03	01.0173025.00	Soil	25-Sep-17 13:15	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds													
117-84-0	Di-n-octyl phthalate	< 445		µg/kg dry	445	50.3	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
206-44-0	Fluoranthene	< 89.9		µg/kg dry	89.9	47.5	1	"	"	"	"	"	
86-73-7	Fluorene	< 89.9		µg/kg dry	89.9	45.7	1	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 225		µg/kg dry	225	44.3	1	"	"	"	"	"	
87-68-3	Hexachlorobutadiene	< 225		µg/kg dry	225	53.8	1	"	"	"	"	"	
77-47-4	Hexachlorocyclopentadiene	< 225		µg/kg dry	225	30.6	1	"	"	"	"	"	
67-72-1	Hexachloroethane	< 225		µg/kg dry	225	48.5	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 89.9		µg/kg dry	89.9	32.3	1	"	"	"	"	"	
78-59-1	Isophorone	< 225		µg/kg dry	225	42.2	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 89.9		µg/kg dry	89.9	54.3	1	"	"	"	"	"	
95-48-7	2-Methylphenol	< 445		µg/kg dry	445	37.8	1	"	"	"	"	"	
108-39-4, 106-44-5	3 & 4-Methylphenol	< 445		µg/kg dry	445	43.0	1	"	"	"	"	"	
91-20-3	Naphthalene	< 89.9		µg/kg dry	89.9	41.9	1	"	"	"	"	"	
88-74-4	2-Nitroaniline	< 445		µg/kg dry	445	37.7	1	"	"	"	"	"	
99-09-2	3-Nitroaniline	< 445		µg/kg dry	445	60.8	1	"	"	"	"	"	
100-01-6	4-Nitroaniline	< 225		µg/kg dry	225	69.3	1	"	"	"	"	"	
98-95-3	Nitrobenzene	< 225		µg/kg dry	225	41.0	1	"	"	"	"	"	
88-75-5	2-Nitrophenol	< 225		µg/kg dry	225	37.3	1	"	"	"	"	"	
100-02-7	4-Nitrophenol	< 1780		µg/kg dry	1780	71.9	1	"	"	"	"	"	
62-75-9	N-Nitrosodimethylamine	< 225		µg/kg dry	225	41.8	1	"	"	"	"	"	
621-64-7	N-Nitrosodi-n-propylamine	< 225		µg/kg dry	225	43.8	1	"	"	"	"	"	
86-30-6	N-Nitrosodiphenylamine	< 445		µg/kg dry	445	48.2	1	"	"	"	"	"	
87-86-5	Pentachlorophenol	< 445		µg/kg dry	445	47.5	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 89.9		µg/kg dry	89.9	41.8	1	"	"	"	"	"	
108-95-2	Phenol	< 445		µg/kg dry	445	29.3	1	"	"	"	"	"	
129-00-0	Pyrene	< 89.9		µg/kg dry	89.9	50.1	1	"	"	"	"	"	
110-86-1	Pyridine	< 445		µg/kg dry	445	66.3	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 445		µg/kg dry	445	44.1	1	"	"	"	"	"	
90-12-0	1-Methylnaphthalene	< 89.9		µg/kg dry	89.9	44.2	1	"	"	"	"	"	
95-95-4	2,4,5-Trichlorophenol	< 445		µg/kg dry	445	40.0	1	"	"	"	"	"	
88-06-2	2,4,6-Trichlorophenol	< 225		µg/kg dry	225	40.1	1	"	"	"	"	"	
82-68-8	Pentachloronitrobenzene	< 445		µg/kg dry	445	70.2	1	"	"	"	"	"	
95-94-3	1,2,4,5-Tetrachlorobenzene	< 445		µg/kg dry	445	43.1	1	"	"	"	"	"	
Surrogate recoveries:													
321-60-8	*2-Fluorobiphenyl*	*54*			*30-130 %*			"	"	"	"	"	
367-12-4	*2-Fluorophenol*	*51*			*30-130 %*			"	"	"	"	"	
4165-60-0	*Nitrobenzene-d5*	*52*			*30-130 %*			"	"	"	"	"	
4165-62-2	*Phenol-d5*	*57*			*30-130 %*			"	"	"	"	"	
1718-51-0	*Terphenyl-dl4*	*71*			*30-130 %*			"	"	"	"	"	
118-79-6	*2,4,6-Tribromophenol*	*63*			*30-130 %*			"	"	"	"	"	
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-C SC39680-03	01.0173025.00	Soil	25-Sep-17 13:15	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
MADEP EPH Prepared by method SW846 3546													
	C9-C18 Aliphatic Hydrocarbons	< 13.4		mg/kg dry	13.4	2.75	1	MADEP EPH 5/2004 R	02-Oct-17	05-Oct-17	EDT	1716783	
	C19-C36 Aliphatic Hydrocarbons	< 13.4		mg/kg dry	13.4	3.63	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	< 13.4		mg/kg dry	13.4	5.65	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	< 13.4		mg/kg dry	13.4	5.65	1	"	"	"	"	"	
91-20-3	Naphthalene	< 0.447		mg/kg dry	0.447	0.165	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 0.447		mg/kg dry	0.447	0.150	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.447		mg/kg dry	0.447	0.169	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.447		mg/kg dry	0.447	0.171	1	"	"	"	"	"	
86-73-7	Fluorene	< 0.447		mg/kg dry	0.447	0.169	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 0.447		mg/kg dry	0.447	0.163	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.447		mg/kg dry	0.447	0.164	1	"	"	"	"	"	
206-44-0	Fluoranthene	< 0.447		mg/kg dry	0.447	0.169	1	"	"	"	"	"	
129-00-0	Pyrene	< 0.447		mg/kg dry	0.447	0.172	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.447		mg/kg dry	0.447	0.192	1	"	"	"	"	"	
218-01-9	Chrysene	< 0.447		mg/kg dry	0.447	0.183	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.447		mg/kg dry	0.447	0.231	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.447		mg/kg dry	0.447	0.236	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.447		mg/kg dry	0.447	0.238	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.447		mg/kg dry	0.447	0.289	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.447		mg/kg dry	0.447	0.288	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.447		mg/kg dry	0.447	0.279	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*61*			*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*60*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*76*			*40-140 %*			"	"	"	"	"	
Fingerprinting by GC													
8006-61-9	Gasoline	< 35.6		mg/kg dry	35.6	35.6	1	SW846 8100Mod.	04-Oct-17	06-Oct-17	SM	1716919	
68476-30-2	Fuel Oil #2	< 35.6		mg/kg dry	35.6	23.7	1	"	"	"	"	"	
68476-31-3	Fuel Oil #4	< 35.6		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
68553-00-4	Fuel Oil #6	< 35.6		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
M09800000	Motor Oil	< 35.6		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
8032-32-4	Ligroin	< 35.6		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
J00100000	Aviation Fuel	< 35.6		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
	Hydraulic Oil	< 35.6		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
	Dielectric Fluid	< 35.6		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
	Unidentified	**75.7**		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
	Other Oil	**Calculated as**		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	**75.7**		mg/kg dry	35.6	35.6	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*118*			*40-140 %*			"	"	"	"	"	

This laboratory report is not valid without an authorized signature on the cover page.

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-C SC39680-03	01.0173025.00	Soil	25-Sep-17 13:15	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
General Chemistry Parameters													
	% Solids	**74.0**		%			1	SM2540 G (11) Mod.	27-Sep-17	27-Sep-17	MBR	1716554	
	Specific Conductance (EC)	**38.8**		uS/cm	10.0	10.0	1	SM22 2510B	28-Sep-17	28-Sep-17	BD	1716586	
Prepared by method General Preparation SVOC													
	Moisture	**26.0**		%			1	SM2540 G (11) Mod. calculation	27-Sep-17	28-Sep-17	CMB	1716555	
Toxicity Characteristics													
Reactivity Cyanide/Sulfide													
	Reactivity	**See Narrative**		mg/kg dry			1	SW846 Ch. 7.3	29-Sep-17	29-Sep-17	TN	1716697	
57-12-5	Reactive Cyanide	< 22.9		mg/kg dry	22.9	22.9	1	"	"	"	"	"	
18496-25-8	Reactive Sulfide	< 45.8		mg/kg dry	45.8	45.8	1	"	"	"	"	"	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 404410-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7440-38-2	Arsenic	**3.46**		mg/Kg	0.87	0.87	1	SW6010C	05-Oct-17	06-Oct-17 22:53	M-CT007	404410A	
7440-43-9	Cadmium	< 0.43		mg/Kg	0.43	0.43	1	"	"	"	"	"	
7440-47-3	Chromium	**23.5**		mg/Kg	0.43	0.43	1	"	"	"	"	"	
7440-50-8	Copper	**18.3**		mg/Kg	0.43	0.43	1	"	"	"	"	"	
7439-92-1	Lead	**15.2**		mg/Kg	0.43	0.43	1	"	"	"	"	"	
7440-02-0	Nickel	**17.4**		mg/Kg	0.43	0.43	1	"	"	"	"	"	
7440-66-6	Zinc	**82.1**	Q1	mg/Kg	0.43	0.43	1	"	"	"	"	"	
Prepared by method 404534-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7439-97-6	Mercury	< 0.03		mg/Kg	0.03	0.03	1	SW7471B	09-Oct-17	09-Oct-17 08:46	M-CT007	404534A	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 403367-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
72-54-8	4,4' -DDD	< 2.2		ug/Kg	2.2	2.2	2	SW8081B	28-Sep-17	29-Sep-17 20:17	M-CT007	403367A	
72-55-9	4,4' -DDE	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
50-29-3	4,4' -DDT	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
319-84-6	a-BHC	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
15972-60-8	Alachlor	< 8.7		ug/Kg	8.7	8.7	2	"	"	"	"	"	
309-00-2	Aldrin	< 4.4		ug/Kg	4.4	4.4	2	"	"	"	"	"	
319-85-7	b-BHC	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
57-74-9	Chlordane	< 44		ug/Kg	44	44	2	"	"	"	"	"	
319-86-8	d-BHC	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
60-57-1	Dieldrin	< 4.4		ug/Kg	4.4	4.4	2	"	"	"	"	"	
959-98-8	Endosulfan I	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
33213-65-9	Endosulfan II	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
1031-07-8	Endosulfan sulfate	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
72-20-8	Endrin	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
7421-93-4	Endrin aldehyde	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
53494-70-5	Endrin ketone	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRUS-C SC39680-03	01.0173025.00	Soil	25-Sep-17 13:15	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Subcontracted Analyses													
Subcontracted Analyses													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
58-89-9	g-BHC	< 1.7		ug/Kg	1.7	1.7	2	SW8081B	28-Sep-17	29-Sep-17 20:17	M-CT007	403367A	
76-44-8	Heptachlor	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
1024-57-3	Heptachlor epoxide	< 2.2		ug/Kg	2.2	2.2	2	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 4.4		ug/Kg	4.4	4.4	2	"	"	"	"	"	
72-43-5	Methoxychlor	< 44		ug/Kg	44	44	2	"	"	"	"	"	
8001-35-2	Toxaphene	< 170		ug/Kg	170	170	2	"	"	"	"	"	
Surrogate recoveries:													
2051-24-3	*% DCBP*	*76*			*30-150 %*			"	"	"	"	"	
877-09-8	*% TCMX*	*75*			*30-150 %*			"	"	"	"	"	
Subcontracted Analyses Prepared by method 403427-										Methylation date: 28-Sep-17			
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
93-76-5	2,4,5-T	< 110		ug/Kg	110	110	10	SW8151A	"	30-Sep-17 00:59	M-CT007	403427A	
93-72-1	2,4,5-TP (Silvex)	< 110		ug/Kg	110	110	10	"	"	"	"	"	
94-75-7	2,4-D	< 220		ug/Kg	220	220	10	"	"	"	"	"	
94-82-6	2,4-DB	< 1100		ug/Kg	1100	1100	10	"	"	"	"	"	
75-99-0	Dalapon	< 110		ug/Kg	110	110	10	"	"	"	"	"	
1918-00-9	Dicamba	< 110		ug/Kg	110	110	10	"	"	"	"	"	
120-36-5	Dichloroprop	< 160		ug/Kg	160	160	10	"	"	"	"	"	
88-85-7	Dinoseb	< 110		ug/Kg	110	110	10	"	"	"	"	"	
94-74-6	MCPA	< 33000		ug/Kg	33000	33000	10	"	"	"	"	"	
7085-19-0	MCPP	< 33000		ug/Kg	33000	33000	10	"	"	"	"	"	
Surrogate recoveries:													
19719-28-9	*% DCAA*	*64*			*30-150 %*			"	"	"	"	"	
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Percent Solid	**75**		%			1	SW846-%Solid	25-Sep-17 13:15	28-Sep-17 21:50	M-CT007	'[none]'	
Prepared by method 403834-SW9060A/													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Tot.Org.Carbon	**10,000**	Q1a	mg/kg	100	100	1	SW9060A/L. Kahn	"	02-Oct-17 17:08	M-CT007	403834A	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRD5	01.0173025.00	Soil	25-Sep-17 14:00	26-Sep-17
SC39680-04				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Prepared by method Volatiles													
	VOC Extraction	**Field extracted**		N/A			1	VOC Soil Extraction			MBR	1716565	
Volatile Organic Compounds by SW846 8260													
Prepared by method SW846 5035A Soil (low level)							Initial weight: 7.44 g						
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	< 5.13		µg/kg dry	5.13	2.60	1	SW846 8260C	28-Sep-17	29-Sep-17	MP	1716596	
67-64-1	Acetone	< 51.3		µg/kg dry	51.3	20.5	1	"	"	"	"	"	
107-13-1	Acrylonitrile	< 5.13		µg/kg dry	5.13	4.93	1	"	"	"	"	"	
71-43-2	Benzene	< 5.13		µg/kg dry	5.13	1.36	1	"	"	"	"	"	
108-86-1	Bromobenzene	< 5.13		µg/kg dry	5.13	1.37	1	"	"	"	"	"	
74-97-5	Bromochloromethane	< 5.13		µg/kg dry	5.13	2.59	1	"	"	"	"	"	
75-27-4	Bromodichloromethane	< 5.13		µg/kg dry	5.13	3.42	1	"	"	"	"	"	
75-25-2	Bromoform	< 5.13		µg/kg dry	5.13	4.90	1	"	"	"	"	"	
74-83-9	Bromomethane	< 10.3		µg/kg dry	10.3	4.63	1	"	"	"	"	"	
78-93-3	2-Butanone (MEK)	< 10.3		µg/kg dry	10.3	9.18	1	"	"	"	"	"	
104-51-8	n-Butylbenzene	< 5.13		µg/kg dry	5.13	1.47	1	"	"	"	"	"	
135-98-8	sec-Butylbenzene	< 5.13		µg/kg dry	5.13	0.93	1	"	"	"	"	"	
98-06-6	tert-Butylbenzene	< 5.13		µg/kg dry	5.13	1.15	1	"	"	"	"	"	
75-15-0	Carbon disulfide	< 10.3		µg/kg dry	10.3	3.28	1	"	"	"	"	"	
56-23-5	Carbon tetrachloride	< 5.13		µg/kg dry	5.13	4.20	1	"	"	"	"	"	
108-90-7	Chlorobenzene	< 5.13		µg/kg dry	5.13	1.61	1	"	"	"	"	"	
75-00-3	Chloroethane	< 10.3		µg/kg dry	10.3	2.85	1	"	"	"	"	"	
67-66-3	Chloroform	< 5.13		µg/kg dry	5.13	2.76	1	"	"	"	"	"	
74-87-3	Chloromethane	< 10.3		µg/kg dry	10.3	2.12	1	"	"	"	"	"	
95-49-8	2-Chlorotoluene	< 5.13		µg/kg dry	5.13	1.28	1	"	"	"	"	"	
106-43-4	4-Chlorotoluene	< 5.13		µg/kg dry	5.13	1.21	1	"	"	"	"	"	
96-12-8	1,2-Dibromo-3-chloropropane	< 10.3		µg/kg dry	10.3	7.42	1	"	"	"	"	"	
124-48-1	Dibromochloromethane	< 5.13		µg/kg dry	5.13	3.48	1	"	"	"	"	"	
106-93-4	1,2-Dibromoethane (EDB)	< 5.13		µg/kg dry	5.13	3.44	1	"	"	"	"	"	
74-95-3	Dibromomethane	< 5.13		µg/kg dry	5.13	2.67	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 5.13		µg/kg dry	5.13	1.33	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 5.13		µg/kg dry	5.13	1.11	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 5.13		µg/kg dry	5.13	1.52	1	"	"	"	"	"	
75-71-8	Dichlorodifluoromethane (Freon12)	< 10.3		µg/kg dry	10.3	1.95	1	"	"	"	"	"	
75-34-3	1,1-Dichloroethane	< 5.13		µg/kg dry	5.13	1.34	1	"	"	"	"	"	
107-06-2	1,2-Dichloroethane	< 5.13		µg/kg dry	5.13	1.84	1	"	"	"	"	"	
75-35-4	1,1-Dichloroethene	< 5.13		µg/kg dry	5.13	2.68	1	"	"	"	"	"	
156-59-2	cis-1,2-Dichloroethene	< 5.13		µg/kg dry	5.13	1.90	1	"	"	"	"	"	
156-60-5	trans-1,2-Dichloroethene	< 5.13		µg/kg dry	5.13	2.72	1	"	"	"	"	"	
78-87-5	1,2-Dichloropropane	< 5.13		µg/kg dry	5.13	2.69	1	"	"	"	"	"	
142-28-9	1,3-Dichloropropane	< 5.13		µg/kg dry	5.13	2.66	1	"	"	"	"	"	
594-20-7	2,2-Dichloropropane	< 5.13		µg/kg dry	5.13	2.42	1	"	"	"	"	"	
563-58-6	1,1-Dichloropropene	< 5.13		µg/kg dry	5.13	1.65	1	"	"	"	"	"	
10061-01-5	cis-1,3-Dichloropropene	< 5.13		µg/kg dry	5.13	3.09	1	"	"	"	"	"	
10061-02-6	trans-1,3-Dichloropropene	< 5.13		µg/kg dry	5.13	2.69	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRD5	01.0173025.00	Soil	25-Sep-17 14:00	26-Sep-17
SC39680-04				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Volatile Organic Compounds													
Volatile Organic Compounds by SW846 8260													
						Initial weight: 7.44 g							
100-41-4	Ethylbenzene	< 5.13		µg/kg dry	5.13	0.74	1	SW846 8260C	28-Sep-17	29-Sep-17	MP	1716596	
87-68-3	Hexachlorobutadiene	< 5.13		µg/kg dry	5.13	2.58	1	"	"	"	"	"	
591-78-6	2-Hexanone (MBK)	< 10.3		µg/kg dry	10.3	6.30	1	"	"	"	"	"	
98-82-8	Isopropylbenzene	< 5.13		µg/kg dry	5.13	1.01	1	"	"	"	"	"	
99-87-6	4-Isopropyltoluene	< 5.13		µg/kg dry	5.13	1.10	1	"	"	"	"	"	
1634-04-4	Methyl tert-butyl ether	< 5.13		µg/kg dry	5.13	1.89	1	"	"	"	"	"	
108-10-1	4-Methyl-2-pentanone (MIBK)	< 10.3		µg/kg dry	10.3	2.64	1	"	"	"	"	"	
75-09-2	Methylene chloride	< 10.3		µg/kg dry	10.3	2.04	1	"	"	"	"	"	
91-20-3	Naphthalene	< 5.13		µg/kg dry	5.13	3.05	1	"	"	"	"	"	
103-65-1	n-Propylbenzene	< 5.13		µg/kg dry	5.13	0.83	1	"	"	"	"	"	
100-42-5	Styrene	< 5.13		µg/kg dry	5.13	1.03	1	"	"	"	"	"	
630-20-6	1,1,1,2-Tetrachloroethane	< 5.13		µg/kg dry	5.13	4.36	1	"	"	"	"	"	
79-34-5	1,1,2,2-Tetrachloroethane	< 5.13		µg/kg dry	5.13	4.34	1	"	"	"	"	"	
127-18-4	Tetrachloroethene	< 5.13		µg/kg dry	5.13	1.76	1	"	"	"	"	"	
108-88-3	Toluene	< 5.13		µg/kg dry	5.13	1.66	1	"	"	"	"	"	
87-61-6	1,2,3-Trichlorobenzene	< 5.13		µg/kg dry	5.13	1.80	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 5.13		µg/kg dry	5.13	3.78	1	"	"	"	"	"	
108-70-3	1,3,5-Trichlorobenzene	< 5.13		µg/kg dry	5.13	1.61	1	"	"	"	"	"	
71-55-6	1,1,1-Trichloroethane	< 5.13		µg/kg dry	5.13	1.70	1	"	"	"	"	"	
79-00-5	1,1,2-Trichloroethane	< 5.13		µg/kg dry	5.13	3.72	1	"	"	"	"	"	
79-01-6	Trichloroethene	< 5.13		µg/kg dry	5.13	1.40	1	"	"	"	"	"	
75-69-4	Trichlorofluoromethane (Freon 11)	< 5.13		µg/kg dry	5.13	2.77	1	"	"	"	"	"	
96-18-4	1,2,3-Trichloropropane	< 5.13		µg/kg dry	5.13	3.85	1	"	"	"	"	"	
95-63-6	1,2,4-Trimethylbenzene	< 5.13		µg/kg dry	5.13	1.25	1	"	"	"	"	"	
108-67-8	1,3,5-Trimethylbenzene	< 5.13		µg/kg dry	5.13	0.88	1	"	"	"	"	"	
75-01-4	Vinyl chloride	< 5.13		µg/kg dry	5.13	1.73	1	"	"	"	"	"	
179601-23-1	m,p-Xylene	< 10.3		µg/kg dry	10.3	0.92	1	"	"	"	"	"	
95-47-6	o-Xylene	< 5.13		µg/kg dry	5.13	1.44	1	"	"	"	"	"	
109-99-9	Tetrahydrofuran	< 10.3		µg/kg dry	10.3	8.09	1	"	"	"	"	"	
60-29-7	Ethyl ether	< 5.13		µg/kg dry	5.13	4.65	1	"	"	"	"	"	
994-05-8	Tert-amyl methyl ether	< 5.13		µg/kg dry	5.13	1.71	1	"	"	"	"	"	
637-92-3	Ethyl tert-butyl ether	< 5.13		µg/kg dry	5.13	2.77	1	"	"	"	"	"	
108-20-3	Di-isopropyl ether	< 5.13		µg/kg dry	5.13	0.95	1	"	"	"	"	"	
75-65-0	Tert-Butanol / butyl alcohol	< 51.3		µg/kg dry	51.3	33.6	1	"	"	"	"	"	
123-91-1	1,4-Dioxane	< 103		µg/kg dry	103	89.1	1	"	"	"	"	"	
110-57-6	trans-1,4-Dichloro-2-butene	< 25.7		µg/kg dry	25.7	11.7	1	"	"	"	"	"	
64-17-5	Ethanol	< 1030		µg/kg dry	1030	191	1	"	"	"	"	"	
Surrogate recoveries:													
460-00-4	*4-Bromofluorobenzene*	*99*			*70-130 %*			"	"	"	"	"	
2037-26-5	*Toluene-d8*	*98*			*70-130 %*			"	"	"	"	"	
17060-07-0	*1,2-Dichloroethane-d4*	*113*			*70-130 %*			"	"	"	"	"	
1868-53-7	*Dibromofluoromethane*	*95*			*70-130 %*			"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRD5	01.0173025.00	Soil	25-Sep-17 14:00	26-Sep-17
SC39680-04				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds Prepared by method SW846 3546													
83-32-9	Acenaphthene	< 80.1		µg/kg dry	80.1	39.9	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
208-96-8	Acenaphthylene	< 80.1		µg/kg dry	80.1	39.5	1	"	"	"	"	"	
62-53-3	Aniline	< 396		µg/kg dry	396	28.5	1	"	"	"	"	"	
120-12-7	Anthracene	< 80.1		µg/kg dry	80.1	38.3	1	"	"	"	"	"	
103-33-3	Azobenzene/Diphenyldiazene	< 396		µg/kg dry	396	39.0	1	"	"	"	"	"	
92-87-5	Benzidine	< 396		µg/kg dry	396	79.8	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 80.1		µg/kg dry	80.1	42.3	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 80.1		µg/kg dry	80.1	29.8	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 80.1		µg/kg dry	80.1	38.8	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 80.1		µg/kg dry	80.1	32.2	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 80.1		µg/kg dry	80.1	31.4	1	"	"	"	"	"	
65-85-0	Benzoic acid	< 396		µg/kg dry	396	83.3	1	"	"	"	"	"	
100-51-6	Benzyl alcohol	< 396		µg/kg dry	396	32.5	1	"	"	"	"	"	
111-91-1	Bis(2-chloroethoxy)methane	< 396		µg/kg dry	396	35.2	1	"	"	"	"	"	
111-44-4	Bis(2-chloroethyl)ether	< 201		µg/kg dry	201	28.7	1	"	"	"	"	"	
108-60-1	Bis(2-chloroisopropyl)ether	< 201		µg/kg dry	201	30.9	1	"	"	"	"	"	
117-81-7	Bis(2-ethylhexyl)phthalate	< 201		µg/kg dry	201	49.5	1	"	"	"	"	"	
101-55-3	4-Bromophenyl phenyl ether	< 396		µg/kg dry	396	37.1	1	"	"	"	"	"	
85-68-7	Butyl benzyl phthalate	< 396		µg/kg dry	396	46.3	1	"	"	"	"	"	
86-74-8	Carbazole	< 201		µg/kg dry	201	112	1	"	"	"	"	"	
59-50-7	4-Chloro-3-methylphenol	< 396		µg/kg dry	396	37.8	1	"	"	"	"	"	
106-47-8	4-Chloroaniline	< 201		µg/kg dry	201	43.4	1	"	"	"	"	"	
91-58-7	2-Chloronaphthalene	< 396		µg/kg dry	396	36.6	1	"	"	"	"	"	
95-57-8	2-Chlorophenol	< 201		µg/kg dry	201	35.7	1	"	"	"	"	"	
7005-72-3	4-Chlorophenyl phenyl ether	< 396		µg/kg dry	396	47.1	1	"	"	"	"	"	
218-01-9	Chrysene	< 80.1		µg/kg dry	80.1	40.0	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 80.1		µg/kg dry	80.1	30.8	1	"	"	"	"	"	
132-64-9	Dibenzofuran	< 201		µg/kg dry	201	30.5	1	"	"	"	"	"	
95-50-1	1,2-Dichlorobenzene	< 396		µg/kg dry	396	34.6	1	"	"	"	"	"	
541-73-1	1,3-Dichlorobenzene	< 396		µg/kg dry	396	34.6	1	"	"	"	"	"	
106-46-7	1,4-Dichlorobenzene	< 396		µg/kg dry	396	36.8	1	"	"	"	"	"	
91-94-1	3,3´-Dichlorobenzidine	< 396		µg/kg dry	396	60.3	1	"	"	"	"	"	
120-83-2	2,4-Dichlorophenol	< 201		µg/kg dry	201	37.5	1	"	"	"	"	"	
84-66-2	Diethyl phthalate	< 396		µg/kg dry	396	49.0	1	"	"	"	"	"	
131-11-3	Dimethyl phthalate	< 396		µg/kg dry	396	43.4	1	"	"	"	"	"	
105-67-9	2,4-Dimethylphenol	< 396		µg/kg dry	396	28.4	1	"	"	"	"	"	
84-74-2	Di-n-butyl phthalate	< 396		µg/kg dry	396	42.1	1	"	"	"	"	"	
534-52-1	4,6-Dinitro-2-methylphenol	< 396		µg/kg dry	396	50.9	1	"	"	"	"	"	
51-28-5	2,4-Dinitrophenol	< 396		µg/kg dry	396	40.4	1	"	"	"	"	"	
121-14-2	2,4-Dinitrotoluene	< 201		µg/kg dry	201	77.6	1	"	"	"	"	"	
606-20-2	2,6-Dinitrotoluene	< 201		µg/kg dry	201	45.2	1	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRD5	01.0173025.00	Soil	25-Sep-17 14:00	26-Sep-17
SC39680-04				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Semivolatile Organic Compounds by GCMS													
Semivolatile Organic Compounds													
117-84-0	Di-n-octyl phthalate	< 396		µg/kg dry	396	44.8	1	SW846 8270D	04-Oct-17	09-Oct-17	MSL	1716889	
206-44-0	Fluoranthene	**86.1**		µg/kg dry	80.1	42.3	1	"	"	"	"	"	
86-73-7	Fluorene	< 80.1		µg/kg dry	80.1	40.7	1	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 201		µg/kg dry	201	39.5	1	"	"	"	"	"	
87-68-3	Hexachlorobutadiene	< 201		µg/kg dry	201	47.9	1	"	"	"	"	"	
77-47-4	Hexachlorocyclopentadiene	< 201		µg/kg dry	201	27.3	1	"	"	"	"	"	
67-72-1	Hexachloroethane	< 201		µg/kg dry	201	43.3	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 80.1		µg/kg dry	80.1	28.8	1	"	"	"	"	"	
78-59-1	Isophorone	< 201		µg/kg dry	201	37.6	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 80.1		µg/kg dry	80.1	48.4	1	"	"	"	"	"	
95-48-7	2-Methylphenol	< 396		µg/kg dry	396	33.7	1	"	"	"	"	"	
108-39-4, 106-44-5	3 & 4-Methylphenol	< 396		µg/kg dry	396	38.3	1	"	"	"	"	"	
91-20-3	Naphthalene	< 80.1		µg/kg dry	80.1	37.4	1	"	"	"	"	"	
88-74-4	2-Nitroaniline	< 396		µg/kg dry	396	33.6	1	"	"	"	"	"	
99-09-2	3-Nitroaniline	< 396		µg/kg dry	396	54.2	1	"	"	"	"	"	
100-01-6	4-Nitroaniline	< 201		µg/kg dry	201	61.8	1	"	"	"	"	"	
98-95-3	Nitrobenzene	< 201		µg/kg dry	201	36.5	1	"	"	"	"	"	
88-75-5	2-Nitrophenol	< 201		µg/kg dry	201	33.3	1	"	"	"	"	"	
100-02-7	4-Nitrophenol	< 1590		µg/kg dry	1590	64.1	1	"	"	"	"	"	
62-75-9	N-Nitrosodimethylamine	< 201		µg/kg dry	201	37.2	1	"	"	"	"	"	
621-64-7	N-Nitrosodi-n-propylamine	< 201		µg/kg dry	201	39.1	1	"	"	"	"	"	
86-30-6	N-Nitrosodiphenylamine	< 396		µg/kg dry	396	43.0	1	"	"	"	"	"	
87-86-5	Pentachlorophenol	< 396		µg/kg dry	396	42.4	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 80.1		µg/kg dry	80.1	37.3	1	"	"	"	"	"	
108-95-2	Phenol	< 396		µg/kg dry	396	26.1	1	"	"	"	"	"	
129-00-0	Pyrene	< 80.1		µg/kg dry	80.1	44.7	1	"	"	"	"	"	
110-86-1	Pyridine	< 396		µg/kg dry	396	59.1	1	"	"	"	"	"	
120-82-1	1,2,4-Trichlorobenzene	< 396		µg/kg dry	396	39.3	1	"	"	"	"	"	
90-12-0	1-Methylnaphthalene	< 80.1		µg/kg dry	80.1	39.4	1	"	"	"	"	"	
95-95-4	2,4,5-Trichlorophenol	< 396		µg/kg dry	396	35.7	1	"	"	"	"	"	
88-06-2	2,4,6-Trichlorophenol	< 201		µg/kg dry	201	35.8	1	"	"	"	"	"	
82-68-8	Pentachloronitrobenzene	< 396		µg/kg dry	396	62.6	1	"	"	"	"	"	
95-94-3	1,2,4,5-Tetrachlorobenzene	< 396		µg/kg dry	396	38.4	1	"	"	"	"	"	
Surrogate recoveries:													
321-60-8	*2-Fluorobiphenyl*	*62*			*30-130 %*			"	"	"	"	"	
367-12-4	*2-Fluorophenol*	*50*			*30-130 %*			"	"	"	"	"	
4165-60-0	*Nitrobenzene-d5*	*52*			*30-130 %*			"	"	"	"	"	
4165-62-2	*Phenol-d5*	*58*			*30-130 %*			"	"	"	"	"	
1718-51-0	*Terphenyl-dl4*	*85*			*30-130 %*			"	"	"	"	"	
118-79-6	*2,4,6-Tribromophenol*	*72*			*30-130 %*			"	"	"	"	"	
Extractable Petroleum Hydrocarbons													
MADEP EPH													
Prepared by method SW846 3546													

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRD5	01.0173025.00	Soil	25-Sep-17 14:00	26-Sep-17
SC39680-04				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
MADEP EPH													
Prepared by method SW846 3546													
	C9-C18 Aliphatic Hydrocarbons	< 11.9		mg/kg dry	11.9	2.43	1	MADEP EPH 5/2004 R	02-Oct-17	05-Oct-17	EDT	1716783	
	C19-C36 Aliphatic Hydrocarbons	< 11.9		mg/kg dry	11.9	3.21	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	< 11.9		mg/kg dry	11.9	5.00	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	< 11.9		mg/kg dry	11.9	5.00	1	"	"	"	"	"	
91-20-3	Naphthalene	< 0.395		mg/kg dry	0.395	0.146	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	< 0.395		mg/kg dry	0.395	0.133	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.395		mg/kg dry	0.395	0.150	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.395		mg/kg dry	0.395	0.151	1	"	"	"	"	"	
86-73-7	Fluorene	< 0.395		mg/kg dry	0.395	0.150	1	"	"	"	"	"	
85-01-8	Phenanthrene	< 0.395		mg/kg dry	0.395	0.144	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.395		mg/kg dry	0.395	0.145	1	"	"	"	"	"	
206-44-0	Fluoranthene	< 0.395		mg/kg dry	0.395	0.150	1	"	"	"	"	"	
129-00-0	Pyrene	< 0.395		mg/kg dry	0.395	0.152	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.395		mg/kg dry	0.395	0.170	1	"	"	"	"	"	
218-01-9	Chrysene	< 0.395		mg/kg dry	0.395	0.161	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.395		mg/kg dry	0.395	0.204	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.395		mg/kg dry	0.395	0.209	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.395		mg/kg dry	0.395	0.210	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.395		mg/kg dry	0.395	0.255	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.395		mg/kg dry	0.395	0.254	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.395		mg/kg dry	0.395	0.247	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*72*			*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*66*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*58*			*40-140 %*			"	"	"	"	"	
Fingerprinting by GC													
8006-61-9	Gasoline	< 31.8		mg/kg dry	31.8	31.8	1	SW846 8100Mod.	04-Oct-17	06-Oct-17	SM	1716919	
68476-30-2	Fuel Oil #2	< 31.8		mg/kg dry	31.8	21.1	1	"	"	"	"	"	
68476-31-3	Fuel Oil #4	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
68553-00-4	Fuel Oil #6	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
M09800000	Motor Oil	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
8032-32-4	Ligroin	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
J00100000	Aviation Fuel	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
	Hydraulic Oil	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
	Dielectric Fluid	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
	Unidentified	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
	Other Oil	**Calculated as**		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	< 31.8		mg/kg dry	31.8	31.8	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*124*			*40-140 %*			"	"	"	"	"	

This laboratory report is not valid without an authorized signature on the cover page.

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRD5 SC39680-04	01.0173025.00	Soil	25-Sep-17 14:00	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
General Chemistry Parameters													
	% Solids	**82.5**		%			1	SM2540 G (11) Mod.	27-Sep-17	27-Sep-17	MBR	1716554	
	Specific Conductance (EC)	**67.1**		uS/cm	10.0	10.0	1	SM22 2510B	28-Sep-17	28-Sep-17	BD	1716586	
Prepared by method General Preparation SVOC													
	Moisture	**17.5**		%			1	SM2540 G (11) Mod. calculation	27-Sep-17	28-Sep-17	CMB	1716555	
Toxicity Characteristics													
Reactivity Cyanide/Sulfide													
	Reactivity	**See Narrative**		mg/kg dry			1	SW846 Ch. 7.3	29-Sep-17	29-Sep-17	TN	1716697	
57-12-5	Reactive Cyanide	< 23.3		mg/kg dry	23.3	23.3	1	"	"	"	"	"	
18496-25-8	Reactive Sulfide	< 46.5		mg/kg dry	46.5	46.5	1	"	"	"	"	"	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 404410-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7440-38-2	Arsenic	**2.93**		mg/Kg	0.74	0.74	1	SW6010C	05-Oct-17	06-Oct-17 22:56	M-CT007	404410A	
7440-43-9	Cadmium	< 0.37		mg/Kg	0.37	0.37	1	"	"	"	"	"	
7440-47-3	Chromium	**4.48**		mg/Kg	0.37	0.37	1	"	"	"	"	"	
7440-50-8	Copper	**3.74**		mg/Kg	0.37	0.37	1	"	"	"	"	"	
7439-92-1	Lead	**2.86**		mg/Kg	0.37	0.37	1	"	"	"	"	"	
7440-02-0	Nickel	**4.10**		mg/Kg	0.37	0.37	1	"	"	"	"	"	
7440-66-6	Zinc	**20.9**	Q1	mg/Kg	0.37	0.37	1	"	"	"	"	"	
Prepared by method 404534-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
7439-97-6	Mercury	**0.07**		mg/Kg	0.03	0.03	1	SW7471B	09-Oct-17	09-Oct-17 08:50	M-CT007	404534A	
Subcontracted Analyses													
Subcontracted Analyses Prepared by method 403367-													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
72-54-8	4,4' -DDD	< 7.9		ug/Kg	7.9	7.9	2	SW8081B	28-Sep-17	29-Sep-17 20:35	M-CT007	403367A	
72-55-9	4,4' -DDE	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
50-29-3	4,4' -DDT	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
319-84-6	a-BHC	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
15972-60-8	Alachlor	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
309-00-2	Aldrin	< 4.0		ug/Kg	4.0	4.0	2	"	"	"	"	"	
319-85-7	b-BHC	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
57-74-9	Chlordane	< 40		ug/Kg	40	40	2	"	"	"	"	"	
319-86-8	d-BHC	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
60-57-1	Dieldrin	< 4.0		ug/Kg	4.0	4.0	2	"	"	"	"	"	
959-98-8	Endosulfan I	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
33213-65-9	Endosulfan II	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
1031-07-8	Endosulfan sulfate	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
72-20-8	Endrin	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
7421-93-4	Endrin aldehyde	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
53494-70-5	Endrin ketone	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
BRD5 SC39680-04	01.0173025.00	Soil	25-Sep-17 14:00	26-Sep-17

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Subcontracted Analyses													
Subcontracted Analyses													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
58-89-9	g-BHC	< 1.6		ug/Kg	1.6	1.6	2	SW8081B	28-Sep-17	29-Sep-17 20:35	M-CT007	403367A	
76-44-8	Heptachlor	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
1024-57-3	Heptachlor epoxide	< 7.9		ug/Kg	7.9	7.9	2	"	"	"	"	"	
118-74-1	Hexachlorobenzene	< 4.0		ug/Kg	4.0	4.0	2	"	"	"	"	"	
72-43-5	Methoxychlor	< 40		ug/Kg	40	40	2	"	"	"	"	"	
8001-35-2	Toxaphene	< 160		ug/Kg	160	160	2	"	"	"	"	"	
Surrogate recoveries:													
2051-24-3	*% DCBP*	*61*			*30-150 %*			"	"	"	"	"	
877-09-8	*% TCMX*	*58*			*30-150 %*			"	"	"	"	"	
Subcontracted Analyses													
Prepared by method 403427-										Methylation date: 28-Sep-17			
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
93-76-5	2,4,5-T	< 98		ug/Kg	98	98	10	SW8151A	"	30-Sep-17 01:18	M-CT007	403427A	
93-72-1	2,4,5-TP (Silvex)	< 98		ug/Kg	98	98	10	"	"	"	"	"	
94-75-7	2,4-D	< 200		ug/Kg	200	200	10	"	"	"	"	"	
94-82-6	2,4-DB	< 980		ug/Kg	980	980	10	"	"	"	"	"	
75-99-0	Dalapon	< 98		ug/Kg	98	98	10	"	"	"	"	"	
1918-00-9	Dicamba	< 98		ug/Kg	98	98	10	"	"	"	"	"	
120-36-5	Dichloroprop	< 150		ug/Kg	150	150	10	"	"	"	"	"	
88-85-7	Dinoseb	< 98		ug/Kg	98	98	10	"	"	"	"	"	
94-74-6	MCPA	< 29000		ug/Kg	29000	29000	10	"	"	"	"	"	
7085-19-0	MCPP	< 29000		ug/Kg	29000	29000	10	"	"	"	"	"	
Surrogate recoveries:													
19719-28-9	*% DCAA*	*47*			*30-150 %*			"	"	"	"	"	
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Percent Solid	**84**		%			1	SW846-%Solid	25-Sep-17 14:00	28-Sep-17 21:50	M-CT007	'[none]'	
Prepared by method 403834-SW9060A/													
*Analysis performed by Phoenix Environmental Labs, Inc. * - MACT007*													
	Tot.Org.Carbon	**2,100**	Q1a	mg/kg	100	100	1	SW9060A/L. Kahn	"	02-Oct-17 17:08	M-CT007	403834A	

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716596 - SW846 5035A Soil (low level)										
Blank (1716596-BLK1)					Prepared & Analyzed: 28-Sep-17					
1,1,2-Trichlorotrifluoroethane (Freon 113)	< 5.00		µg/kg wet	5.00						
Acetone	< 50.0		µg/kg wet	50.0						
Acrylonitrile	< 5.00		µg/kg wet	5.00						
Benzene	< 5.00		µg/kg wet	5.00						
Bromobenzene	< 5.00		µg/kg wet	5.00						
Bromochloromethane	< 5.00		µg/kg wet	5.00						
Bromodichloromethane	< 5.00		µg/kg wet	5.00						
Bromoform	< 5.00		µg/kg wet	5.00						
Bromomethane	< 10.0		µg/kg wet	10.0						
2-Butanone (MEK)	< 10.0		µg/kg wet	10.0						
n-Butylbenzene	< 5.00		µg/kg wet	5.00						
sec-Butylbenzene	< 5.00		µg/kg wet	5.00						
tert-Butylbenzene	< 5.00		µg/kg wet	5.00						
Carbon disulfide	< 10.0		µg/kg wet	10.0						
Carbon tetrachloride	< 5.00		µg/kg wet	5.00						
Chlorobenzene	< 5.00		µg/kg wet	5.00						
Chloroethane	< 10.0		µg/kg wet	10.0						
Chloroform	< 5.00		µg/kg wet	5.00						
Chloromethane	< 10.0		µg/kg wet	10.0						
2-Chlorotoluene	< 5.00		µg/kg wet	5.00						
4-Chlorotoluene	< 5.00		µg/kg wet	5.00						
1,2-Dibromo-3-chloropropane	< 10.0		µg/kg wet	10.0						
Dibromochloromethane	< 5.00		µg/kg wet	5.00						
1,2-Dibromoethane (EDB)	< 5.00		µg/kg wet	5.00						
Dibromomethane	< 5.00		µg/kg wet	5.00						
1,2-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
1,3-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
1,4-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
Dichlorodifluoromethane (Freon12)	< 10.0		µg/kg wet	10.0						
1,1-Dichloroethane	< 5.00		µg/kg wet	5.00						
1,2-Dichloroethane	< 5.00		µg/kg wet	5.00						
1,1-Dichloroethene	< 5.00		µg/kg wet	5.00						
cis-1,2-Dichloroethene	< 5.00		µg/kg wet	5.00						
trans-1,2-Dichloroethene	< 5.00		µg/kg wet	5.00						
1,2-Dichloropropane	< 5.00		µg/kg wet	5.00						
1,3-Dichloropropane	< 5.00		µg/kg wet	5.00						
2,2-Dichloropropane	< 5.00		µg/kg wet	5.00						
1,1-Dichloropropene	< 5.00		µg/kg wet	5.00						
cis-1,3-Dichloropropene	< 5.00		µg/kg wet	5.00						
trans-1,3-Dichloropropene	< 5.00		µg/kg wet	5.00						
Ethylbenzene	< 5.00		µg/kg wet	5.00						
Hexachlorobutadiene	< 5.00		µg/kg wet	5.00						
2-Hexanone (MBK)	< 10.0		µg/kg wet	10.0						
Isopropylbenzene	< 5.00		µg/kg wet	5.00						
4-Isopropyltoluene	< 5.00		µg/kg wet	5.00						
Methyl tert-butyl ether	< 5.00		µg/kg wet	5.00						
4-Methyl-2-pentanone (MIBK)	< 10.0		µg/kg wet	10.0						
Methylene chloride	< 10.0		µg/kg wet	10.0						
Naphthalene	< 5.00		µg/kg wet	5.00						
n-Propylbenzene	< 5.00		µg/kg wet	5.00						

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716596 - SW846 5035A Soil (low level)										
Blank (1716596-BLK1)					Prepared & Analyzed: 28-Sep-17					
Styrene	< 5.00		µg/kg wet	5.00						
1,1,1,2-Tetrachloroethane	< 5.00		µg/kg wet	5.00						
1,1,2,2-Tetrachloroethane	< 5.00		µg/kg wet	5.00						
Tetrachloroethene	< 5.00		µg/kg wet	5.00						
Toluene	< 5.00		µg/kg wet	5.00						
1,2,3-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,2,4-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,3,5-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,1,1-Trichloroethane	< 5.00		µg/kg wet	5.00						
1,1,2-Trichloroethane	< 5.00		µg/kg wet	5.00						
Trichloroethene	< 5.00		µg/kg wet	5.00						
Trichlorofluoromethane (Freon 11)	< 5.00		µg/kg wet	5.00						
1,2,3-Trichloropropane	< 5.00		µg/kg wet	5.00						
1,2,4-Trimethylbenzene	< 5.00		µg/kg wet	5.00						
1,3,5-Trimethylbenzene	< 5.00		µg/kg wet	5.00						
Vinyl chloride	< 5.00		µg/kg wet	5.00						
m,p-Xylene	< 10.0		µg/kg wet	10.0						
o-Xylene	< 5.00		µg/kg wet	5.00						
Tetrahydrofuran	< 10.0		µg/kg wet	10.0						
Ethyl ether	< 5.00		µg/kg wet	5.00						
Tert-amyl methyl ether	< 5.00		µg/kg wet	5.00						
Ethyl tert-butyl ether	< 5.00		µg/kg wet	5.00						
Di-isopropyl ether	< 5.00		µg/kg wet	5.00						
Tert-Butanol / butyl alcohol	< 50.0		µg/kg wet	50.0						
1,4-Dioxane	< 100		µg/kg wet	100						
trans-1,4-Dichloro-2-butene	< 25.0		µg/kg wet	25.0						
Ethanol	< 1000		µg/kg wet	1000						
Surrogate: 4-Bromofluorobenzene	*49.4*		µg/kg		*50.0*		*99*	*70-130*		
Surrogate: Toluene-d8	*49.5*		µg/kg		*50.0*		*99*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*56.3*		µg/kg		*50.0*		*113*	*70-130*		
Surrogate: Dibromofluoromethane	*50.6*		µg/kg		*50.0*		*101*	*70-130*		
LCS (1716596-BS1)					Prepared & Analyzed: 28-Sep-17					
1,1,2-Trichlorotrifluoroethane (Freon 113)	**19.9**		µg/kg		20.0		100	70-130		
Acetone	**26.9**		µg/kg		20.0		135	70-130		
Acrylonitrile	**19.3**		µg/kg		20.0		96	70-130		
Benzene	**20.0**		µg/kg		20.0		100	70-130		
Bromobenzene	**20.4**		µg/kg		20.0		102	70-130		
Bromochloromethane	**19.9**		µg/kg		20.0		99	70-130		
Bromodichloromethane	**20.0**		µg/kg		20.0		100	70-130		
Bromoform	**17.2**		µg/kg		20.0		86	70-130		
Bromomethane	**19.5**		µg/kg		20.0		98	70-130		
2-Butanone (MEK)	**19.9**		µg/kg		20.0		99	70-130		
n-Butylbenzene	**23.9**		µg/kg		20.0		119	70-130		
sec-Butylbenzene	**21.2**		µg/kg		20.0		106	70-130		
tert-Butylbenzene	**20.6**		µg/kg		20.0		103	70-130		
Carbon disulfide	**20.1**		µg/kg		20.0		101	70-130		
Carbon tetrachloride	**19.7**		µg/kg		20.0		99	70-130		
Chlorobenzene	**20.1**		µg/kg		20.0		100	70-130		
Chloroethane	**22.0**		µg/kg		20.0		110	70-130		
Chloroform	**19.5**		µg/kg		20.0		98	70-130		

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716596 - SW846 5035A Soil (low level)										
LCS (1716596-BS1)						Prepared & Analyzed: 28-Sep-17				
Chloromethane	**17.5**		µg/kg		20.0		88	70-130		
2-Chlorotoluene	**20.3**		µg/kg		20.0		102	70-130		
4-Chlorotoluene	**21.7**		µg/kg		20.0		108	70-130		
1,2-Dibromo-3-chloropropane	**17.3**		µg/kg		20.0		86	70-130		
Dibromochloromethane	**19.7**		µg/kg		20.0		98	70-130		
1,2-Dibromoethane (EDB)	**19.8**		µg/kg		20.0		99	70-130		
Dibromomethane	**20.3**		µg/kg		20.0		102	70-130		
1,2-Dichlorobenzene	**20.8**		µg/kg		20.0		104	70-130		
1,3-Dichlorobenzene	**21.0**		µg/kg		20.0		105	70-130		
1,4-Dichlorobenzene	**20.8**		µg/kg		20.0		104	70-130		
Dichlorodifluoromethane (Freon12)	**16.9**		µg/kg		20.0		85	70-130		
1,1-Dichloroethane	**20.0**		µg/kg		20.0		100	70-130		
1,2-Dichloroethane	**19.7**		µg/kg		20.0		98	70-130		
1,1-Dichloroethene	**19.0**		µg/kg		20.0		95	70-130		
cis-1,2-Dichloroethene	**20.1**		µg/kg		20.0		100	70-130		
trans-1,2-Dichloroethene	**20.0**		µg/kg		20.0		100	70-130		
1,2-Dichloropropane	**20.0**		µg/kg		20.0		100	70-130		
1,3-Dichloropropane	**20.3**		µg/kg		20.0		101	70-130		
2,2-Dichloropropane	**21.0**		µg/kg		20.0		105	70-130		
1,1-Dichloropropene	**20.5**		µg/kg		20.0		103	70-130		
cis-1,3-Dichloropropene	**20.2**		µg/kg		20.0		101	70-130		
trans-1,3-Dichloropropene	**20.1**		µg/kg		20.0		101	70-130		
Ethylbenzene	**20.6**		µg/kg		20.0		103	70-130		
Hexachlorobutadiene	**22.5**		µg/kg		20.0		113	70-130		
2-Hexanone (MBK)	**19.6**		µg/kg		20.0		98	70-130		
Isopropylbenzene	**20.4**		µg/kg		20.0		102	70-130		
4-Isopropyltoluene	**22.4**		µg/kg		20.0		112	70-130		
Methyl tert-butyl ether	**19.1**		µg/kg		20.0		96	70-130		
4-Methyl-2-pentanone (MIBK)	**17.0**		µg/kg		20.0		85	70-130		
Methylene chloride	**19.6**		µg/kg		20.0		98	70-130		
Naphthalene	**19.1**		µg/kg		20.0		96	70-130		
n-Propylbenzene	**21.9**		µg/kg		20.0		109	70-130		
Styrene	**21.1**		µg/kg		20.0		105	70-130		
1,1,1,2-Tetrachloroethane	**20.0**		µg/kg		20.0		100	70-130		
1,1,2,2-Tetrachloroethane	**19.2**		µg/kg		20.0		96	70-130		
Tetrachloroethene	**20.9**		µg/kg		20.0		105	70-130		
Toluene	**20.6**		µg/kg		20.0		103	70-130		
1,2,3-Trichlorobenzene	**22.3**		µg/kg		20.0		112	70-130		
1,2,4-Trichlorobenzene	**23.4**		µg/kg		20.0		117	70-130		
1,3,5-Trichlorobenzene	**24.4**		µg/kg		20.0		122	70-130		
1,1,1-Trichloroethane	**19.9**		µg/kg		20.0		100	70-130		
1,1,2-Trichloroethane	**19.7**		µg/kg		20.0		99	70-130		
Trichloroethene	**19.7**		µg/kg		20.0		99	70-130		
Trichlorofluoromethane (Freon 11)	**20.7**		µg/kg		20.0		103	70-130		
1,2,3-Trichloropropane	**19.2**		µg/kg		20.0		96	70-130		
1,2,4-Trimethylbenzene	**21.7**		µg/kg		20.0		108	70-130		
1,3,5-Trimethylbenzene	**21.5**		µg/kg		20.0		108	70-130		
Vinyl chloride	**22.8**		µg/kg		20.0		114	70-130		
m,p-Xylene	**20.4**		µg/kg		20.0		102	70-130		
o-Xylene	**20.2**		µg/kg		20.0		101	70-130		

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716596 - SW846 5035A Soil (low level)										
LCS (1716596-BS1)						Prepared & Analyzed: 28-Sep-17				
Tetrahydrofuran	**19.7**		µg/kg		20.0		98	70-130		
Ethyl ether	**20.4**		µg/kg		20.0		102	70-130		
Tert-amyl methyl ether	**19.8**		µg/kg		20.0		99	70-130		
Ethyl tert-butyl ether	**19.8**		µg/kg		20.0		99	70-130		
Di-isopropyl ether	**20.5**		µg/kg		20.0		102	70-130		
Tert-Butanol / butyl alcohol	**177**		µg/kg		200		89	70-130		
1,4-Dioxane	**178**		µg/kg		200		89	70-130		
trans-1,4-Dichloro-2-butene	**16.5**		µg/kg		20.0		82	70-130		
Ethanol	**398**		µg/kg		400		99	70-130		
Surrogate: 4-Bromofluorobenzene	*50.2*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: Toluene-d8	*49.8*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*49.9*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: Dibromofluoromethane	*50.1*		µg/kg		*50.0*		*100*	*70-130*		
LCS Dup (1716596-BSD1)						Prepared & Analyzed: 28-Sep-17				
1,1,2-Trichlorotrifluoroethane (Freon 113)	**19.8**		µg/kg		20.0		99	70-130	0.7	30
Acetone	**24.2**		µg/kg		20.0		121	70-130	11	30
Acrylonitrile	**20.2**		µg/kg		20.0		101	70-130	5	30
Benzene	**20.0**		µg/kg		20.0		100	70-130	0.4	30
Bromobenzene	**20.6**		µg/kg		20.0		103	70-130	1	30
Bromochloromethane	**20.0**		µg/kg		20.0		100	70-130	0.4	30
Bromodichloromethane	**20.0**		µg/kg		20.0		100	70-130	0.3	30
Bromoform	**17.8**		µg/kg		20.0		89	70-130	3	30
Bromomethane	**19.8**		µg/kg		20.0		99	70-130	1	30
2-Butanone (MEK)	**19.8**		µg/kg		20.0		99	70-130	0.6	30
n-Butylbenzene	**23.4**		µg/kg		20.0		117	70-130	2	30
sec-Butylbenzene	**21.4**		µg/kg		20.0		107	70-130	0.9	30
tert-Butylbenzene	**20.7**		µg/kg		20.0		103	70-130	0.4	30
Carbon disulfide	**19.9**		µg/kg		20.0		100	70-130	0.9	30
Carbon tetrachloride	**19.5**		µg/kg		20.0		98	70-130	1	30
Chlorobenzene	**20.0**		µg/kg		20.0		100	70-130	0.3	30
Chloroethane	**21.2**		µg/kg		20.0		106	70-130	4	30
Chloroform	**19.9**		µg/kg		20.0		99	70-130	2	30
Chloromethane	**16.9**		µg/kg		20.0		84	70-130	4	30
2-Chlorotoluene	**20.3**		µg/kg		20.0		102	70-130	0.05	30
4-Chlorotoluene	**21.7**		µg/kg		20.0		108	70-130	0.1	30
1,2-Dibromo-3-chloropropane	**18.1**		µg/kg		20.0		90	70-130	5	30
Dibromochloromethane	**19.7**		µg/kg		20.0		98	70-130	0.05	30
1,2-Dibromoethane (EDB)	**20.0**		µg/kg		20.0		100	70-130	1	30
Dibromomethane	**20.6**		µg/kg		20.0		103	70-130	1	30
1,2-Dichlorobenzene	**20.8**		µg/kg		20.0		104	70-130	0.1	30
1,3-Dichlorobenzene	**20.9**		µg/kg		20.0		105	70-130	0.4	30
1,4-Dichlorobenzene	**20.6**		µg/kg		20.0		103	70-130	0.7	30
Dichlorodifluoromethane (Freon12)	**16.2**		µg/kg		20.0		81	70-130	5	30
1,1-Dichloroethane	**20.0**		µg/kg		20.0		100	70-130	0.1	30
1,2-Dichloroethane	**20.2**		µg/kg		20.0		101	70-130	2	30
1,1-Dichloroethene	**19.6**		µg/kg		20.0		98	70-130	3	30
cis-1,2-Dichloroethene	**19.9**		µg/kg		20.0		100	70-130	0.8	30
trans-1,2-Dichloroethene	**19.8**		µg/kg		20.0		99	70-130	1	30
1,2-Dichloropropane	**20.0**		µg/kg		20.0		100	70-130	0.4	30
1,3-Dichloropropane	**20.5**		µg/kg		20.0		103	70-130	1	30

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716596 - SW846 5035A Soil (low level)										
LCS Dup (1716596-BSD1)					Prepared & Analyzed: 28-Sep-17					
2,2-Dichloropropane	**20.5**		µg/kg		20.0		103	70-130	2	30
1,1-Dichloropropene	**20.5**		µg/kg		20.0		102	70-130	0.1	30
cis-1,3-Dichloropropene	**20.3**		µg/kg		20.0		101	70-130	0.1	30
trans-1,3-Dichloropropene	**20.0**		µg/kg		20.0		100	70-130	0.4	30
Ethylbenzene	**20.5**		µg/kg		20.0		102	70-130	0.5	30
Hexachlorobutadiene	**22.6**		µg/kg		20.0		113	70-130	0.4	30
2-Hexanone (MBK)	**17.8**		µg/kg		20.0		89	70-130	10	30
Isopropylbenzene	**20.4**		µg/kg		20.0		102	70-130	0.1	30
4-Isopropyltoluene	**22.2**		µg/kg		20.0		111	70-130	1	30
Methyl tert-butyl ether	**19.3**		µg/kg		20.0		96	70-130	1	30
4-Methyl-2-pentanone (MIBK)	**19.1**		µg/kg		20.0		96	70-130	12	30
Methylene chloride	**19.7**		µg/kg		20.0		98	70-130	0.4	30
Naphthalene	**21.9**		µg/kg		20.0		109	70-130	13	30
n-Propylbenzene	**21.5**		µg/kg		20.0		108	70-130	1	30
Styrene	**21.0**		µg/kg		20.0		105	70-130	0.5	30
1,1,1,2-Tetrachloroethane	**19.9**		µg/kg		20.0		100	70-130	0.1	30
1,1,2,2-Tetrachloroethane	**20.2**		µg/kg		20.0		101	70-130	5	30
Tetrachloroethene	**20.5**		µg/kg		20.0		103	70-130	2	30
Toluene	**20.0**		µg/kg		20.0		100	70-130	3	30
1,2,3-Trichlorobenzene	**23.3**		µg/kg		20.0		117	70-130	4	30
1,2,4-Trichlorobenzene	**23.6**		µg/kg		20.0		118	70-130	0.9	30
1,3,5-Trichlorobenzene	**23.7**		µg/kg		20.0		119	70-130	3	30
1,1,1-Trichloroethane	**19.6**		µg/kg		20.0		98	70-130	2	30
1,1,2-Trichloroethane	**20.0**		µg/kg		20.0		100	70-130	1	30
Trichloroethene	**20.0**		µg/kg		20.0		100	70-130	2	30
Trichlorofluoromethane (Freon 11)	**20.7**		µg/kg		20.0		104	70-130	0.3	30
1,2,3-Trichloropropane	**20.1**		µg/kg		20.0		101	70-130	5	30
1,2,4-Trimethylbenzene	**21.6**		µg/kg		20.0		108	70-130	0.3	30
1,3,5-Trimethylbenzene	**21.4**		µg/kg		20.0		107	70-130	0.6	30
Vinyl chloride	**21.9**		µg/kg		20.0		109	70-130	4	30
m,p-Xylene	**20.3**		µg/kg		20.0		101	70-130	0.6	30
o-Xylene	**20.2**		µg/kg		20.0		101	70-130	0.3	30
Tetrahydrofuran	**18.3**		µg/kg		20.0		92	70-130	7	30
Ethyl ether	**20.9**		µg/kg		20.0		104	70-130	2	30
Tert-amyl methyl ether	**20.2**		µg/kg		20.0		101	70-130	2	30
Ethyl tert-butyl ether	**20.1**		µg/kg		20.0		100	70-130	1	30
Di-isopropyl ether	**20.6**		µg/kg		20.0		103	70-130	0.7	30
Tert-Butanol / butyl alcohol	**181**		µg/kg		200		90	70-130	2	30
1,4-Dioxane	**193**		µg/kg		200		96	70-130	8	30
trans-1,4-Dichloro-2-butene	**16.7**		µg/kg		20.0		83	70-130	1	30
Ethanol	**405**		µg/kg		400		101	70-130	2	30
Surrogate: 4-Bromofluorobenzene	*49.7*		µg/kg		*50.0*		*99*	*70-130*		
Surrogate: Toluene-d8	*49.8*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*50.3*		µg/kg		*50.0*		*101*	*70-130*		
Surrogate: Dibromofluoromethane	*50.6*		µg/kg		*50.0*		*101*	*70-130*		
Batch 1716738 - SW846 5035A Soil (low level)										
Blank (1716738-BLK1)					Prepared & Analyzed: 02-Oct-17					
1,1,2-Trichlorotrifluoroethane (Freon 113)	< 5.00		µg/kg wet	5.00						
Acetone	< 50.0		µg/kg wet	50.0						
Acrylonitrile	< 5.00		µg/kg wet	5.00						

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716738 - SW846 5035A Soil (low level)										
Blank (1716738-BLK1)					Prepared & Analyzed: 02-Oct-17					
Benzene	< 5.00		µg/kg wet	5.00						
Bromobenzene	< 5.00		µg/kg wet	5.00						
Bromochloromethane	< 5.00		µg/kg wet	5.00						
Bromodichloromethane	< 5.00		µg/kg wet	5.00						
Bromoform	< 5.00		µg/kg wet	5.00						
Bromomethane	< 10.0		µg/kg wet	10.0						
2-Butanone (MEK)	< 10.0		µg/kg wet	10.0						
n-Butylbenzene	< 5.00		µg/kg wet	5.00						
sec-Butylbenzene	< 5.00		µg/kg wet	5.00						
tert-Butylbenzene	< 5.00		µg/kg wet	5.00						
Carbon disulfide	< 10.0		µg/kg wet	10.0						
Carbon tetrachloride	< 5.00		µg/kg wet	5.00						
Chlorobenzene	< 5.00		µg/kg wet	5.00						
Chloroethane	< 10.0		µg/kg wet	10.0						
Chloroform	< 5.00		µg/kg wet	5.00						
Chloromethane	< 10.0		µg/kg wet	10.0						
2-Chlorotoluene	< 5.00		µg/kg wet	5.00						
4-Chlorotoluene	< 5.00		µg/kg wet	5.00						
1,2-Dibromo-3-chloropropane	< 10.0		µg/kg wet	10.0						
Dibromochloromethane	< 5.00		µg/kg wet	5.00						
1,2-Dibromoethane (EDB)	< 5.00		µg/kg wet	5.00						
Dibromomethane	< 5.00		µg/kg wet	5.00						
1,2-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
1,3-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
1,4-Dichlorobenzene	< 5.00		µg/kg wet	5.00						
Dichlorodifluoromethane (Freon12)	< 10.0		µg/kg wet	10.0						
1,1-Dichloroethane	< 5.00		µg/kg wet	5.00						
1,2-Dichloroethane	< 5.00		µg/kg wet	5.00						
1,1-Dichloroethene	< 5.00		µg/kg wet	5.00						
cis-1,2-Dichloroethene	< 5.00		µg/kg wet	5.00						
trans-1,2-Dichloroethene	< 5.00		µg/kg wet	5.00						
1,2-Dichloropropane	< 5.00		µg/kg wet	5.00						
1,3-Dichloropropane	< 5.00		µg/kg wet	5.00						
2,2-Dichloropropane	< 5.00		µg/kg wet	5.00						
1,1-Dichloropropene	< 5.00		µg/kg wet	5.00						
cis-1,3-Dichloropropene	< 5.00		µg/kg wet	5.00						
trans-1,3-Dichloropropene	< 5.00		µg/kg wet	5.00						
Ethylbenzene	< 5.00		µg/kg wet	5.00						
Hexachlorobutadiene	< 5.00		µg/kg wet	5.00						
2-Hexanone (MBK)	< 10.0		µg/kg wet	10.0						
Isopropylbenzene	< 5.00		µg/kg wet	5.00						
4-Isopropyltoluene	< 5.00		µg/kg wet	5.00						
Methyl tert-butyl ether	< 5.00		µg/kg wet	5.00						
4-Methyl-2-pentanone (MIBK)	< 10.0		µg/kg wet	10.0						
Methylene chloride	< 10.0		µg/kg wet	10.0						
Naphthalene	< 5.00		µg/kg wet	5.00						
n-Propylbenzene	< 5.00		µg/kg wet	5.00						
Styrene	< 5.00		µg/kg wet	5.00						
1,1,1,2-Tetrachloroethane	< 5.00		µg/kg wet	5.00						
1,1,2,2-Tetrachloroethane	< 5.00		µg/kg wet	5.00						

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716738 - SW846 5035A Soil (low level)										
Blank (1716738-BLK1)					Prepared & Analyzed: 02-Oct-17					
Tetrachloroethene	< 5.00		µg/kg wet	5.00						
Toluene	< 5.00		µg/kg wet	5.00						
1,2,3-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,2,4-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,3,5-Trichlorobenzene	< 5.00		µg/kg wet	5.00						
1,1,1-Trichloroethane	< 5.00		µg/kg wet	5.00						
1,1,2-Trichloroethane	< 5.00		µg/kg wet	5.00						
Trichloroethene	< 5.00		µg/kg wet	5.00						
Trichlorofluoromethane (Freon 11)	< 5.00		µg/kg wet	5.00						
1,2,3-Trichloropropane	< 5.00		µg/kg wet	5.00						
1,2,4-Trimethylbenzene	< 5.00		µg/kg wet	5.00						
1,3,5-Trimethylbenzene	< 5.00		µg/kg wet	5.00						
Vinyl chloride	< 5.00		µg/kg wet	5.00						
m,p-Xylene	< 10.0		µg/kg wet	10.0						
o-Xylene	< 5.00		µg/kg wet	5.00						
Tetrahydrofuran	< 10.0		µg/kg wet	10.0						
Ethyl ether	< 5.00		µg/kg wet	5.00						
Tert-amyl methyl ether	< 5.00		µg/kg wet	5.00						
Ethyl tert-butyl ether	< 5.00		µg/kg wet	5.00						
Di-isopropyl ether	< 5.00		µg/kg wet	5.00						
Tert-Butanol / butyl alcohol	< 50.0		µg/kg wet	50.0						
1,4-Dioxane	< 100		µg/kg wet	100						
trans-1,4-Dichloro-2-butene	< 25.0		µg/kg wet	25.0						
Ethanol	< 1000		µg/kg wet	1000						
Surrogate: 4-Bromofluorobenzene	*50.3*		µg/kg		*50.0*		*101*	*70-130*		
Surrogate: Toluene-d8	*50.8*		µg/kg		*50.0*		*102*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*57.8*		µg/kg		*50.0*		*116*	*70-130*		
Surrogate: Dibromofluoromethane	*51.4*		µg/kg		*50.0*		*103*	*70-130*		
LCS (1716738-BS1)					Prepared & Analyzed: 02-Oct-17					
1,1,2-Trichlorotrifluoroethane (Freon 113)	**17.8**		µg/kg		20.0		89	70-130		
Acetone	**18.7**		µg/kg		20.0		93	70-130		
Acrylonitrile	**18.9**		µg/kg		20.0		95	70-130		
Benzene	**18.5**		µg/kg		20.0		93	70-130		
Bromobenzene	**19.4**		µg/kg		20.0		97	70-130		
Bromochloromethane	**19.4**		µg/kg		20.0		97	70-130		
Bromodichloromethane	**18.7**		µg/kg		20.0		94	70-130		
Bromoform	**16.6**		µg/kg		20.0		83	70-130		
Bromomethane	**18.7**		µg/kg		20.0		94	70-130		
2-Butanone (MEK)	**17.0**		µg/kg		20.0		85	70-130		
n-Butylbenzene	**20.4**		µg/kg		20.0		102	70-130		
sec-Butylbenzene	**19.4**		µg/kg		20.0		97	70-130		
tert-Butylbenzene	**19.0**		µg/kg		20.0		95	70-130		
Carbon disulfide	**17.7**		µg/kg		20.0		88	70-130		
Carbon tetrachloride	**17.9**		µg/kg		20.0		89	70-130		
Chlorobenzene	**18.7**		µg/kg		20.0		94	70-130		
Chloroethane	**21.1**		µg/kg		20.0		106	70-130		
Chloroform	**18.5**		µg/kg		20.0		93	70-130		
Chloromethane	**16.2**		µg/kg		20.0		81	70-130		
2-Chlorotoluene	**18.8**		µg/kg		20.0		94	70-130		
4-Chlorotoluene	**20.2**		µg/kg		20.0		101	70-130		

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716738 - SW846 5035A Soil (low level)										
LCS (1716738-BS1)						Prepared & Analyzed: 02-Oct-17				
1,2-Dibromo-3-chloropropane	**16.3**		µg/kg		20.0		82	70-130		
Dibromochloromethane	**18.4**		µg/kg		20.0		92	70-130		
1,2-Dibromoethane (EDB)	**19.4**		µg/kg		20.0		97	70-130		
Dibromomethane	**19.8**		µg/kg		20.0		99	70-130		
1,2-Dichlorobenzene	**19.7**		µg/kg		20.0		98	70-130		
1,3-Dichlorobenzene	**19.6**		µg/kg		20.0		98	70-130		
1,4-Dichlorobenzene	**19.3**		µg/kg		20.0		97	70-130		
Dichlorodifluoromethane (Freon12)	**17.4**		µg/kg		20.0		87	70-130		
1,1-Dichloroethane	**18.4**		µg/kg		20.0		92	70-130		
1,2-Dichloroethane	**19.1**		µg/kg		20.0		96	70-130		
1,1-Dichloroethene	**18.4**		µg/kg		20.0		92	70-130		
cis-1,2-Dichloroethene	**18.4**		µg/kg		20.0		92	70-130		
trans-1,2-Dichloroethene	**18.0**		µg/kg		20.0		90	70-130		
1,2-Dichloropropane	**18.5**		µg/kg		20.0		93	70-130		
1,3-Dichloropropane	**19.3**		µg/kg		20.0		96	70-130		
2,2-Dichloropropane	**17.6**		µg/kg		20.0		88	70-130		
1,1-Dichloropropene	**18.6**		µg/kg		20.0		93	70-130		
cis-1,3-Dichloropropene	**18.6**		µg/kg		20.0		93	70-130		
trans-1,3-Dichloropropene	**18.5**		µg/kg		20.0		92	70-130		
Ethylbenzene	**19.0**		µg/kg		20.0		95	70-130		
Hexachlorobutadiene	**20.0**		µg/kg		20.0		100	70-130		
2-Hexanone (MBK)	**17.6**		µg/kg		20.0		88	70-130		
Isopropylbenzene	**19.0**		µg/kg		20.0		95	70-130		
4-Isopropyltoluene	**20.3**		µg/kg		20.0		102	70-130		
Methyl tert-butyl ether	**17.9**		µg/kg		20.0		90	70-130		
4-Methyl-2-pentanone (MIBK)	**16.7**		µg/kg		20.0		83	70-130		
Methylene chloride	**18.0**		µg/kg		20.0		90	70-130		
Naphthalene	**17.3**		µg/kg		20.0		87	70-130		
n-Propylbenzene	**19.8**		µg/kg		20.0		99	70-130		
Styrene	**19.6**		µg/kg		20.0		98	70-130		
1,1,1,2-Tetrachloroethane	**18.8**		µg/kg		20.0		94	70-130		
1,1,2,2-Tetrachloroethane	**18.6**		µg/kg		20.0		93	70-130		
Tetrachloroethene	**19.4**		µg/kg		20.0		97	70-130		
Toluene	**18.8**		µg/kg		20.0		94	70-130		
1,2,3-Trichlorobenzene	**20.6**		µg/kg		20.0		103	70-130		
1,2,4-Trichlorobenzene	**21.0**		µg/kg		20.0		105	70-130		
1,3,5-Trichlorobenzene	**22.0**		µg/kg		20.0		110	70-130		
1,1,1-Trichloroethane	**18.1**		µg/kg		20.0		91	70-130		
1,1,2-Trichloroethane	**19.0**		µg/kg		20.0		95	70-130		
Trichloroethene	**18.4**		µg/kg		20.0		92	70-130		
Trichlorofluoromethane (Freon 11)	**19.0**		µg/kg		20.0		95	70-130		
1,2,3-Trichloropropane	**18.7**		µg/kg		20.0		93	70-130		
1,2,4-Trimethylbenzene	**20.1**		µg/kg		20.0		101	70-130		
1,3,5-Trimethylbenzene	**19.8**		µg/kg		20.0		99	70-130		
Vinyl chloride	**22.8**		µg/kg		20.0		114	70-130		
m,p-Xylene	**18.6**		µg/kg		20.0		93	70-130		
o-Xylene	**19.0**		µg/kg		20.0		95	70-130		
Tetrahydrofuran	**16.2**		µg/kg		20.0		81	70-130		
Ethyl ether	**21.1**		µg/kg		20.0		106	70-130		
Tert-amyl methyl ether	**20.4**		µg/kg		20.0		102	70-130		

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716738 - SW846 5035A Soil (low level)										
LCS (1716738-BS1)						Prepared & Analyzed: 02-Oct-17				
Ethyl tert-butyl ether	**18.2**		µg/kg		20.0		91	70-130		
Di-isopropyl ether	**19.0**		µg/kg		20.0		95	70-130		
Tert-Butanol / butyl alcohol	**161**		µg/kg		200		80	70-130		
1,4-Dioxane	**177**		µg/kg		200		88	70-130		
trans-1,4-Dichloro-2-butene	**16.4**		µg/kg		20.0		82	70-130		
Ethanol	**408**		µg/kg		400		102	70-130		
Surrogate: 4-Bromofluorobenzene	*50.0*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: Toluene-d8	*50.0*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*49.7*		µg/kg		*50.0*		*99*	*70-130*		
Surrogate: Dibromofluoromethane	*50.0*		µg/kg		*50.0*		*100*	*70-130*		
LCS Dup (1716738-BSD1)						Prepared & Analyzed: 02-Oct-17				
1,1,2-Trichlorotrifluoroethane (Freon 113)	**17.9**		µg/kg		20.0		90	70-130	1	30
Acetone	**19.3**		µg/kg		20.0		96	70-130	3	30
Acrylonitrile	**18.8**		µg/kg		20.0		94	70-130	0.7	30
Benzene	**18.6**		µg/kg		20.0		93	70-130	0.5	30
Bromobenzene	**19.8**		µg/kg		20.0		99	70-130	2	30
Bromochloromethane	**19.2**		µg/kg		20.0		96	70-130	0.8	30
Bromodichloromethane	**18.8**		µg/kg		20.0		94	70-130	0.4	30
Bromoform	**16.1**		µg/kg		20.0		81	70-130	3	30
Bromomethane	**20.2**		µg/kg		20.0		101	70-130	7	30
2-Butanone (MEK)	**17.1**		µg/kg		20.0		86	70-130	0.8	30
n-Butylbenzene	**20.1**		µg/kg		20.0		100	70-130	2	30
sec-Butylbenzene	**19.5**		µg/kg		20.0		98	70-130	0.7	30
tert-Butylbenzene	**19.2**		µg/kg		20.0		96	70-130	0.9	30
Carbon disulfide	**17.6**		µg/kg		20.0		88	70-130	0.2	30
Carbon tetrachloride	**18.0**		µg/kg		20.0		90	70-130	0.7	30
Chlorobenzene	**19.1**		µg/kg		20.0		95	70-130	2	30
Chloroethane	**20.4**		µg/kg		20.0		102	70-130	3	30
Chloroform	**18.6**		µg/kg		20.0		93	70-130	0.4	30
Chloromethane	**18.8**		µg/kg		20.0		94	70-130	15	30
2-Chlorotoluene	**19.8**		µg/kg		20.0		99	70-130	5	30
4-Chlorotoluene	**20.4**		µg/kg		20.0		102	70-130	1	30
1,2-Dibromo-3-chloropropane	**15.6**		µg/kg		20.0		78	70-130	5	30
Dibromochloromethane	**18.6**		µg/kg		20.0		93	70-130	0.9	30
1,2-Dibromoethane (EDB)	**19.3**		µg/kg		20.0		96	70-130	0.5	30
Dibromomethane	**19.7**		µg/kg		20.0		98	70-130	0.5	30
1,2-Dichlorobenzene	**19.6**		µg/kg		20.0		98	70-130	0.5	30
1,3-Dichlorobenzene	**19.6**		µg/kg		20.0		98	70-130	0.2	30
1,4-Dichlorobenzene	**19.2**		µg/kg		20.0		96	70-130	0.5	30
Dichlorodifluoromethane (Freon12)	**17.3**		µg/kg		20.0		87	70-130	0.6	30
1,1-Dichloroethane	**18.5**		µg/kg		20.0		93	70-130	0.7	30
1,2-Dichloroethane	**19.4**		µg/kg		20.0		97	70-130	1	30
1,1-Dichloroethene	**19.0**		µg/kg		20.0		95	70-130	3	30
cis-1,2-Dichloroethene	**18.6**		µg/kg		20.0		93	70-130	0.8	30
trans-1,2-Dichloroethene	**18.0**		µg/kg		20.0		90	70-130	0.2	30
1,2-Dichloropropane	**18.6**		µg/kg		20.0		93	70-130	0.05	30
1,3-Dichloropropane	**18.9**		µg/kg		20.0		95	70-130	2	30
2,2-Dichloropropane	**17.4**		µg/kg		20.0		87	70-130	1	30
1,1-Dichloropropene	**18.7**		µg/kg		20.0		93	70-130	0.4	30
cis-1,3-Dichloropropene	**18.8**		µg/kg		20.0		94	70-130	1	30

Volatile Organic Compounds - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8260C										
Batch 1716738 - SW846 5035A Soil (low level)										
LCS Dup (1716738-BSD1)					Prepared & Analyzed: 02-Oct-17					
trans-1,3-Dichloropropene	**18.2**		µg/kg		20.0		91	70-130	1	30
Ethylbenzene	**19.2**		µg/kg		20.0		96	70-130	1	30
Hexachlorobutadiene	**20.0**		µg/kg		20.0		100	70-130	0.05	30
2-Hexanone (MBK)	**16.3**		µg/kg		20.0		81	70-130	8	30
Isopropylbenzene	**19.1**		µg/kg		20.0		95	70-130	0.6	30
4-Isopropyltoluene	**20.0**		µg/kg		20.0		100	70-130	1	30
Methyl tert-butyl ether	**17.6**		µg/kg		20.0		88	70-130	2	30
4-Methyl-2-pentanone (MIBK)	**16.2**		µg/kg		20.0		81	70-130	2	30
Methylene chloride	**18.5**		µg/kg		20.0		93	70-130	3	30
Naphthalene	**17.4**		µg/kg		20.0		87	70-130	0.2	30
n-Propylbenzene	**19.8**		µg/kg		20.0		99	70-130	0.2	30
Styrene	**19.5**		µg/kg		20.0		97	70-130	0.4	30
1,1,1,2-Tetrachloroethane	**18.7**		µg/kg		20.0		94	70-130	0.3	30
1,1,2,2-Tetrachloroethane	**18.6**		µg/kg		20.0		93	70-130	0.05	30
Tetrachloroethene	**19.1**		µg/kg		20.0		96	70-130	2	30
Toluene	**18.8**		µg/kg		20.0		94	70-130	0.4	30
1,2,3-Trichlorobenzene	**20.4**		µg/kg		20.0		102	70-130	1	30
1,2,4-Trichlorobenzene	**20.2**		µg/kg		20.0		101	70-130	4	30
1,3,5-Trichlorobenzene	**21.9**		µg/kg		20.0		109	70-130	0.4	30
1,1,1-Trichloroethane	**18.3**		µg/kg		20.0		92	70-130	1	30
1,1,2-Trichloroethane	**18.8**		µg/kg		20.0		94	70-130	0.9	30
Trichloroethene	**18.8**		µg/kg		20.0		94	70-130	2	30
Trichlorofluoromethane (Freon 11)	**19.4**		µg/kg		20.0		97	70-130	2	30
1,2,3-Trichloropropane	**18.6**		µg/kg		20.0		93	70-130	0.6	30
1,2,4-Trimethylbenzene	**20.0**		µg/kg		20.0		100	70-130	0.8	30
1,3,5-Trimethylbenzene	**19.7**		µg/kg		20.0		98	70-130	0.6	30
Vinyl chloride	**22.2**		µg/kg		20.0		111	70-130	2	30
m,p-Xylene	**18.9**		µg/kg		20.0		94	70-130	2	30
o-Xylene	**19.1**		µg/kg		20.0		96	70-130	0.6	30
Tetrahydrofuran	**16.7**		µg/kg		20.0		83	70-130	3	30
Ethyl ether	**21.3**		µg/kg		20.0		106	70-130	0.8	30
Tert-amyl methyl ether	**20.2**		µg/kg		20.0		101	70-130	1	30
Ethyl tert-butyl ether	**18.2**		µg/kg		20.0		91	70-130	0.5	30
Di-isopropyl ether	**18.8**		µg/kg		20.0		94	70-130	0.8	30
Tert-Butanol / butyl alcohol	**155**		µg/kg		200		78	70-130	4	30
1,4-Dioxane	**170**		µg/kg		200		85	70-130	4	30
trans-1,4-Dichloro-2-butene	**15.7**		µg/kg		20.0		78	70-130	5	30
Ethanol	**403**		µg/kg		400		101	70-130	1	30
Surrogate: 4-Bromofluorobenzene	*50.2*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: Toluene-d8	*49.8*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4	*49.8*		µg/kg		*50.0*		*100*	*70-130*		
Surrogate: Dibromofluoromethane	*50.4*		µg/kg		*50.0*		*101*	*70-130*		

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1716889 - SW846 3546										
Blank (1716889-BLK1)					Prepared: 04-Oct-17 Analyzed: 06-Oct-17					
Acenaphthene	< 66.1		µg/kg wet	66.1						
Acenaphthylene	< 66.1		µg/kg wet	66.1						
Aniline	< 327		µg/kg wet	327						
Anthracene	< 66.1		µg/kg wet	66.1						
Azobenzene/Diphenyldiazene	< 327		µg/kg wet	327						
Benzidine	< 327		µg/kg wet	327						
Benzo (a) anthracene	< 66.1		µg/kg wet	66.1						
Benzo (a) pyrene	< 66.1		µg/kg wet	66.1						
Benzo (b) fluoranthene	< 66.1		µg/kg wet	66.1						
Benzo (g,h,i) perylene	< 66.1		µg/kg wet	66.1						
Benzo (k) fluoranthene	< 66.1		µg/kg wet	66.1						
Benzoic acid	< 327		µg/kg wet	327						
Benzyl alcohol	< 327		µg/kg wet	327						
Bis(2-chloroethoxy)methane	< 327		µg/kg wet	327						
Bis(2-chloroethyl)ether	< 165		µg/kg wet	165						
Bis(2-chloroisopropyl)ether	< 165		µg/kg wet	165						
Bis(2-ethylhexyl)phthalate	< 165		µg/kg wet	165						
4-Bromophenyl phenyl ether	< 327		µg/kg wet	327						
Butyl benzyl phthalate	< 327		µg/kg wet	327						
Carbazole	< 165		µg/kg wet	165						
4-Chloro-3-methylphenol	< 327		µg/kg wet	327						
4-Chloroaniline	< 165		µg/kg wet	165						
2-Chloronaphthalene	< 327		µg/kg wet	327						
2-Chlorophenol	< 165		µg/kg wet	165						
4-Chlorophenyl phenyl ether	< 327		µg/kg wet	327						
Chrysene	< 66.1		µg/kg wet	66.1						
Dibenzo (a,h) anthracene	< 66.1		µg/kg wet	66.1						
Dibenzofuran	< 165		µg/kg wet	165						
1,2-Dichlorobenzene	< 327		µg/kg wet	327						
1,3-Dichlorobenzene	< 327		µg/kg wet	327						
1,4-Dichlorobenzene	< 327		µg/kg wet	327						
3,3´-Dichlorobenzidine	< 327		µg/kg wet	327						
2,4-Dichlorophenol	< 165		µg/kg wet	165						
Diethyl phthalate	< 327		µg/kg wet	327						
Dimethyl phthalate	< 327		µg/kg wet	327						
2,4-Dimethylphenol	< 327		µg/kg wet	327						
Di-n-butyl phthalate	< 327		µg/kg wet	327						
4,6-Dinitro-2-methylphenol	< 327		µg/kg wet	327						
2,4-Dinitrophenol	< 327		µg/kg wet	327						
2,4-Dinitrotoluene	< 165		µg/kg wet	165						
2,6-Dinitrotoluene	< 165		µg/kg wet	165						
Di-n-octyl phthalate	< 327		µg/kg wet	327						
Fluoranthene	< 66.1		µg/kg wet	66.1						
Fluorene	< 66.1		µg/kg wet	66.1						
Hexachlorobenzene	< 165		µg/kg wet	165						
Hexachlorobutadiene	< 165		µg/kg wet	165						
Hexachlorocyclopentadiene	< 165		µg/kg wet	165						
Hexachloroethane	< 165		µg/kg wet	165						
Indeno (1,2,3-cd) pyrene	< 66.1		µg/kg wet	66.1						
Isophorone	< 165		µg/kg wet	165						

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1716889 - SW846 3546										
Blank (1716889-BLK1)					Prepared: 04-Oct-17 Analyzed: 06-Oct-17					
2-Methylnaphthalene	< 66.1		µg/kg wet	66.1						
2-Methylphenol	< 327		µg/kg wet	327						
3 & 4-Methylphenol	< 327		µg/kg wet	327						
Naphthalene	< 66.1		µg/kg wet	66.1						
2-Nitroaniline	< 327		µg/kg wet	327						
3-Nitroaniline	< 327		µg/kg wet	327						
4-Nitroaniline	< 165		µg/kg wet	165						
Nitrobenzene	< 165		µg/kg wet	165						
2-Nitrophenol	< 165		µg/kg wet	165						
4-Nitrophenol	< 1310		µg/kg wet	1310						
N-Nitrosodimethylamine	< 165		µg/kg wet	165						
N-Nitrosodi-n-propylamine	< 165		µg/kg wet	165						
N-Nitrosodiphenylamine	< 327		µg/kg wet	327						
Pentachlorophenol	< 327		µg/kg wet	327						
Phenanthrene	< 66.1		µg/kg wet	66.1						
Phenol	< 327		µg/kg wet	327						
Pyrene	< 66.1		µg/kg wet	66.1						
Pyridine	< 327		µg/kg wet	327						
1,2,4-Trichlorobenzene	< 327		µg/kg wet	327						
1-Methylnaphthalene	< 66.1		µg/kg wet	66.1						
2,4,5-Trichlorophenol	< 327		µg/kg wet	327						
2,4,6-Trichlorophenol	< 165		µg/kg wet	165						
Pentachloronitrobenzene	< 327		µg/kg wet	327						
1,2,4,5-Tetrachlorobenzene	< 327		µg/kg wet	327						
Surrogate: 2-Fluorobiphenyl	*901*		µg/kg wet		*1650*		*55*	*30-130*		
Surrogate: 2-Fluorophenol	*788*		µg/kg wet		*1650*		*48*	*30-130*		
Surrogate: Nitrobenzene-d5	*825*		µg/kg wet		*1650*		*50*	*30-130*		
Surrogate: Phenol-d5	*924*		µg/kg wet		*1650*		*56*	*30-130*		
Surrogate: Terphenyl-dl4	*1160*		µg/kg wet		*1650*		*70*	*30-130*		
Surrogate: 2,4,6-Tribromophenol	*706*		µg/kg wet		*1650*		*43*	*30-130*		
LCS (1716889-BS1)					Prepared: 04-Oct-17 Analyzed: 06-Oct-17					
Acenaphthene	**814**		µg/kg wet	66.6	1660		49	40-140		
Acenaphthylene	**866**		µg/kg wet	66.6	1660		52	40-140		
Aniline	**578**	QC2	µg/kg wet	329	1660		35	40-140		
Anthracene	**777**		µg/kg wet	66.6	1660		47	40-140		
Azobenzene/Diphenyldiazene	**790**		µg/kg wet	329	1660		48	40-140		
Benzidine	**759**		µg/kg wet	329	1660		46	40-140		
Benzo (a) anthracene	**829**		µg/kg wet	66.6	1660		50	40-140		
Benzo (a) pyrene	**880**		µg/kg wet	66.6	1660		53	40-140		
Benzo (b) fluoranthene	**857**		µg/kg wet	66.6	1660		52	40-140		
Benzo (g,h,i) perylene	**833**		µg/kg wet	66.6	1660		50	40-140		
Benzo (k) fluoranthene	**916**		µg/kg wet	66.6	1660		55	40-140		
Benzoic acid	**246**	QC2	µg/kg wet	329	1660		15	30-130		
Benzyl alcohol	**858**		µg/kg wet	329	1660		52	40-140		
Bis(2-chloroethoxy)methane	**583**	QC2	µg/kg wet	329	1660		35	40-140		
Bis(2-chloroethyl)ether	**689**		µg/kg wet	167	1660		41	40-140		
Bis(2-chloroisopropyl)ether	**586**	QC2	µg/kg wet	167	1660		35	40-140		
Bis(2-ethylhexyl)phthalate	**888**		µg/kg wet	167	1660		53	40-140		
4-Bromophenyl phenyl ether	**741**		µg/kg wet	329	1660		45	40-140		
Butyl benzyl phthalate	**884**		µg/kg wet	329	1660		53	40-140		

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1716889 - SW846 3546										
LCS (1716889-BS1)						Prepared: 04-Oct-17 Analyzed: 06-Oct-17				
Carbazole	**1280**		µg/kg wet	167	1660		77	40-140		
4-Chloro-3-methylphenol	**811**		µg/kg wet	329	1660		49	30-130		
4-Chloroaniline	**588**	QC2	µg/kg wet	167	1660		35	40-140		
2-Chloronaphthalene	**1060**		µg/kg wet	329	1660		64	40-140		
2-Chlorophenol	**804**		µg/kg wet	167	1660		48	30-130		
4-Chlorophenyl phenyl ether	**853**		µg/kg wet	329	1660		51	40-140		
Chrysene	**858**		µg/kg wet	66.6	1660		52	40-140		
Dibenzo (a,h) anthracene	**939**		µg/kg wet	66.6	1660		56	40-140		
Dibenzofuran	**932**		µg/kg wet	167	1660		56	40-140		
1,2-Dichlorobenzene	**990**		µg/kg wet	329	1660		60	40-140		
1,3-Dichlorobenzene	**915**		µg/kg wet	329	1660		55	40-140		
1,4-Dichlorobenzene	**966**		µg/kg wet	329	1660		58	40-140		
3,3´-Dichlorobenzidine	**1140**		µg/kg wet	329	1660		68	40-140		
2,4-Dichlorophenol	**811**		µg/kg wet	167	1660		49	30-130		
Diethyl phthalate	**902**		µg/kg wet	329	1660		54	40-140		
Dimethyl phthalate	**904**		µg/kg wet	329	1660		54	40-140		
2,4-Dimethylphenol	**711**		µg/kg wet	329	1660		43	30-130		
Di-n-butyl phthalate	**878**		µg/kg wet	329	1660		53	40-140		
4,6-Dinitro-2-methylphenol	**739**		µg/kg wet	329	1660		44	30-130		
2,4-Dinitrophenol	**508**		µg/kg wet	329	1660		31	30-130		
2,4-Dinitrotoluene	**1080**		µg/kg wet	167	1660		65	40-140		
2,6-Dinitrotoluene	**1040**		µg/kg wet	167	1660		63	40-140		
Di-n-octyl phthalate	**925**		µg/kg wet	329	1660		56	40-140		
Fluoranthene	**836**		µg/kg wet	66.6	1660		50	40-140		
Fluorene	**786**		µg/kg wet	66.6	1660		47	40-140		
Hexachlorobenzene	**1030**		µg/kg wet	167	1660		62	40-140		
Hexachlorobutadiene	**884**		µg/kg wet	167	1660		53	40-140		
Hexachlorocyclopentadiene	**1150**		µg/kg wet	167	1660		69	40-140		
Hexachloroethane	**1060**		µg/kg wet	167	1660		64	40-140		
Indeno (1,2,3-cd) pyrene	**896**		µg/kg wet	66.6	1660		54	40-140		
Isophorone	**729**		µg/kg wet	167	1660		44	40-140		
2-Methylnaphthalene	**922**		µg/kg wet	66.6	1660		55	40-140		
2-Methylphenol	**806**		µg/kg wet	329	1660		48	30-130		
3 & 4-Methylphenol	**872**		µg/kg wet	329	1660		52	30-130		
Naphthalene	**781**		µg/kg wet	66.6	1660		47	40-140		
2-Nitroaniline	**860**		µg/kg wet	329	1660		52	40-140		
3-Nitroaniline	**972**		µg/kg wet	329	1660		58	40-140		
4-Nitroaniline	**1030**		µg/kg wet	167	1660		62	40-140		
Nitrobenzene	**927**		µg/kg wet	167	1660		56	40-140		
2-Nitrophenol	**806**		µg/kg wet	167	1660		48	30-130		
4-Nitrophenol	**969**		µg/kg wet	1320	1660		58	30-130		
N-Nitrosodimethylamine	**677**		µg/kg wet	167	1660		41	40-140		
N-Nitrosodi-n-propylamine	**771**		µg/kg wet	167	1660		46	40-140		
N-Nitrosodiphenylamine	**810**		µg/kg wet	329	1660		49	40-140		
Pentachlorophenol	**543**		µg/kg wet	329	1660		33	30-130		
Phenanthrene	**779**		µg/kg wet	66.6	1660		47	40-140		
Phenol	**777**		µg/kg wet	329	1660		47	30-130		
Pyrene	**837**		µg/kg wet	66.6	1660		50	40-140		
Pyridine	**550**	QC2	µg/kg wet	329	1660		33	40-140		
1,2,4-Trichlorobenzene	**951**		µg/kg wet	329	1660		57	40-140		

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1716889 - SW846 3546										
LCS (1716889-BS1)					Prepared: 04-Oct-17 Analyzed: 06-Oct-17					
1-Methylnaphthalene	**863**		µg/kg wet	66.6	1660		52	40-140		
2,4,5-Trichlorophenol	**935**		µg/kg wet	329	1660		56	30-130		
2,4,6-Trichlorophenol	**832**		µg/kg wet	167	1660		50	30-130		
Pentachloronitrobenzene	**1040**		µg/kg wet	329	1660		62	40-140		
1,2,4,5-Tetrachlorobenzene	**853**		µg/kg wet	329	1660		51	40-140		
Surrogate: 2-Fluorobiphenyl	*856*		µg/kg wet		*1660*		*51*	*30-130*		
Surrogate: 2-Fluorophenol	*766*		µg/kg wet		*1660*		*46*	*30-130*		
Surrogate: Nitrobenzene-d5	*793*		µg/kg wet		*1660*		*48*	*30-130*		
Surrogate: Phenol-d5	*830*		µg/kg wet		*1660*		*50*	*30-130*		
Surrogate: Terphenyl-dl4	*960*		µg/kg wet		*1660*		*58*	*30-130*		
Surrogate: 2,4,6-Tribromophenol	*857*		µg/kg wet		*1660*		*52*	*30-130*		
LCS Dup (1716889-BSD1)					Prepared: 04-Oct-17 Analyzed: 06-Oct-17					
Acenaphthene	**788**		µg/kg wet	66.1	1650		48	40-140	3	30
Acenaphthylene	**828**		µg/kg wet	66.1	1650		50	40-140	4	30
Aniline	**556**	QC2	µg/kg wet	327	1650		34	40-140	4	30
Anthracene	**758**		µg/kg wet	66.1	1650		46	40-140	2	30
Azobenzene/Diphenyldiazene	**755**		µg/kg wet	327	1650		46	40-140	5	30
Benzidine	**734**		µg/kg wet	327	1650		44	40-140	3	30
Benzo (a) anthracene	**752**		µg/kg wet	66.1	1650		46	40-140	10	30
Benzo (a) pyrene	**814**		µg/kg wet	66.1	1650		49	40-140	8	30
Benzo (b) fluoranthene	**821**		µg/kg wet	66.1	1650		50	40-140	4	30
Benzo (g,h,i) perylene	**724**		µg/kg wet	66.1	1650		44	40-140	14	30
Benzo (k) fluoranthene	**803**		µg/kg wet	66.1	1650		49	40-140	13	30
Benzoic acid	**201**	QC2	µg/kg wet	327	1650		12	30-130	20	30
Benzyl alcohol	**705**		µg/kg wet	327	1650		43	40-140	20	30
Bis(2-chloroethoxy)methane	**543**	QC2	µg/kg wet	327	1650		33	40-140	7	30
Bis(2-chloroethyl)ether	**672**		µg/kg wet	165	1650		41	40-140	3	30
Bis(2-chloroisopropyl)ether	**542**	QC2	µg/kg wet	165	1650		33	40-140	8	30
Bis(2-ethylhexyl)phthalate	**815**		µg/kg wet	165	1650		49	40-140	9	30
4-Bromophenyl phenyl ether	**690**		µg/kg wet	327	1650		42	40-140	7	30
Butyl benzyl phthalate	**809**		µg/kg wet	327	1650		49	40-140	9	30
Carbazole	**1200**		µg/kg wet	165	1650		72	40-140	7	30
4-Chloro-3-methylphenol	**759**		µg/kg wet	327	1650		46	30-130	7	30
4-Chloroaniline	**562**	QC2	µg/kg wet	165	1650		34	40-140	4	30
2-Chloronaphthalene	**962**		µg/kg wet	327	1650		58	40-140	10	30
2-Chlorophenol	**778**		µg/kg wet	165	1650		47	30-130	3	30
4-Chlorophenyl phenyl ether	**822**		µg/kg wet	327	1650		50	40-140	4	30
Chrysene	**792**		µg/kg wet	66.1	1650		48	40-140	8	30
Dibenzo (a,h) anthracene	**831**		µg/kg wet	66.1	1650		50	40-140	12	30
Dibenzofuran	**919**		µg/kg wet	165	1650		56	40-140	1	30
1,2-Dichlorobenzene	**931**		µg/kg wet	327	1650		56	40-140	6	30
1,3-Dichlorobenzene	**894**		µg/kg wet	327	1650		54	40-140	2	30
1,4-Dichlorobenzene	**920**		µg/kg wet	327	1650		56	40-140	5	30
3,3´-Dichlorobenzidine	**1070**		µg/kg wet	327	1650		65	40-140	6	30
2,4-Dichlorophenol	**751**		µg/kg wet	165	1650		45	30-130	8	30
Diethyl phthalate	**880**		µg/kg wet	327	1650		53	40-140	2	30
Dimethyl phthalate	**874**		µg/kg wet	327	1650		53	40-140	3	30
2,4-Dimethylphenol	**669**		µg/kg wet	327	1650		41	30-130	6	30
Di-n-butyl phthalate	**795**		µg/kg wet	327	1650		48	40-140	10	30
4,6-Dinitro-2-methylphenol	**727**		µg/kg wet	327	1650		44	30-130	2	30

Semivolatile Organic Compounds by GCMS - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 8270D										
Batch 1716889 - SW846 3546										
LCS Dup (1716889-BSD1)					Prepared: 04-Oct-17 Analyzed: 06-Oct-17					
2,4-Dinitrophenol	**502**		µg/kg wet	327	1650		30	30-130	1	30
2,4-Dinitrotoluene	**1060**		µg/kg wet	165	1650		64	40-140	2	30
2,6-Dinitrotoluene	**961**		µg/kg wet	165	1650		58	40-140	8	30
Di-n-octyl phthalate	**833**		µg/kg wet	327	1650		50	40-140	10	30
Fluoranthene	**782**		µg/kg wet	66.1	1650		47	40-140	7	30
Fluorene	**773**		µg/kg wet	66.1	1650		47	40-140	2	30
Hexachlorobenzene	**919**		µg/kg wet	165	1650		56	40-140	11	30
Hexachlorobutadiene	**860**		µg/kg wet	165	1650		52	40-140	3	30
Hexachlorocyclopentadiene	**1080**		µg/kg wet	165	1650		65	40-140	6	30
Hexachloroethane	**994**		µg/kg wet	165	1650		60	40-140	7	30
Indeno (1,2,3-cd) pyrene	**796**		µg/kg wet	66.1	1650		48	40-140	12	30
Isophorone	**716**		µg/kg wet	165	1650		43	40-140	2	30
2-Methylnaphthalene	**858**		µg/kg wet	66.1	1650		52	40-140	7	30
2-Methylphenol	**743**		µg/kg wet	327	1650		45	30-130	8	30
3 & 4-Methylphenol	**821**		µg/kg wet	327	1650		50	30-130	6	30
Naphthalene	**744**		µg/kg wet	66.1	1650		45	40-140	5	30
2-Nitroaniline	**812**		µg/kg wet	327	1650		49	40-140	6	30
3-Nitroaniline	**941**		µg/kg wet	327	1650		57	40-140	3	30
4-Nitroaniline	**989**		µg/kg wet	165	1650		60	40-140	4	30
Nitrobenzene	**899**		µg/kg wet	165	1650		54	40-140	3	30
2-Nitrophenol	**796**		µg/kg wet	165	1650		48	30-130	1	30
4-Nitrophenol	**902**		µg/kg wet	1310	1650		55	30-130	7	30
N-Nitrosodimethylamine	**658**		µg/kg wet	165	1650		40	40-140	3	30
N-Nitrosodi-n-propylamine	**728**		µg/kg wet	165	1650		44	40-140	6	30
N-Nitrosodiphenylamine	**785**		µg/kg wet	327	1650		48	40-140	3	30
Pentachlorophenol	**468**	QC2	µg/kg wet	327	1650		28	30-130	15	30
Phenanthrene	**714**		µg/kg wet	66.1	1650		43	40-140	9	30
Phenol	**759**		µg/kg wet	327	1650		46	30-130	2	30
Pyrene	**789**		µg/kg wet	66.1	1650		48	40-140	6	30
Pyridine	**509**	QC2	µg/kg wet	327	1650		31	40-140	8	30
1,2,4-Trichlorobenzene	**889**		µg/kg wet	327	1650		54	40-140	7	30
1-Methylnaphthalene	**792**		µg/kg wet	66.1	1650		48	40-140	8	30
2,4,5-Trichlorophenol	**865**		µg/kg wet	327	1650		52	30-130	8	30
2,4,6-Trichlorophenol	**787**		µg/kg wet	165	1650		48	30-130	6	30
Pentachloronitrobenzene	**978**		µg/kg wet	327	1650		59	40-140	6	30
1,2,4,5-Tetrachlorobenzene	**799**		µg/kg wet	327	1650		48	40-140	6	30
Surrogate: 2-Fluorobiphenyl	*772*		µg/kg wet		*1650*		*47*	*30-130*		
Surrogate: 2-Fluorophenol	*712*		µg/kg wet		*1650*		*43*	*30-130*		
Surrogate: Nitrobenzene-d5	*764*		µg/kg wet		*1650*		*46*	*30-130*		
Surrogate: Phenol-d5	*802*		µg/kg wet		*1650*		*49*	*30-130*		
Surrogate: Terphenyl-dl4	*877*		µg/kg wet		*1650*		*53*	*30-130*		
Surrogate: 2,4,6-Tribromophenol	*803*		µg/kg wet		*1650*		*49*	*30-130*		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1716783 - SW846 3546										
Blank (1716783-BLK1)					Prepared: 02-Oct-17 Analyzed: 04-Oct-17					
C9-C18 Aliphatic Hydrocarbons	< 9.95		mg/kg wet	9.95						
C19-C36 Aliphatic Hydrocarbons	< 9.95		mg/kg wet	9.95						
C11-C22 Aromatic Hydrocarbons	< 9.95		mg/kg wet	9.95						
Unadjusted C11-C22 Aromatic Hydrocarbons	< 9.95		mg/kg wet	9.95						
Total Petroleum Hydrocarbons	< 29.9		mg/kg wet	29.9						
Unadjusted Total Petroleum Hydrocarbons	< 29.9		mg/kg wet	29.9						
Naphthalene	< 0.331		mg/kg wet	0.331						
2-Methylnaphthalene	< 0.331		mg/kg wet	0.331						
Acenaphthylene	< 0.331		mg/kg wet	0.331						
Acenaphthene	< 0.331		mg/kg wet	0.331						
Fluorene	< 0.331		mg/kg wet	0.331						
Phenanthrene	< 0.331		mg/kg wet	0.331						
Anthracene	< 0.331		mg/kg wet	0.331						
Fluoranthene	< 0.331		mg/kg wet	0.331						
Pyrene	< 0.331		mg/kg wet	0.331						
Benzo (a) anthracene	< 0.331		mg/kg wet	0.331						
Chrysene	< 0.331		mg/kg wet	0.331						
Benzo (b) fluoranthene	< 0.331		mg/kg wet	0.331						
Benzo (k) fluoranthene	< 0.331		mg/kg wet	0.331						
Benzo (a) pyrene	< 0.331		mg/kg wet	0.331						
Indeno (1,2,3-cd) pyrene	< 0.331		mg/kg wet	0.331						
Dibenzo (a,h) anthracene	< 0.331		mg/kg wet	0.331						
Benzo (g,h,i) perylene	< 0.331		mg/kg wet	0.331						
n-Nonane (C9)	< 0.331		mg/kg wet	0.331						
n-Decane	< 0.331		mg/kg wet	0.331						
n-Dodecane	< 0.331		mg/kg wet	0.331						
n-Tetradecane	< 0.331		mg/kg wet	0.331						
n-Hexadecane	< 0.331		mg/kg wet	0.331						
n-Octadecane	< 0.331		mg/kg wet	0.331						
n-Nonadecane	< 0.331		mg/kg wet	0.331						
n-Eicosane	< 0.331		mg/kg wet	0.331						
n-Docosane	< 0.331		mg/kg wet	0.331						
n-Tetracosane	< 0.331		mg/kg wet	0.331						
n-Hexacosane	< 0.331		mg/kg wet	0.331						
n-Octacosane	< 0.331		mg/kg wet	0.331						
n-Triacontane	< 0.331		mg/kg wet	0.331						
n-Hexatriacontane	< 0.331		mg/kg wet	0.331						
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet							
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet							
Surrogate: 1-Chlorooctadecane	*2.68*		mg/kg wet		*3.32*		*81*	*40-140*		
Surrogate: Ortho-Terphenyl	*2.19*		mg/kg wet		*3.32*		*66*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.97*		mg/kg wet		*2.65*		*74*	*40-140*		
LCS (1716783-BS1)					Prepared: 02-Oct-17 Analyzed: 04-Oct-17					
C9-C18 Aliphatic Hydrocarbons	**21.7**		mg/kg wet	9.99	20.0		108	40-140		
C19-C36 Aliphatic Hydrocarbons	**35.4**		mg/kg wet	9.99	26.7		133	40-140		
Unadjusted C11-C22 Aromatic Hydrocarbons	**21.0**		mg/kg wet	9.99	22.7		93	40-140		
Naphthalene	**0.915**		mg/kg wet	0.333	1.33		69	40-140		
2-Methylnaphthalene	**0.990**		mg/kg wet	0.333	1.33		74	40-140		
Acenaphthylene	**1.10**		mg/kg wet	0.333	1.33		82	40-140		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1716783 - SW846 3546										
LCS (1716783-BS1)						Prepared: 02-Oct-17 Analyzed: 04-Oct-17				
Acenaphthene	**1.08**		mg/kg wet	0.333	1.33		81	40-140		
Fluorene	**1.19**		mg/kg wet	0.333	1.33		89	40-140		
Phenanthrene	**1.41**		mg/kg wet	0.333	1.33		106	40-140		
Anthracene	**1.51**		mg/kg wet	0.333	1.33		114	40-140		
Fluoranthene	**1.51**		mg/kg wet	0.333	1.33		114	40-140		
Pyrene	**1.33**		mg/kg wet	0.333	1.33		100	40-140		
Benzo (a) anthracene	**1.41**		mg/kg wet	0.333	1.33		106	40-140		
Chrysene	**1.45**		mg/kg wet	0.333	1.33		109	40-140		
Benzo (b) fluoranthene	**1.38**		mg/kg wet	0.333	1.33		104	40-140		
Benzo (k) fluoranthene	**1.56**		mg/kg wet	0.333	1.33		117	40-140		
Benzo (a) pyrene	**1.56**		mg/kg wet	0.333	1.33		117	40-140		
Indeno (1,2,3-cd) pyrene	**1.53**		mg/kg wet	0.333	1.33		115	40-140		
Dibenzo (a,h) anthracene	**1.49**		mg/kg wet	0.333	1.33		111	40-140		
Benzo (g,h,i) perylene	**1.65**		mg/kg wet	0.333	1.33		124	40-140		
n-Nonane (C9)	**1.56**		mg/kg wet	0.333	3.33		47	30-140		
n-Decane	**2.07**		mg/kg wet	0.333	3.33		62	40-140		
n-Dodecane	**2.75**		mg/kg wet	0.333	3.33		83	40-140		
n-Tetradecane	**3.40**		mg/kg wet	0.333	3.33		102	40-140		
n-Hexadecane	**4.12**		mg/kg wet	0.333	3.33		124	40-140		
n-Octadecane	**4.46**		mg/kg wet	0.333	3.33		134	40-140		
n-Nonadecane	**4.39**		mg/kg wet	0.333	3.33		132	40-140		
n-Eicosane	**4.32**		mg/kg wet	0.333	3.33		130	40-140		
n-Docosane	**3.88**		mg/kg wet	0.333	3.33		117	40-140		
n-Tetracosane	**3.96**		mg/kg wet	0.333	3.33		119	40-140		
n-Hexacosane	**3.98**		mg/kg wet	0.333	3.33		119	40-140		
n-Octacosane	**4.08**		mg/kg wet	0.333	3.33		123	40-140		
n-Triacontane	**4.15**		mg/kg wet	0.333	3.33		125	40-140		
n-Hexatriacontane	**4.34**		mg/kg wet	0.333	3.33		130	40-140		
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet		1.33			0-200		
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet		1.33			0-200		
Surrogate: 1-Chlorooctadecane	*2.18*		mg/kg wet		*3.33*		*65*	*40-140*		
Surrogate: Ortho-Terphenyl	*1.97*		mg/kg wet		*3.33*		*59*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.71*		mg/kg wet		*2.67*		*64*	*40-140*		
LCS (1716783-BS2)						Prepared: 02-Oct-17 Analyzed: 03-Oct-17				
C9-C18 Aliphatic Hydrocarbons	**21.3**		mg/kg wet	10.0	40.0		53	40-140		
C19-C36 Aliphatic Hydrocarbons	**31.8**		mg/kg wet	10.0	53.3		60	40-140		
Unadjusted C11-C22 Aromatic Hydrocarbons	**24.6**		mg/kg wet	10.0	45.3		54	40-140		
Naphthalene	**1.58**		mg/kg wet	0.333	2.67		59	40-140		
2-Methylnaphthalene	**1.57**		mg/kg wet	0.333	2.67		59	40-140		
Acenaphthylene	**1.61**		mg/kg wet	0.333	2.67		60	40-140		
Acenaphthene	**1.54**		mg/kg wet	0.333	2.67		58	40-140		
Fluorene	**1.86**		mg/kg wet	0.333	2.67		70	40-140		
Phenanthrene	**1.73**		mg/kg wet	0.333	2.67		65	40-140		
Anthracene	**2.05**		mg/kg wet	0.333	2.67		77	40-140		
Fluoranthene	**1.64**		mg/kg wet	0.333	2.67		61	40-140		
Pyrene	**1.47**		mg/kg wet	0.333	2.67		55	40-140		
Benzo (a) anthracene	**1.25**		mg/kg wet	0.333	2.67		47	40-140		
Chrysene	**1.26**		mg/kg wet	0.333	2.67		47	40-140		
Benzo (b) fluoranthene	**1.15**		mg/kg wet	0.333	2.67		43	40-140		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1716783 - SW846 3546										
LCS (1716783-BS2)						Prepared: 02-Oct-17 Analyzed: 03-Oct-17				
Benzo (k) fluoranthene	**1.30**		mg/kg wet	0.333	2.67		49	40-140		
Benzo (a) pyrene	**1.16**		mg/kg wet	0.333	2.67		44	40-140		
Indeno (1,2,3-cd) pyrene	**1.09**		mg/kg wet	0.333	2.67		41	40-140		
Dibenzo (a,h) anthracene	**1.06**		mg/kg wet	0.333	2.67		40	40-140		
Benzo (g,h,i) perylene	**1.17**		mg/kg wet	0.333	2.67		44	40-140		
n-Nonane (C9)	**2.36**		mg/kg wet	0.333	6.67		35	30-140		
n-Decane	**2.73**		mg/kg wet	0.333	6.67		41	40-140		
n-Dodecane	**2.93**		mg/kg wet	0.333	6.67		44	40-140		
n-Tetradecane	**3.17**		mg/kg wet	0.333	6.67		48	40-140		
n-Hexadecane	**3.53**		mg/kg wet	0.333	6.67		53	40-140		
n-Octadecane	**3.78**		mg/kg wet	0.333	6.67		57	40-140		
n-Nonadecane	**3.74**		mg/kg wet	0.333	6.67		56	40-140		
n-Eicosane	**3.67**		mg/kg wet	0.333	6.67		55	40-140		
n-Docosane	**3.28**		mg/kg wet	0.333	6.67		49	40-140		
n-Tetracosane	**3.38**		mg/kg wet	0.333	6.67		51	40-140		
n-Hexacosane	**3.47**		mg/kg wet	0.333	6.67		52	40-140		
n-Octacosane	**3.60**		mg/kg wet	0.333	6.67		54	40-140		
n-Triacontane	**3.71**		mg/kg wet	0.333	6.67		56	40-140		
n-Hexatriacontane	**5.54**		mg/kg wet	0.333	6.67		83	40-140		
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet		2.67			0-200		
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet		2.67			0-200		
Surrogate: 1-Chlorooctadecane	*1.83*		mg/kg wet		*3.33*		*55*	*40-140*		
Surrogate: Ortho-Terphenyl	*2.50*		mg/kg wet		*3.33*		*75*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.84*		mg/kg wet		*2.67*		*69*	*40-140*		
LCS Dup (1716783-BSD1)						Prepared: 02-Oct-17 Analyzed: 04-Oct-17				
C9-C18 Aliphatic Hydrocarbons	**21.4**		mg/kg wet	9.91	19.8		108	40-140	1	25
C19-C36 Aliphatic Hydrocarbons	**32.7**		mg/kg wet	9.91	26.4		124	40-140	8	25
Unadjusted C11-C22 Aromatic Hydrocarbons	**17.3**		mg/kg wet	9.91	22.5		77	40-140	19	25
Naphthalene	**0.705**	QR2	mg/kg wet	0.330	1.32		53	40-140	26	25
2-Methylnaphthalene	**0.795**		mg/kg wet	0.330	1.32		60	40-140	22	25
Acenaphthylene	**0.905**		mg/kg wet	0.330	1.32		68	40-140	19	25
Acenaphthene	**0.909**		mg/kg wet	0.330	1.32		69	40-140	17	25
Fluorene	**0.995**		mg/kg wet	0.330	1.32		75	40-140	18	25
Phenanthrene	**1.24**		mg/kg wet	0.330	1.32		94	40-140	13	25
Anthracene	**1.36**		mg/kg wet	0.330	1.32		103	40-140	11	25
Fluoranthene	**1.37**		mg/kg wet	0.330	1.32		104	40-140	10	25
Pyrene	**1.20**		mg/kg wet	0.330	1.32		91	40-140	10	25
Benzo (a) anthracene	**1.16**		mg/kg wet	0.330	1.32		88	40-140	20	25
Chrysene	**1.22**		mg/kg wet	0.330	1.32		92	40-140	17	25
Benzo (b) fluoranthene	**1.15**		mg/kg wet	0.330	1.32		87	40-140	19	25
Benzo (k) fluoranthene	**1.26**		mg/kg wet	0.330	1.32		96	40-140	21	25
Benzo (a) pyrene	**1.22**		mg/kg wet	0.330	1.32		92	40-140	25	25
Indeno (1,2,3-cd) pyrene	**1.15**	QR2	mg/kg wet	0.330	1.32		87	40-140	29	25
Dibenzo (a,h) anthracene	**1.15**		mg/kg wet	0.330	1.32		87	40-140	25	25
Benzo (g,h,i) perylene	**1.26**	QR2	mg/kg wet	0.330	1.32		95	40-140	27	25
n-Nonane (C9)	**1.57**		mg/kg wet	0.330	3.30		47	30-140	0.6	25
n-Decane	**2.07**		mg/kg wet	0.330	3.30		63	40-140	0.4	25
n-Dodecane	**2.68**		mg/kg wet	0.330	3.30		81	40-140	3	25
n-Tetradecane	**3.31**		mg/kg wet	0.330	3.30		100	40-140	3	25

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
MADEP EPH 5/2004 R										
Batch 1716783 - SW846 3546										
LCS Dup (1716783-BSD1)						Prepared: 02-Oct-17 Analyzed: 04-Oct-17				
n-Hexadecane	**3.99**		mg/kg wet	0.330	3.30		121	40-140	3	25
n-Octadecane	**4.32**		mg/kg wet	0.330	3.30		131	40-140	3	25
n-Nonadecane	**4.25**		mg/kg wet	0.330	3.30		129	40-140	3	25
n-Eicosane	**4.15**		mg/kg wet	0.330	3.30		126	40-140	4	25
n-Docosane	**3.66**		mg/kg wet	0.330	3.30		111	40-140	6	25
n-Tetracosane	**3.66**		mg/kg wet	0.330	3.30		111	40-140	8	25
n-Hexacosane	**3.63**		mg/kg wet	0.330	3.30		110	40-140	9	25
n-Octacosane	**3.69**		mg/kg wet	0.330	3.30		112	40-140	10	25
n-Triacontane	**3.73**		mg/kg wet	0.330	3.30		113	40-140	11	25
n-Hexatriacontane	**4.23**		mg/kg wet	0.330	3.30		128	40-140	3	25
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet		1.32			0-200		200
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet		1.32			0-200		200
Surrogate: 1-Chlorooctadecane	*2.13*		mg/kg wet		*3.30*		*65*	*40-140*		
Surrogate: Ortho-Terphenyl	*1.83*		mg/kg wet		*3.30*		*56*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.57*		mg/kg wet		*2.64*		*60*	*40-140*		
SW846 8100Mod.										
Batch 1716919 - SW846 3546										
Blank (1716919-BLK1)						Prepared: 04-Oct-17 Analyzed: 06-Oct-17				
Gasoline	< 26.4		mg/kg wet	26.4						
Fuel Oil #2	< 26.4		mg/kg wet	26.4						
Fuel Oil #4	< 26.4		mg/kg wet	26.4						
Fuel Oil #6	< 26.4		mg/kg wet	26.4						
Motor Oil	< 26.4		mg/kg wet	26.4						
Ligroin	< 26.4		mg/kg wet	26.4						
Aviation Fuel	< 26.4		mg/kg wet	26.4						
Hydraulic Oil	< 26.4		mg/kg wet	26.4						
Dielectric Fluid	< 26.4		mg/kg wet	26.4						
Unidentified	< 26.4		mg/kg wet	26.4						
Other Oil	< 26.4		mg/kg wet	26.4						
Total Petroleum Hydrocarbons	< 26.4		mg/kg wet	26.4						
Surrogate: 1-Chlorooctadecane	*5.17*		mg/kg wet		*6.61*		*78*	*40-140*		
LCS (1716919-BS1)						Prepared: 04-Oct-17 Analyzed: 06-Oct-17				
Fuel Oil #2	**142**		mg/kg wet	26.5	133		107	40-140		
Surrogate: 1-Chlorooctadecane	*4.27*		mg/kg wet		*3.32*		*129*	*40-140*		
LCS Dup (1716919-BSD1)						Prepared: 04-Oct-17 Analyzed: 06-Oct-17				
Fuel Oil #2	**143**		mg/kg wet	26.4	132		108	40-140	0.8	30
Surrogate: 1-Chlorooctadecane	*4.13*		mg/kg wet		*3.31*		*125*	*40-140*		

General Chemistry Parameters - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SM22 2510B										
Batch 1716586 - General Preparation										
LCS (1716586-BS1)					Prepared & Analyzed: 28-Sep-17					
Specific Conductance (EC)	**1000**		uS/cm	10.0	997		101	95-105		
MRL Check (1716586-MRL1)					Prepared & Analyzed: 28-Sep-17					
Specific Conductance (EC)	**10.1**		uS/cm	10.0	9.97		101	70-130		
Reference (1716586-SRM1)					Prepared & Analyzed: 28-Sep-17					
Specific Conductance (EC)	**103**		uS/cm	10.0	100		103	90-110		
SM2540 G (11) Mod.										
Batch 1716554 - General Preparation										
Duplicate (1716554-DUP1)			**Source: SC39680-01**		Prepared & Analyzed: 27-Sep-17					
% Solids	**88.2**		%			87.9			0.3	5
SM2540 G (11) Mod. calculation										
Batch 1716555 - General Preparation										
Duplicate (1716555-DUP1)			**Source: SC39680-01**		Prepared: 27-Sep-17 Analyzed: 28-Sep-17					
Moisture	**11.8**		%			12.1			2	20

Toxicity Characteristics - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW846 Ch. 7.3										
Batch 1716697 - General Preparation										
Blank (1716697-BLK1)							Prepared & Analyzed: 29-Sep-17			
Reactivity	**See Narrative**		mg/kg wet							
Reactive Cyanide	< 25.0		mg/kg wet	25.0						
Reactive Sulfide	< 50.0		mg/kg wet	50.0						
Reference (1716697-SRM1)							Prepared & Analyzed: 29-Sep-17			
Reactive Cyanide	< 25.0		mg/kg wet	25.0	200		0	0-200		
Reference (1716697-SRM2)							Prepared & Analyzed: 29-Sep-17			
Reactive Sulfide	< 50.0		mg/kg wet	50.0	13400		0	0-200		

Subcontracted Analyses - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW6010C										
Batch 404410A - 404410-										
BLK (BZ15353-BLK)					Prepared: 05-Oct-17 Analyzed: 06-Oct-17					
Zinc	**0.70**		mg/kg	0.33				-		
Nickel	< 0.33		mg/kg	0.33				-		
Lead	< 0.33		mg/kg	0.33				-		
Copper	< 0.33		mg/kg	0.33				-		
Chromium	< 0.33		mg/kg	0.33				-		
Cadmium	< 0.33		mg/kg	0.33				-		
Arsenic	< 0.66		mg/kg	0.66				-		
DUP (BZ15353-DUP)			**Source: SC39680-01**		Prepared: 05-Oct-17 Analyzed: 06-Oct-17					
Lead	**9.68**		mg/kg	0.39				-	10.3	30
Cadmium	< 0.39		mg/kg	0.39		BRL		-	NC	30
Chromium	**13.1**		mg/kg	0.39				-	5.5	30
Copper	**10.3**		mg/kg	0.39				-	5.5	30
Zinc	**48.2**		mg/kg	0.39				-	4.5	30
Nickel	**10.7**		mg/kg	0.39				-	4.8	30
Arsenic	**1.91**		mg/kg	0.79				-	NC	30
LCS (BZ15353-LCS)					Prepared: 05-Oct-17 Analyzed: 06-Oct-17					
Zinc	**158.5**		mg/kg	0.33	145		109	75-125		30
Cadmium	**86.77**		mg/kg	0.33	99.8		86.9	75-125		30
Chromium	**123.3**		mg/kg	0.33	131		94.1	75-125		30
Copper	**188.7**		mg/kg	0.33	194		97.3	75-125		30
Lead	**86.07**		mg/kg	0.33	83.8		103	75-125		30
Nickel	**55.18**		mg/kg	0.33	61.2		90.2	75-125		30
Arsenic	**98.19**		mg/kg	0.66	115		85.4	75-125		30
MS (BZ15353-MS)			**Source: SC39680-01**		Prepared: 05-Oct-17 Analyzed: 06-Oct-17					
Copper	**184.8**		mg/kg	0.33	155.7		112	75-125		30
Zinc	**205.3**		mg/kg	0.33	155.7		102	75-125		30
Arsenic	**294.8**		mg/kg	0.66	311.3		94.1	75-125		30
Lead	**322.6**		mg/kg	0.33	311.3		101	75-125		30
Chromium	**168.9**		mg/kg	0.33	155.7		100	75-125		30
Cadmium	**152.8**		mg/kg	0.33	155.7	BRL	98.0	75-125		30
Nickel	**165.3**		mg/kg	0.33	155.7		99.6	75-125		30
SW7471B										
Batch 404534A - 404534-										
BLK (BZ15280-BLK)					Prepared & Analyzed: 09-Oct-17					
Mercury	< 0.02		mg/kg	0.02				-		
DUP (BZ15280-DUP)			**Source: BZ15280**		Prepared & Analyzed: 09-Oct-17					
Mercury	< 0.03		mg/kg	0.03				-	NC	20
LCS (BZ15280-LCS)					Prepared & Analyzed: 09-Oct-17					
Mercury	**0.1191**		mg/kg	0.02	0.1449		82.2	75-125		20
LCSD (BZ15280-LCSD)					Prepared & Analyzed: 09-Oct-17					
Mercury	**0.1327**		%		0.1515		87.6	75-125	6.4	20
MS (BZ15280-MS)			**Source: BZ15280**		Prepared & Analyzed: 09-Oct-17					
Mercury	**0.1805**		mg/kg	0.02	.16393437		110	75-125		20

Subcontracted Analyses - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW8081B										
Batch 403367A - 403367-										
BLK (BZ10746-BLK)						Prepared: 28-Sep-17 Analyzed: 29-Sep-17				
Hexachlorobenzene	**ND**	c1	ug/Kg	3.3				-		
Dieldrin	**ND**	c1	ug/Kg	1.0				-		
4,4' -DDD	**ND**	c1	ug/Kg	1.7				-		
4,4' -DDE	**ND**	c1	ug/Kg	1.7				-		
4,4' -DDT	**ND**	c1	ug/Kg	1.7				-		
a-BHC	**ND**	c1	ug/Kg	1.0				-		
Alachlor	**ND**	c1	ug/Kg	3.3				-		
Aldrin	**ND**	c1	ug/Kg	1.0				-		
b-BHC	**ND**	c1	ug/Kg	1.0				-		
Toxaphene	**ND**	c1	ug/Kg	130				-		
d-BHC	**ND**	c1	ug/Kg	3.3				-		
Methoxychlor	**ND**	c1	ug/Kg	3.3				-		
Endosulfan I	**ND**	c1	ug/Kg	3.3				-		
Endosulfan II	**ND**	c1	ug/Kg	3.3				-		
Endosulfan sulfate	**ND**	c1	ug/Kg	3.3				-		
Endrin	**ND**	c1	ug/Kg	3.3				-		
Endrin aldehyde	**ND**	c1	ug/Kg	3.3				-		
Endrin ketone	**ND**	c1	ug/Kg	3.3				-		
g-BHC	**ND**	c1	ug/Kg	1.0				-		
Heptachlor	**ND**	c1	ug/Kg	3.3				-		
Heptachlor epoxide	**ND**	c1	ug/Kg	3.3				-		
Chlordane	**ND**	c1	ug/Kg	33				-		
Surrogate: % TCMX	*71*	c1	ug/Kg		*100*			*30-150*		
Surrogate: % DCBP	*78*	c1	ug/Kg		*100*			*30-150*		
LCS (BZ10746-LCS)						Prepared: 28-Sep-17 Analyzed: 29-Sep-17				
Hexachlorobenzene	**41.10**	c1	ug/Kg	3.3	50		82	40-140		30
Endosulfan I	**41.89**	c1	ug/Kg	3.3	50		84	40-140		30
Methoxychlor	**42.71**	c1	ug/Kg	3.3	50		85	40-140		30
Toxaphene	**ND**	c1	ug/Kg	130	50		NA	40-140		30
Heptachlor epoxide	**39.03**	c1	ug/Kg	3.3	50		78	40-140		30
Heptachlor	**42.00**	c1	ug/Kg	3.3	50		84	40-140		30
g-BHC	**38.52**	c1	ug/Kg	1.0	50		77	40-140		30
Endrin ketone	**41.32**	c1	ug/Kg	3.3	50		83	40-140		30
Endrin aldehyde	**36.66**	c1	ug/Kg	3.3	50		73	40-140		30
Endrin	**46.15**	c1	ug/Kg	3.3	50		92	40-140		30
4,4' -DDD	**41.07**	c1	ug/Kg	1.7	50		82	40-140		30
Endosulfan II	**42.55**	c1	ug/Kg	3.3	50		85	40-140		30
Dieldrin	**38.09**	c1	ug/Kg	1.0	50		76	40-140		30
d-BHC	**39.36**	c1	ug/Kg	3.3	50		79	40-140		30
Chlordane	**38.96**	c1	ug/Kg	33	50		78	40-140		30
b-BHC	**35.96**	c1	ug/Kg	1.0	50		72	40-140		30
Aldrin	**38.48**	c1	ug/Kg	1.0	50		77	40-140		30
Alachlor	**ND**	c1	ug/Kg	3.3	50		NA	40-140		30
a-BHC	**40.86**	c1	ug/Kg	1.0	50		82	40-140		30
4,4' -DDT	**40.50**	c1	ug/Kg	1.7	50		81	40-140		30
4,4' -DDE	**38.37**	c1	ug/Kg	1.7	50		77	40-140		30
Endosulfan sulfate	**38.08**	c1	ug/Kg	3.3	50		76	40-140		30
Surrogate: % DCBP	*83.26*	c1	ug/Kg		*100*		*83*	*30-150*		
Surrogate: % TCMX	*79.95*	c1	ug/Kg		*100*		*80*	*30-150*		
LCSD (BZ10746-LCSD)						Prepared: 28-Sep-17 Analyzed: 29-Sep-17				

Subcontracted Analyses - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW8081B										
Batch 403367A - 403367-										
LCSD (BZ10746-LCSD)					Prepared: 28-Sep-17 Analyzed: 29-Sep-17					
Endosulfan I	**45.67**	c1	%	%	50		91	40-140	8.0	30
Methoxychlor	**46.43**	c1	%	%	50		93	40-140	9.0	30
Hexachlorobenzene	**44.62**	c1	%	%	50		89	40-140	8.2	30
Heptachlor epoxide	**42.77**	c1	%	%	50		86	40-140	9.8	30
Heptachlor	**45.06**	c1	%	%	50		90	40-140	6.9	30
g-BHC	**41.68**	c1	%	%	50		83	40-140	7.5	30
Endrin ketone	**45.21**	c1	%	%	50		90	40-140	8.1	30
Endrin aldehyde	**39.10**	c1	%	%	50		78	40-140	6.6	30
Endrin	**49.04**	c1	%	%	50		98	40-140	6.3	30
Toxaphene	**ND**	c1	%	%	50		NA	40-140	NC	30
Endosulfan II	**46.17**	c1	%	%	50		92	40-140	7.9	30
4,4' -DDD	**45.80**	c1	%	%	50		92	40-140	11.5	30
Dieldrin	**41.22**	c1	%	%	50		82	40-140	7.6	30
d-BHC	**42.41**	c1	%	%	50		85	40-140	7.3	30
Chlordane	**41.57**	c1	%	%	50		83	40-140	6.2	30
b-BHC	**39.15**	c1	%	%	50		78	40-140	8.0	30
Aldrin	**41.98**	c1	%	%	50		84	40-140	8.7	30
Alachlor	**ND**	c1	%	%	50		NA	40-140	NC	30
a-BHC	**43.98**	c1	%	%	50		88	40-140	7.1	30
4,4' -DDT	**44.17**	c1	%	%	50		88	40-140	8.3	30
4,4' -DDE	**41.78**	c1	%	%	50		84	40-140	8.7	30
Endosulfan sulfate	**41.32**	c1	%	%	50		83	40-140	8.8	30
Surrogate: % DCBP	*90.13*	c1	%		*100*		*90*	*30-150*		
Surrogate: % TCMX	*82.84*	c1	%		*100*		*83*	*30-150*		
MS (BZ10746-MS)			**Source: SC39680-01**		Prepared: 28-Sep-17 Analyzed: 29-Sep-17					
b-BHC	**29.05**	c1	ug/Kg	1.0	50	BRL	58	30-150		30
Dieldrin	**30.69**	c1	ug/Kg	1.0	50	BRL	61	30-150		30
d-BHC	**33.23**	c1	ug/Kg	3.3	50	BRL	65	30-150		30
4,4' -DDD	**32.16**	c1	ug/Kg	1.7	50	BRL	64	30-150		30
4,4' -DDE	**31.88**	c1	ug/Kg	1.7	50	BRL	60	30-150		30
4,4' -DDT	**33.49**	c1	ug/Kg	1.7	50	BRL	65	30-150		30
a-BHC	**31.66**	c1	ug/Kg	1.0	50	BRL	63	30-150		30
Alachlor	**ND**	c1	ug/Kg	3.3	50	BRL	NA	30-150		30
Chlordane	**27.89**	c1	ug/Kg	33	50	BRL	56	30-150		30
Endosulfan I	**33.59**	c1	ug/Kg	3.3	50	BRL	67	30-150		30
Endosulfan II	**33.94**	c1	ug/Kg	3.3	50	BRL	68	30-150		30
Endosulfan sulfate	**29.50**	c1	ug/Kg	3.3	50	BRL	59	30-150		30
Endrin	**37.84**	c1	ug/Kg	3.3	50	BRL	76	30-150		30
Hexachlorobenzene	**35.91**	c1	ug/Kg	3.3	50	BRL	72	30-150		30
Aldrin	**30.62**	c1	ug/Kg	1.0	50	BRL	61	30-150		30
Endrin aldehyde	**29.22**	c1	ug/Kg	3.3	50	BRL	58	30-150		30
Methoxychlor	**34.39**	c1	ug/Kg	3.3	50	BRL	69	30-150		30
Heptachlor epoxide	**31.90**	c1	ug/Kg	3.3	50	BRL	62	30-150		30
Heptachlor	**35.60**	c1	ug/Kg	3.3	50	BRL	70	30-150		30
g-BHC	**30.22**	c1	ug/Kg	1.0	50	BRL	60	30-150		30
Endrin ketone	**32.47**	c1	ug/Kg	3.3	50	BRL	65	30-150		30
Toxaphene	**ND**	c1	ug/Kg	130	50	BRL	NA	30-150		30
Surrogate: % TCMX	*65.99*	c1	ug/Kg		*100*		*66*	*30-150*		
Surrogate: % DCBP	*70.11*	c1	ug/Kg		*100*		*70*	*30-150*		
MSD (BZ10746-MSD)			**Source: SC39680-01**		Prepared: 28-Sep-17 Analyzed: 29-Sep-17					

Subcontracted Analyses - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW8081B										
Batch 403367A - 403367-										
MSD (BZ10746-MSD)			**Source: SC39680-01**		Prepared: 28-Sep-17 Analyzed: 29-Sep-17					
Chlordane	**28.07**	c1	%	%	50	BRL	56	30-150	0.0	30
Hexachlorobenzene	**37.33**	c1	%	%	50	BRL	75	30-150	4.1	30
4,4' -DDT	**35.64**	c1	%	%	50	BRL	69	30-150	6.0	30
Methoxychlor	**36.10**	c1	%	%	50	BRL	72	30-150	4.3	30
Toxaphene	**ND**	c1	%	%	50	BRL	NA	30-150	NC	30
a-BHC	**33.59**	c1	%	%	50	BRL	67	30-150	6.2	30
Alachlor	**ND**	c1	%	%	50	BRL	NA	30-150	NC	30
Aldrin	**32.41**	c1	%	%	50	BRL	65	30-150	6.3	30
Heptachlor	**37.86**	c1	%	%	50	BRL	75	30-150	6.9	30
g-BHC	**31.38**	c1	%	%	50	BRL	63	30-150	4.9	30
b-BHC	**30.58**	c1	%	%	50	BRL	61	30-150	5.0	30
Endrin ketone	**34.55**	c1	%	%	50	BRL	69	30-150	6.0	30
Endrin aldehyde	**31.19**	c1	%	%	50	BRL	62	30-150	6.7	30
Endrin	**39.73**	c1	%	%	50	BRL	79	30-150	3.9	30
Endosulfan sulfate	**31.09**	c1	%	%	50	BRL	62	30-150	5.0	30
Endosulfan II	**35.94**	c1	%	%	50	BRL	72	30-150	5.7	30
Endosulfan I	**36.21**	c1	%	%	50	BRL	72	30-150	7.2	30
Dieldrin	**32.96**	c1	%	%	50	BRL	66	30-150	7.9	30
d-BHC	**35.80**	c1	%	%	50	BRL	70	30-150	7.4	30
Heptachlor epoxide	**33.59**	c1	%	%	50	BRL	65	30-150	4.7	30
4,4' -DDD	**35.50**	c1	%	%	50	BRL	71	30-150	10.4	30
4,4' -DDE	**33.99**	c1	%	%	50	BRL	64	30-150	6.5	30
Surrogate: % DCBP	*73.05*	c1	%		*100*		*73*	*30-150*		
Surrogate: % TCMX	*68.77*	c1	%		*100*		*69*	*30-150*		
SW8151A										
Batch 403427A - 403427-										
BLK (BZ11322-BLK)					Prepared: 28-Sep-17 Analyzed: 29-Sep-17					
Dicamba	**ND**		ug/Kg	83				-		
MCPP	**ND**		ug/Kg	25000				-		
MCPA	**ND**		ug/Kg	25000				-		
Dichloroprop	**ND**		ug/Kg	170				-		
Dalapon	**ND**		ug/Kg	83				-		
2,4-DB	**ND**		ug/Kg	1700				-		
2,4-D	**ND**		ug/Kg	170				-		
2,4,5-TP (Silvex)	**ND**		ug/Kg	83				-		
2,4,5-T	**ND**		ug/Kg	83				-		
Dinoseb	**ND**		ug/Kg	170				-		
Surrogate: % DCAA	*57*		ug/Kg		*1000*			*30-150*		
LCS (BZ11322-LCS)					Prepared: 28-Sep-17 Analyzed: 29-Sep-17					
MCPP	**21230**	r	ug/Kg	25000	30000		71	40-140		30
2,4,5-T	**63.31**		ug/Kg	83	100		63	40-140		30
MCPA	**24180**		ug/Kg	25000	30000		81	40-140		30
Dinoseb	**53.92**		ug/Kg	170	100		54	10-110		20
Dichloroprop	**149.2**		ug/Kg	170	200		75	40-140		30
Dicamba	**78.39**		ug/Kg	83	100		78	40-140		30
Dalapon	**43.76**		ug/Kg	83	100		44	40-140		30
2,4-DB	**722.0**		ug/Kg	1700	1000		72	40-140		30
2,4-D	**109.3**		ug/Kg	170	200		55	40-140		30
2,4,5-TP (Silvex)	**68.77**		ug/Kg	83	100		69	40-140		30

Subcontracted Analyses - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
SW8151A										
Batch 403427A - 403427-										
LCS (BZ11322-LCS)						Prepared: 28-Sep-17 Analyzed: 29-Sep-17				
Surrogate: % DCAA	*665.4*		ug/Kg		*1000*		*67*	*30-150*		
LCSD (BZ11322-LCSD)						Prepared: 28-Sep-17 Analyzed: 29-Sep-17				
Dicamba	**66.61**		ug/Kg	%	100		67	40-140	15.2	30
MCPP	**38290**	r	ug/Kg	%	30000		128	40-140	57.3	30
MCPA	**21740**		ug/Kg	%	30000		72	40-140	11.8	30
Dichloroprop	**128.4**		ug/Kg	%	200		64	40-140	15.8	30
Dalapon	**48.77**		ug/Kg	%	100		49	40-140	10.8	30
2,4-DB	**635.9**		ug/Kg	%	1000		64	40-140	11.8	30
2,4-D	**92.28**		ug/Kg	%	200		46	40-140	17.8	30
2,4,5-TP (Silvex)	**57.13**		ug/Kg	%	100		57	40-140	19.0	30
2,4,5-T	**55.84**		ug/Kg	%	100		56	40-140	11.8	30
Dinoseb	**45.99**		ug/Kg	%	100		46	10-110	16.0	20
Surrogate: % DCAA	*581.7*		ug/Kg		*1000*		*58*	*30-150*		
MS (BZ11322-MS)			**Source: BZ11322**			Prepared: 28-Sep-17 Analyzed: 29-Sep-17				
Dalapon	**34.43**		ug/Kg	83	100		34	30-150		30
MCPP	**18930**	r	ug/Kg	25000	30000		63	30-150		30
2,4,5-T	**49.01**		ug/Kg	83	100		49	30-150		30
2,4,5-TP (Silvex)	**49.00**		ug/Kg	83	100		49	30-150		30
2,4-D	**69.80**	r	ug/Kg	170	200		35	30-150		30
2,4-DB	**518.0**		ug/Kg	1700	1000		52	30-150		30
Dicamba	**54.73**		ug/Kg	83	100		55	30-150		30
Dinoseb	**43.09**		ug/Kg	170	100		43	10-110		20
MCPA	**22190**		ug/Kg	25000	30000		74	30-150		30
Dichloroprop	**105.6**		ug/Kg	170	200		53	30-150		30
Surrogate: % DCAA	*524.5*		ug/Kg		*1000*		*52*	*30-150*		
MSD (BZ11322-MSD)			**Source: BZ11322**			Prepared: 28-Sep-17 Analyzed: 29-Sep-17				
2,4,5-T	**40.66**		%	%	100		41	30-150	17.8	30
2,4,5-TP (Silvex)	**38.75**		%	%	100		39	30-150	22.7	30
2,4-D	**98.01**	r	%	%	200		49	30-150	33.3	30
2,4-DB	**412.4**		%	%	1000		41	30-150	23.7	30
Dalapon	**30.60**		%	%	100		31	30-150	9.2	30
Dicamba	**40.66**		%	%	100		41	30-150	29.2	30
Dichloroprop	**84.78**		%	%	200		42	30-150	23.2	30
Dinoseb	**36.90**		%	%	100		37	10-110	15.0	20
MCPA	**19360**		%	%	30000		65	30-150	12.9	30
MCPP	**37400**	r	%	%	30000		125	30-150	66.0	30
Surrogate: % DCAA	*434.8*		%		*1000*		*43*	*30-150*		
SW9060A/L. Kahn										
Batch 403834A - 403834-SW9060A/										
BLK (BZ10747-BLK)						Prepared: Analyzed: 02-Oct-17				
Tot.Org.Carbon	< 100		mg/kg	100				-		
DUP (BZ10747-DUP)			**Source: SC39680-02**			Prepared: Analyzed: 02-Oct-17				
Tot.Org.Carbon	**8000**		mg/kg					-	NC	30
LCS (BZ10747-LCS)						Prepared: Analyzed: 02-Oct-17				
Tot.Org.Carbon	**ND**		mg/kg	100			117.9	75-125		30

Extractable Petroleum Hydrocarbons - CCV Evaluation Report

Analyte(s)	Average RF	CCRF	% D		Limit
Batch S708805					
Calibration Check (S708805-CCV1)					
C9-C18 Aliphatic Hydrocarbons	308052.8	247960.2	-0.8		25
C19-C36 Aliphatic Hydrocarbons	327492.2	215877.7	6.0		25
Unadjusted C11-C22 Aromatic Hydrocarbons	338463.7	337007.1	23.9	#	20
Naphthalene	267243.6	331848.6	24.2	#	20
2-Methylnaphthalene	265325.8	317667.2	19.7		20
Acenaphthylene	283176	346884.4	22.5	#	20
Acenaphthene	308845.6	371050.6	20.1	#	20
Fluorene	289286	317021.2	9.6		20
Phenanthrene	284102.7	316541.2	11.4		20
Anthracene	285145.5	325274.2	14.1		20
Fluoranthene	268965.8	294628.6	9.5		20
Pyrene	294318.7	346114	17.6		20
Benzo (a) anthracene	233547.9	268929.4	15.1		20
Chrysene	239161.2	274827.8	14.9		20
Benzo (b) fluoranthene	225469.6	215226.6	-4.5		20
Benzo (k) fluoranthene	215544.3	223484	3.7		20
Benzo (a) pyrene	201054.8	201865.8	0.4		20
Indeno (1,2,3-cd) pyrene	199758.6	170283.2	-14.8		20
Dibenzo (a,h) anthracene	214540.8	179909.1	-16.1		20
Benzo (g,h,i) perylene	183852.2	160546.4	-12.7		20
n-Nonane (C9)	238411.7	297575.4	24.8		30
n-Decane	236784.2	274732	16.0		25
n-Dodecane	239329.8	252963.8	5.7		25
n-Tetradecane	242047.5	210611.6	-13.0		25
n-Hexadecane	243666.2	231209	-5.1		25
n-Octadecane	246866.3	288636.4	16.9		25
n-Nonadecane	241417.4	265084	9.8		25
n-Eicosane	236259.3	294679.2	24.7		25
n-Docosane	236078.6	292271.4	23.8		25
n-Tetracosane	206171.1	256325	24.3		25
n-Hexacosane	188472.5	233149.8	23.7		25
n-Octacosane	173474.2	209949.4	21.0		25
n-Triacontane	160241.2	194912.9	21.6		25
n-Hexatriacontane	109641.2	114875	12.9		25
Naphthalene (aliphatic fraction)	655492.1				
2-Methylnaphthalene (aliphatic fraction)	652143.6				
Calibration Check (S708805-CCV2)					
C9-C18 Aliphatic Hydrocarbons	308052.8	288586.6	17.2		25
C19-C36 Aliphatic Hydrocarbons	327492.2	221339.2	9.0		25
Unadjusted C11-C22 Aromatic Hydrocarbons	338463.7	268973.6	-2.2		20
Naphthalene	267243.6	327967.6	22.7	#	20
2-Methylnaphthalene	265325.8	331482	24.9	#	20
Acenaphthylene	283176	340941.8	20.4	#	20
Acenaphthene	308845.6	350651.6	13.5		20
Fluorene	289286	333147	15.2		20
Phenanthrene	284102.7	314692.6	10.8		20
Anthracene	285145.5	314752.8	10.4		20
Fluoranthene	268965.8	280759	4.4		20
Pyrene	294318.7	283365.4	-3.7		20
Benzo (a) anthracene	233547.9	213666.4	-8.5		20
Chrysene	239161.2	218399.6	-8.7		20

Extractable Petroleum Hydrocarbons - CCV Evaluation Report

Analyte(s)	Average RF	CCRF	% D		Limit
Batch S708805					
Calibration Check (S708805-CCV2)					
Benzo (b) fluoranthene	225469.6	178287.3	-20.9	#	20
Benzo (k) fluoranthene	215544.3	182016.1	-15.6		20
Benzo (a) pyrene	201054.8	159313.5	-20.8	#	20
Indeno (1,2,3-cd) pyrene	199758.6	153536.8	-23.1	#	20
Dibenzo (a,h) anthracene	214540.8	161446.6	-24.7	#	20
Benzo (g,h,i) perylene	183852.2	145963.7	-20.6	#	20
n-Nonane (C9)	238411.7	306084.8	28.4		30
n-Decane	236784.2	256731.4	8.4		25
n-Dodecane	239329.8	264786.6	10.6		25
n-Tetradecane	242047.5	259613.8	7.3		25
n-Hexadecane	243666.2	293019.8	20.3		25
n-Octadecane	246866.3	279195.8	13.1		25
n-Nonadecane	241417.4	295580.2	22.4		25
n-Eicosane	236259.3	286454.6	21.2		25
n-Docosane	236078.6	272026.6	15.2		25
n-Tetracosane	206171.1	254528.2	23.5		25
n-Hexacosane	188472.5	223662.8	18.7		25
n-Octacosane	173474.2	195188.6	12.5		25
n-Triacontane	160241.2	175454.6	9.5		25
n-Hexatriacontane	109641.2	109139	7.7		25
Naphthalene (aliphatic fraction)	655492.1				
2-Methylnaphthalene (aliphatic fraction)	652143.6				
Batch S708831					
Calibration Check (S708831-CCV1)					
C9-C18 Aliphatic Hydrocarbons	308052.8	288586.6	17.2		25
C19-C36 Aliphatic Hydrocarbons	327492.2	221339.2	9.0		25
Unadjusted C11-C22 Aromatic Hydrocarbons	338463.7	268973.6	-2.2		20
Naphthalene	267243.6	327967.6	22.7	#	20
2-Methylnaphthalene	265325.8	331482	24.9	#	20
Acenaphthylene	283176	340941.8	20.4	#	20
Acenaphthene	308845.6	350651.6	13.5		20
Fluorene	289286	333147	15.2		20
Phenanthrene	284102.7	314692.6	10.8		20
Anthracene	285145.5	314752.8	10.4		20
Fluoranthene	268965.8	280759	4.4		20
Pyrene	294318.7	283365.4	-3.7		20
Benzo (a) anthracene	233547.9	213666.4	-8.5		20
Chrysene	239161.2	218399.6	-8.7		20
Benzo (b) fluoranthene	225469.6	178287.3	-20.9	#	20
Benzo (k) fluoranthene	215544.3	182016.1	-15.6		20
Benzo (a) pyrene	201054.8	159313.5	-20.8	#	20
Indeno (1,2,3-cd) pyrene	199758.6	153536.8	-23.1	#	20
Dibenzo (a,h) anthracene	214540.8	161446.6	-24.7	#	20
Benzo (g,h,i) perylene	183852.2	145963.7	-20.6	#	20
n-Nonane (C9)	238411.7	306084.8	28.4		30
n-Decane	236784.2	256731.4	8.4		25
n-Dodecane	239329.8	264786.6	10.6		25
n-Tetradecane	242047.5	259613.8	7.3		25
n-Hexadecane	243666.2	293019.8	20.3		25
n-Octadecane	246866.3	279195.8	13.1		25
n-Nonadecane	241417.4	295580.2	22.4		25

Extractable Petroleum Hydrocarbons - CCV Evaluation Report

Analyte(s)	Average RF	CCRF	% D		Limit
Batch S708831					
Calibration Check (S708831-CCV1)					
n-Eicosane	236259.3	286454.6	21.2		25
n-Docosane	236078.6	272026.6	15.2		25
n-Tetracosane	206171.1	254528.2	23.5		25
n-Hexacosane	188472.5	223662.8	18.7		25
n-Octacosane	173474.2	195188.6	12.5		25
n-Triacontane	160241.2	175454.6	9.5		25
n-Hexatriacontane	109641.2	109139	7.7		25
Naphthalene (aliphatic fraction)	655492.1				
2-Methylnaphthalene (aliphatic fraction)	652143.6				
Calibration Check (S708831-CCV2)					
C9-C18 Aliphatic Hydrocarbons	308052.8	222131.2	-12.3		25
C19-C36 Aliphatic Hydrocarbons	327492.2	182571	-11.9		25
Unadjusted C11-C22 Aromatic Hydrocarbons	338463.7	319167.4	17.0		20
Naphthalene	267243.6	315839.4	18.2		20
2-Methylnaphthalene	265325.8	331094	24.8	#	20
Acenaphthylene	283176	333814.2	17.9		20
Acenaphthene	308845.6	383442.4	24.2	#	20
Fluorene	289286	361045	24.8	#	20
Phenanthrene	284102.7	346158.4	21.8	#	20
Anthracene	285145.5	329703	15.6		20
Fluoranthene	268965.8	267448.6	-0.6		20
Pyrene	294318.7	269546.2	-8.4		20
Benzo (a) anthracene	233547.9	223858.2	-4.1		20
Chrysene	239161.2	227198.2	-5.0		20
Benzo (b) fluoranthene	225469.6	233179.4	3.4		20
Benzo (k) fluoranthene	215544.3	206243.6	-4.3		20
Benzo (a) pyrene	201054.8	211441.6	5.2		20
Indeno (1,2,3-cd) pyrene	199758.6	218903.8	9.6		20
Dibenzo (a,h) anthracene	214540.8	223028.8	4.0		20
Benzo (g,h,i) perylene	183852.2	207618.2	12.9		20
n-Nonane (C9)	238411.7	280987.8	17.9		30
n-Decane	236784.2	264591.4	11.7		25
n-Dodecane	239329.8	291098	21.6		25
n-Tetradecane	242047.5	302479.8	25.0		25
n-Hexadecane	243666.2	280313.8	15.0		25
n-Octadecane	246866.3	295742.6	19.8		25
n-Nonadecane	241417.4	252903.2	4.8		25
n-Eicosane	236259.3	293107.6	24.1		25
n-Docosane	236078.6	278008.6	17.8		25
n-Tetracosane	206171.1	232560.4	12.8		25
n-Hexacosane	188472.5	197833.2	5.0		25
n-Octacosane	173474.2	209446.6	20.7		25
n-Triacontane	160241.2	169838	6.0		25
n-Hexatriacontane	109641.2	110139.7	8.6		25
Naphthalene (aliphatic fraction)	655492.1				
2-Methylnaphthalene (aliphatic fraction)	652143.6				

Analyte(s)	Column	% Breakdown	Limit

The following list indicates the date and time low-level VOC soil/sediment samples were placed in the freezer at the lab:

SC39680-01	*BRUS-A*	9/26/2017 10:50 AM
SC39680-02	*BRUS-B*	9/26/2017 10:50 AM
SC39680-03	*BRUS-C*	9/26/2017 10:50 AM
SC39680-04	*BRD5*	9/26/2017 10:50 AM

Notes and Definitions

c1	Alpha and gamma chlordane were spiked and analyzed instead of technical chlordane. Gamma chlordane recovery is reported as chlordane in the LCS, LCSD, MS and MSD.
Q1	Present in blank, no bias suspected.
Q1a	This parameter is not certified by MA for this matrix.
QC2	Analyte out of acceptance range in QC spike but no reportable concentration present in sample.
QR2	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on percent recoveries and completeness of QC data.
r	This parameter is outside laboratory rpd specified recovery limits.
Z-2	The method allows for up to four analytes to fail in a closing CCV.
dry	Sample results reported on a dry weight basis
NR	Not Reported
RPD	Relative Percent Difference

Interpretation of Total Petroleum Hydrocarbon Report

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from analyses of various petroleum products. Possible match categories are as follows:

Gasoline - includes regular, unleaded, premium, etc.
Fuel Oil #2 - includes home heating oil, #2 fuel oil, and diesel
Fuel Oil #4 - includes #4 fuel oil
Fuel Oil #6 - includes #6 fuel oil and bunker "C" oil
Motor Oil - includes virgin and waste automobile oil
Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha
Aviation Fuel - includes kerosene, Jet A and JP-4
Other Oil - includes lubricating and cutting oil, and silicon oil

At times, the unidentified petroleum product is quantified using a calibration that most closely approximates the distribution of compounds in the sample. When this occurs, the result is qualified as Calculated as.

Laboratory Control Sample (LCS): A known matrix spiked with compound(s) representative of the target analytes, which is used to document laboratory performance.

Matrix Duplicate: An intra-laboratory split sample which is used to document the precision of a method in a given sample matrix.

Matrix Spike: An aliquot of a sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Method Blank: An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

Method Detection Limit (MDL): The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.

Reportable Detection Limit (RDL): The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. For many analytes the RDL analyte concentration is selected as the lowest non-zero standard in the calibration curve. While the RDL is approximately 5 to 10 times the MDL, the RDL for each sample takes into account the sample volume/weight, extract/digestate volume, cleanup procedures and, if applicable, dry weight correction. Sample RDLs are highly matrix-dependent.

Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. These compounds are spiked into all blanks, standards, and samples prior to analysis. Percent recoveries are calculated for each surrogate.

Continuing Calibration Verification: The calibration relationship established during the initial calibration must be verified at periodic intervals. Concentrations, intervals, and criteria are method specific.

Sc 39680

SPECTRUM ANALYTICAL, INC.
Featuring
HANIBAL TECHNOLOGY

CHAIN OF CUSTODY RECORD

Page 1 of 1

Special Handling:
- ☑ Standard TAT - 7 to 10 business days
- ☐ Rush TAT - Date Needed: _____
- All TATs subject to laboratory approval.
- Min. 24-hour notification needed for rushes.
- Samples disposed of after 60 days unless otherwise instructed.

Report To: GZA GeoEnvironmental Inc
1350 Main St Ste 1400
Springfield, MA 01103

Telephone #:

Project Mgr. Steve Spink

Invoice To: Same

P.O. No.: _____ RQN: _____

Project No.: 01.0173025.00
Site Name: Bay Rd
Location: Hadley State: MA
Sampler(s): Adam Cote, Seth Taylor

1=Na_2S2O_3 2=HCl 3=H_2SO_4 4=HNO_3 5=NaOH 6=Ascorbic Acid 7=CH_3OH
8=$NaHSO_4$ 9= Deionized Water 10=H_3PO_4 11= Not present 12= _____

List preservative code below:

QA/QC Reporting Notes:
* additional charges may apply

DW=Drinking Water GW=Groundwater WW=Wastewater
O=Oil SW= Surface Water SO=Soil SL=Sludge A=Air
X1= _____ X2= _____ X3= _____

G=Grab C=Composite

Lab Id:	Sample Id:	Date:	Time:	Type	Matrix	Containers: # of VOA Vials	# of Amber Glass	# of Clear Glass	# of Plastic	Tot Organic Carbon	Analyses:							MA DEP MCP CAM Report: Yes☐ No☐ CT DPH RCP Report: Yes☐ No☐ **QA/QC Reporting Level** ☐ Standard ☐ No QC ☐ DQA* ☐ NY ASP A* ☐ NY ASP B* ☐ NJ Reduced* ☐ NJ Full* ☐ TIER II* ☐ TIER IV* ☐ Other State-specific reporting standards:
39680-01	BHUS-A	9/25/17	10:20	G	C	3	3											• Hold for TCLP
-02	BRUS-B		11:50															• H_2O % for all samples
-03	BRUS-C		13:15															• TOC by 9060
-04	BRD5		14:20															

Relinquished by:	Received by:	Date:	Time:	Temp°C
Seth Taylor		9/26/17	9:50	1-8
			10:50	0
				1-8
				C1

☐ EDD Format _____
☑ E-mail to Stephen.Spink@GZA.com

Condition upon receipt: Custody Seals: ☐ Present ☐ Intact ☐ Broken
☐ Ambient ☒ Iced ☐ Refrigerated ☐ DI VOA Frozen ☐ Soil Jar Frozen

Proposal No. 608460-130088

A00804 - 235

Sc 39680

SPECTRUM ANALYTICAL, INC.
Featuring
HANIBAL TECHNOLOGY

CHAIN OF CUSTODY RECORD

Page 1 of 1

Special Handling:
- ☑ Standard TAT - 7 to 10 business days
- ☐ Rush TAT - Date Needed: _____
- All TATs subject to laboratory approval.
- Min. 24-hour notification needed for rushes.
- Samples disposed of after 60 days unless otherwise instructed.

Report To: GZA GeoEnvironmental Inc
1350 Main St Ste 1400
Springfield, MA ~~01030~~ 01103
Telephone #:
Project Mgr. Steve Spink

Invoice To: Same
P.O. No.: _____ RQN: _____

Project No.: 01.0173025.00
Site Name: Bay Rd
Location: Hadley State: MA
Sampler(s): Adam Cote, Seth Taylor

1=$Na_2S_2O_3$ 2=HCl 3=H_2SO_4 4=HNO_3 5=NaOH 6=Ascorbic Acid 7=CH_3OH
8= $NaHSO_4$ 9= Deionized Water 10=H_3PO_4 11= Not present 12= _____

List preservative code below:

QA/QC Reporting Notes:
* additional charges may apply

DW=Drinking Water GW=Groundwater WW=Wastewater
O=Oil SW= Surface Water SO=Soil SL=Sludge A=Air
X1= _____ X2= _____ X3= _____

G=Grab C=Composite

MA DEP MCP CAM Report: Yes ☒ No ☐
CT DPH RCP Report: Yes ☐ No ☐

QA/QC Reporting Level
☐ Standard ☐ No QC ☐ DQA*
☐ NY ASP A* ☐ NY ASP B*
☐ NJ Reduced* ☐ NJ Full*
☐ TIER II* ☐ TIER IV*
☐ Other _____

State-specific reporting standards:

Lab Id:	Sample Id:	Date:	Time:	Type	Matrix	# of VOA Vials	# of Amber Glass	# of Clear Glass	# of Plastic	Containers: Tot Organic Carbon	Analyses: VOCs by 8260	TPH by 8100 Modified	MA EPH	SVOCs by 8270	VOCs by 8260 Solid	RCRA 8 Metals, Cyanide, Sulfide	
39680-01	BRUS-A	9/25/17	1020	G	S	3	3										
-02	BRUS-B		1150														
-03	BRUS-C		1315														
-04	BRDT		1420														

- Hold for TCLP
- H2O% for all samples
- TCL by 8260

CAM needed per client
9/28

Relinquished by:	Received by:	Date:	Time:	Temp°C
Seth Taylor		9/26/17	950	1-8
			1050	0
				1-8
				C1

☐ EDD Format _____
☑ E-mail to Stephen.Spink@GZA.com

Condition upon receipt: Custody Seals: ☐ Present ☐ Intact ☐ Broken
☐ Ambient ☒ Iced ☐ Refrigerated ☐ DI VOA Frozen ☐ Soil Jar Frozen

Proposal No. 608460-130088

A00804 - 236

Batch Summary

'[none]'

Subcontracted Analyses

SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716554

General Chemistry Parameters

1716554-DUP1
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716555

General Chemistry Parameters

1716555-DUP1
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716586

General Chemistry Parameters

1716586-BS1
1716586-MRL1
1716586-SRM1
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716596

Volatile Organic Compounds

1716596-BLK1
1716596-BS1
1716596-BSD1
SC39680-01 (BRUS-A)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716697

Toxicity Characteristics

1716697-BLK1
1716697-SRM1
1716697-SRM2
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716738

Volatile Organic Compounds

1716738-BLK1
1716738-BS1
1716738-BSD1
SC39680-02 (BRUS-B)

1716783

Extractable Petroleum Hydrocarbons

1716783-BLK1
1716783-BS1
1716783-BS2
1716783-BSD1
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716889

Semivolatile Organic Compounds by GCMS

1716889-BLK1
1716889-BS1
1716889-BSD1
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

1716919

Extractable Petroleum Hydrocarbons

1716919-BLK1
1716919-BS1
1716919-BSD1
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

403367A

Subcontracted Analyses

BZ10746-BLK
BZ10746-LCS
BZ10746-LCSD
BZ10746-MS
BZ10746-MSD
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

403427A

Subcontracted Analyses

BZ11322-BLK
BZ11322-LCS
BZ11322-LCSD
BZ11322-MS
BZ11322-MSD
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

403834A

Subcontracted Analyses

BZ10747-BLK
BZ10747-DUP
BZ10747-LCS
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

404410A

Subcontracted Analyses

BZ15353-BLK
BZ15353-DUP
BZ15353-LCS
BZ15353-MS
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

404534A

Subcontracted Analyses

BZ15280-BLK
BZ15280-DUP
BZ15280-LCS
BZ15280-LCSD
BZ15280-MS
SC39680-01 (BRUS-A)
SC39680-02 (BRUS-B)
SC39680-03 (BRUS-C)
SC39680-04 (BRD5)

S608497

Extractable Petroleum Hydrocarbons

S608497-CAL9
S608497-CALA
S608497-CALB
S608497-CALC
S608497-CALD
S608497-CALE
S608497-CALF
S608497-CALG
S608497-CALH
S608497-CALI
S608497-CALJ
S608497-CALK
S608497-CALL
S608497-CALM
S608497-ICV2
S608497-LCV2

S707844

Extractable Petroleum Hydrocarbons

S707844-CAL1
S707844-CAL2
S707844-CAL3
S707844-CAL4
S707844-CAL5
S707844-CAL6
S707844-CAL7
S707844-CAL8
S707844-CAL9
S707844-CALA
S707844-CALB
S707844-CALC
S707844-ICV1
S707844-LCV1

S708282

Semivolatile Organic Compounds by GCMS

S708282-CAL1
S708282-CAL2
S708282-CAL3
S708282-CAL4
S708282-CAL5
S708282-CAL6
S708282-CAL7
S708282-CAL8
S708282-CAL9
S708282-CALA
S708282-ICV1
S708282-LCV1
S708282-LCV2
S708282-TUN1

S708614

Volatile Organic Compounds

S708614-CCV1
S708614-TUN1

S708676

Volatile Organic Compounds

S708676-CCV1
S708676-TUN1

S708708

Volatile Organic Compounds

S708708-CAL1
S708708-CAL2
S708708-CAL3
S708708-CAL4
S708708-CAL5
S708708-CAL6
S708708-CAL7
S708708-CAL8
S708708-CAL9
S708708-ICV1
S708708-LCV1
S708708-TUN1

S708751

Extractable Petroleum Hydrocarbons

S708751-CCV1
S708751-CCV2

S708805

Extractable Petroleum Hydrocarbons

S708805-CCV1
S708805-CCV2

S708831

Extractable Petroleum Hydrocarbons

S708831-CCV1
S708831-CCV2

S708876

Extractable Petroleum Hydrocarbons

S708876-CCV1
S708876-CCV2

S708896

Semivolatile Organic Compounds by GCMS

S708896-CCV1
S708896-TUN1

S708957

Semivolatile Organic Compounds by GCMS

S708957-CCV1
S708957-TUN1

APPENDIX H

PRELIMINARY WAVE EQUATION ANALYSIS RESULTS



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F: 781.278.5702
www.gza.com

APPENDIX H – PRELIMINARY WAVE EQUATION OF PILE ANALYSIS (WEAP)

Bay Road (Route 47) Bridge Over Fort River
GZA Project No. 173284.00

Calculated by: M. Deery	Date: 12-18-2019
Checked by: M. Smith	Date: 12-18-2019
Revised by: M. Deery	Date: 4-1-2020
Checked by: M. Smith	Date: 7-20-2020

PURPOSE: Perform preliminary Wave Equation Analyses (WEAP) for the piles to be installed at the abutment and intermediate pier substructures at the Bay Road Bridge over Fort River project located in Hadley, Massachusetts to evaluate the driveability and stresses in the piles during driving based on anticipated subsurface conditions. ***The WEAP analyses presented herein supersede those presented in our December 2019 report to reflect updated pile loads and pile sizes.***

The WEAP input assumptions and parameters are summarized below:

ABUTMENT PILES

- Hammer: The abutment piles are modelled with the Delmag D8-12 single acting diesel hammer. The Delmag D8-12 has a ram weight of 1,760 lbs. and a maximum rated stroke of 11.4 feet, yielding a maximum rated energy of 20,100 foot-lbs. The hammer cushioning material consists of 2.0-inches of aluminum and conbest. No pile cushioning material is required for the steel HP12x84 piles described below.

- Pile: For the driveability analyses 65-foot long, Grade 50 steel HP12x84 piles are modeled, which assumes an additional 7 feet of pile is ordered to provide a buffer against damage to the top of the pile during driving. Actual pile order lengths may vary. The cross-sectional steel area for this pile type is 24.6 square inches. The required nominal axial pile resistance of 192 kips is based on dividing the maximum axial factored design load of 153 kips by a resistance factor of 0.8 (static load testing on a sacrificial pile is specified for this project). The maximum allowable driving stress for Grade 50 steel is 45 ksi (i.e., 0.9fy).

- Soil: North Abutment: Proposed pile cut-off elevation is El. 117 and proposed pile tip elevation is El. 59, which is a 58-foot long pile. For the analysis, working grade for pile installation was assumed to be El. 112, which is about 12 feet below finished roadway grade and 3 feet below the bottom of pile cap elevation. Based on the subsurface profile (see **Attachment 1**), the North Abutment resistance profile is modeled as 50% end bearing and 50% skin friction triangularly distributed in medium dense sand and gravel overlying a larger triangular distribution in the underlying dense to very dense sand and gravel along the lower 13 feet of the pile. Although the dense to very dense sand gravel was ignored in the static axial calculations, it was included in this analysis to evaluate the stresses in the pile under difficult driving conditions.

  South Abutment: Proposed pile cut-off elevation is El. 118 and proposed pile tip elevation is El. 60, which is a 58-foot long pile. For the analysis, working grade is assumed to be El. 113, about 12 feet below finished roadway grade and 3 feet below the bottom of pile cap elevation. Based on the subsurface profile (see **Attachment 1**), the South Abutment resistance profile is modeled as 50%

end bearing and 50% skin friction triangularly distributed in medium dense sand and gravel overlying a larger triangular distribution in the underlying dense to very dense sand and gravel along the lower 13 feet of the pile. Although the dense to very dense sand gravel was ignored in the static axial calculations, it was included in this analysis to evaluate the stresses in the pile under difficult driving conditions.

- Analysis: A variable capacity analysis was performed which develops a driving resistance based on the most efficient hammer stroke.

- Results: The preliminary WEAP results are summarized on **Table 1**. The initial driving criteria is based on the results of the WEAP and our experience with similar piles in similar ground conditions.

Table 1: Summary of WEAP Results for Axial Resistance at Abutment Piles

Substructure	Nominal Resistance (kips)	Initial Driving Criteria [1] (BPI)	Ram Stroke (ft)	Driving Stress [2] (ksi)	Transfer Energy (kip-ft)
North Abutment	192	5 for 6 inches	8.1	19.4	8.7
South Abutment	192	5 for 6 inches	8.1	19.4	8.7

Notes:
1. Final driving criteria for axial resistance to be based on WEAP performed by Contractor based on Contractor's proposed pile driving system and the results of both the dynamic testing and static axial load test.
2. The maximum allowable driving stress is 45 ksi for Grade 50 steel.

INTERMEDIATE PIER PILES

- Hammer: The intermediate pier piles are modelled with the Delmag D36-32 single acting diesel hammer. The Delmag D36-32 diesel hammer has a ram weight of 7,930 lbs. and a maximum rated stroke of 11.4 feet, yielding a maximum rated energy of 90,402 foot-lbs. The Delmag D36-32 can be equipped with either a ratchet style fuel pump with four fuel settings or a variable throttle controlled by a hydraulic pump. For the analysis we assumed the hammer is equipped with the ratchet style fuel pump. The fuel pump settings are designed to limit the ram stroke to 5.2 feet, 7.0 feet, 8.8 feet, and 11.4 feet (open) yielding rated energies of 40,892 foot-lbs., 55,350 foot-lbs., 69,608 foot-lbs., and 90,402 foot-lbs., respectively. The Delmag D36-32 was modeled operating on fuel setting 2 (7.0-foot rated stroke) to develop both the required nominal resistance at a reasonable penetration resistance without overstressing the pile section and to achieve the required pile embedment. The hammer cushioning material reportedly consists of 2 inches of aluminum and conbest. No pile cushioning material is required for the steel 24-inch diameter pipe piles described below.

- Pile: Proposed pile cut-off elevation is El. 120.5 and proposed pile tip elevation for axial resistance is El. 62, but the tip elevation needs to extend to El. 55 to satisfy lateral resistance. This results in a 65.5-foot long pile. For the driveability analyses 70-foot long, 24-inch diameter, 0.5-inch wall thickness closed-end Grade 3 steel pipe piles are modeled are modeled assuming 4.5 feet of additional pile is ordered to provide a buffer against damage on the top of the pile during driving and the pile cut-off elevation. Actual pile order lengths may vary. The cross-sectional steel area for this pile type is 36.91 square inches. The required nominal axial pile resistance of 469 kips is based on dividing the maximum

axial factored design load of 305 kips by a resistance factor of 0.65 (dynamic load testing is specified for this project). (Note that the pile design is controlled by lateral loads and requires the piles to be driven deeper to obtain fixity.) Static analyses estimate a nominal axial pile resistance of 577 kips at the required tip elevation to satisfy lateral load requirements. Therefore, for this driveability analysis, a variable capacity analysis was performed assuming a nominal pile resistance up to 600 kips with the hammer operating on fuel setting 2. The maximum allowable driving stress for Grade 3 steel is 40.5 ksi (i.e., $0.9f_y$).

- Soil: Mudline (not including scour) for the pile installation was assumed to be El. 102, which is about 18.5 feet below the average pile cut-off of El 120.5. Based on the subsurface profile (see **Attachment 1**), the North and South Pier resistance profile is modeled as 70% end bearing and 30% skin friction triangularly distributed in medium dense sand and gravel overlying a larger triangular distribution in the underlying dense to very dense sand and gravel along the lower 14 feet of the pile. Based on the static axial calculations end bearing accounts for about 60% of the nominal resistance of the pile. For this driveability analysis, 70% end bearing was used to evaluate the stresses in the pile, which conservatively considers more difficult driving conditions especially since the pile will be driven closed ended. Scour was not considered in the WEAP because it is not representative of the conditions anticipated to be encountered at the time of installation.

- Analysis: Two analyses were performed for the assumed hammer-pile-soil system.
  1. Constant capacity analyses which develops a driving resistance based on a varied hammer stroke.
  2. Variable capacity analysis which develops a driving resistance based on the Delmag D36-32 operating on fuel setting 2.

- Results: The preliminary WEAP results to achieve the minimum required nominal axial geotechnical resistance of 470 kips is summarized on **Table 2**. The initial driving criteria is based on the results of the WEAP and our experience with similar piles in similar ground conditions.

  To achieve the required embedment depth for lateral resistance, the piles are estimated to be driven to a nominal geotechnical resistance of 600 kips. Based on the results of the variable capacity analysis the stroke of the hammer will need to be increased in order to achieve the required embedment depth for lateral resistance. Preliminary WEAP results to achieve the embedment depth is summarized in **Table 3**. The WEAP indicates that the hammer can be operated to achieve the minimum tip elevation without overstressing the piles.

Table 2: Summary of WEAP Results for Axial Resistance at Intermediate Pier Piles

Substructure	Nominal Resistance (kips)	Initial Driving Criteria [1] (BPI)	Ram Stroke (ft)	Driving Stress [2] (ksi)	Transfer Energy (kip-ft)
North Pier	469	4 for 6 inches	6.5	24.7	31.8
South Pier	469	4 for 6 inches	6.5	24.7	31.8

Notes:

1. Final driving criteria for axial resistance to be based on WEAP performed by Contractor based on Contractor's proposed pile driving system and the results of dynamic testing.
2. The maximum allowable driving stress is 40.5 ksi for Grade 3 steel.

Table 3: Summary of WEAP Results for Minimum Embedment at Intermediate Pier Piles

Substructure	Nominal Resistance (kips)	Driving Resistance [1] (BPI)	Ram Stroke (ft)	Driving Stress [2] (ksi)	Transfer Energy (kip-ft)
North Pier	600	5	6.9	26.3	33.6
South Pier	600	5	6.9	26.3	33.6

Notes:

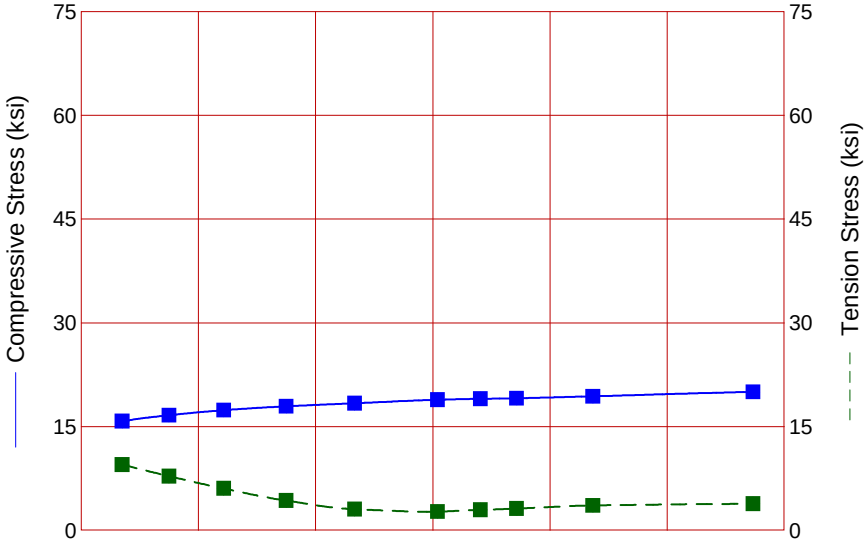
1. Driving resistance in order to achieve the required embedment depth for lateral resistance to be based on WEAP performed by Contractor based on Contractor's proposed pile driving system and the results of dynamic testing.
2. The maximum allowable driving stress is 40.5 ksi for Grade 3 steel.

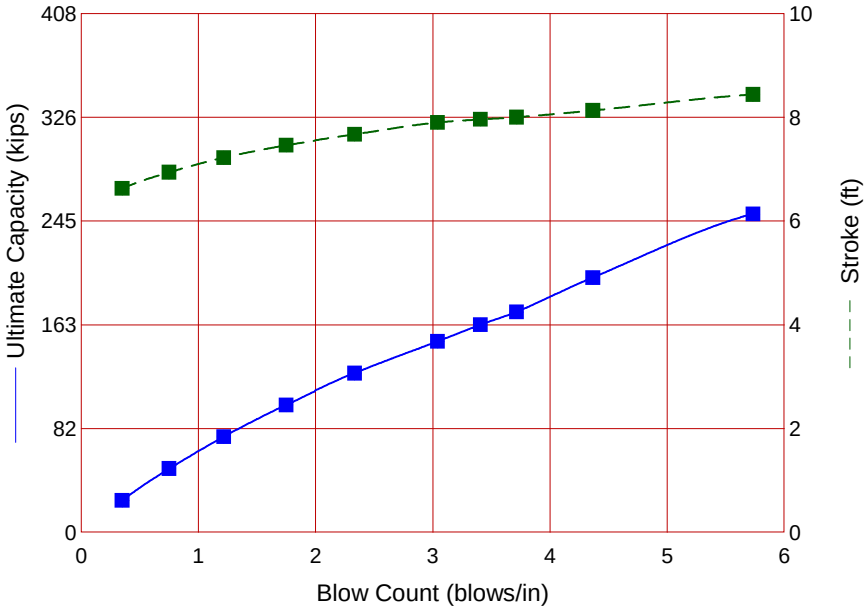
Attachments: WEAP Results and Soil Parameters

GZA GeoEnvironmental Inc.
■ Bay Road N.Abut D8-12 65'HP12x84 VC
✳ Bay Road S.Abut D8-12 65'HP12x84 VC

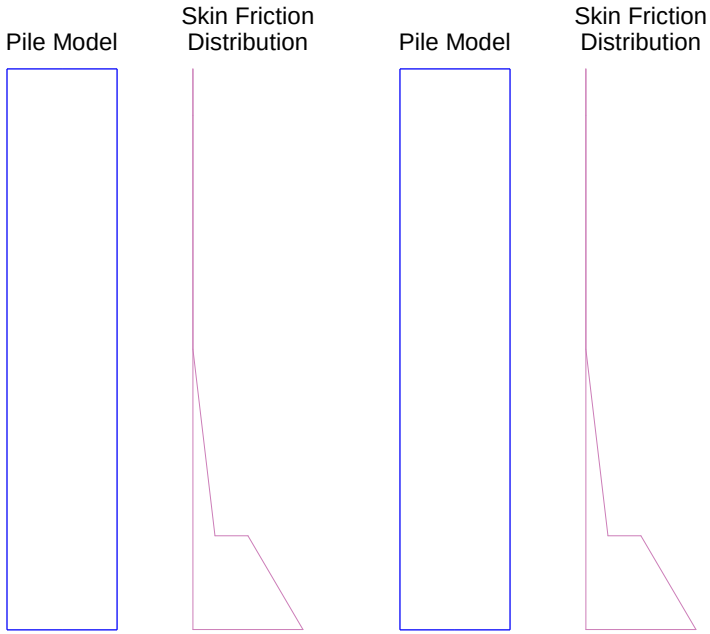
18-Dec-2019

GRLWEAP Version 2010





	■ DELMAG D 8-12		✳ DELMAG D 8-12	
Ram Weight	1.76		1.76	kips
Efficiency	0.800		0.800	
Pressure	1875 (100%)		1875 (100%)	psi
Helmet Weight	1.90		1.90	kips
Hammer Cushion	60155		60155	kips/in
COR of H.C.	0.800		0.800	
Skin Quake	0.100	in	0.100	in
Toe Quake	0.100	in	0.100	in
Skin Damping	0.050	s/ft	0.050	s/ft
Toe Damping	0.150	s/ft	0.150	s/ft
Pile Length	65.00		65.00	ft
Pile Penetration	53.00		53.00	ft
Pile Top Area	24.60		24.60	in2



GZA GeoEnvironmental Inc. 18-Dec-2019
Bay Road N.Abut D8-12 65'HP12x84 VC GRLWEAP Version 2010

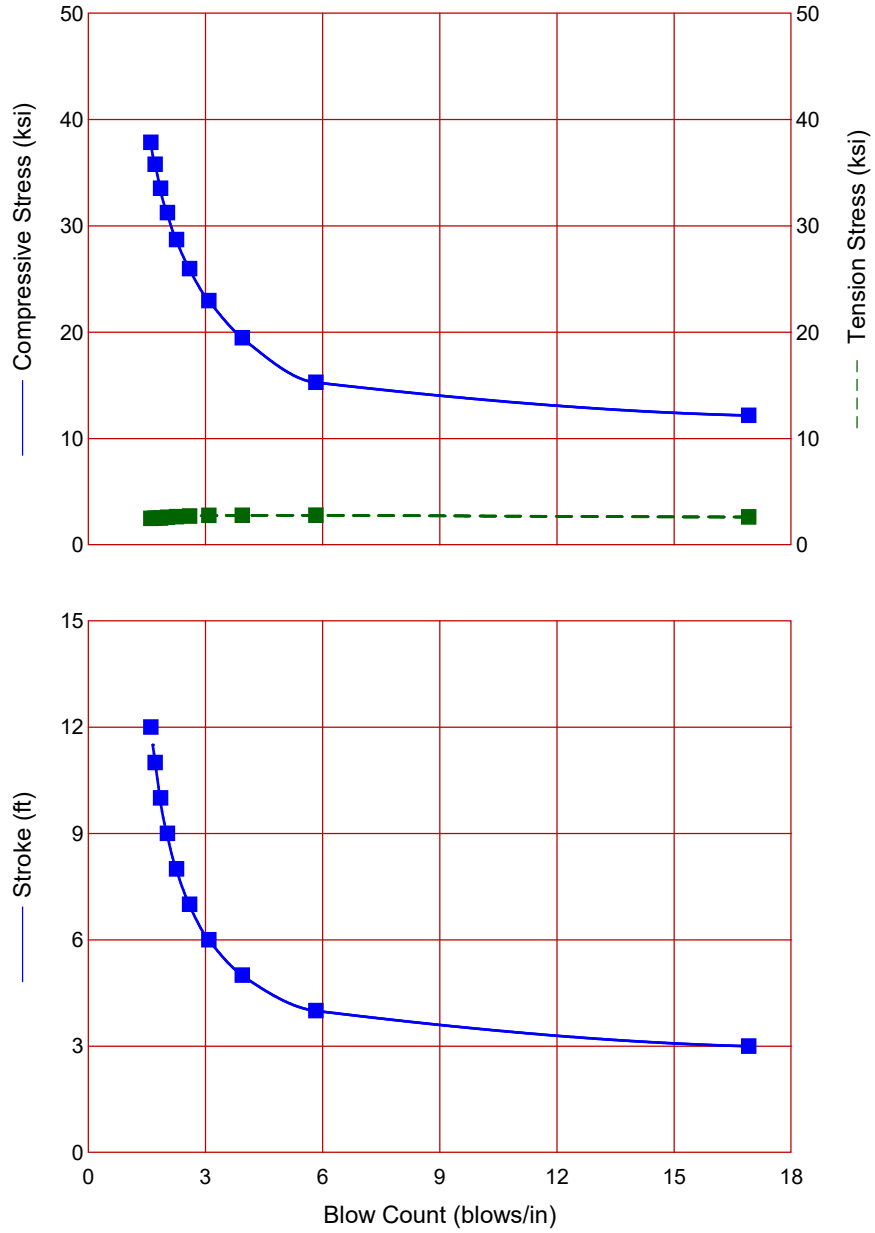
Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
25.0	15.78	9.50	0.3	6.63	9.66
50.0	16.66	7.84	0.8	6.94	9.24
75.0	17.38	6.06	1.2	7.22	8.93
100.0	17.94	4.32	1.8	7.46	8.85
125.0	18.38	3.07	2.3	7.67	8.76
150.0	18.89	2.73	3.0	7.90	8.78
163.0	19.02	2.97	3.4	7.96	8.75
173.0	19.10	3.16	3.7	8.00	8.71
200.0	19.39	3.61	4.4	8.13	8.70
250.0	20.02	3.86	5.7	8.44	9.00

Bay Road S.Abut D8-12 65'HP12x84 VC

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
25.0	15.78	9.50	0.3	6.63	9.66
50.0	16.66	7.84	0.8	6.94	9.24
75.0	17.38	6.06	1.2	7.22	8.93
100.0	17.94	4.32	1.8	7.46	8.85
125.0	18.38	3.07	2.3	7.67	8.76
150.0	18.89	2.73	3.0	7.90	8.78
163.0	19.02	2.97	3.4	7.96	8.75
173.0	19.10	3.16	3.7	8.00	8.71
200.0	19.39	3.61	4.4	8.13	8.70
250.0	20.02	3.86	5.7	8.44	9.00

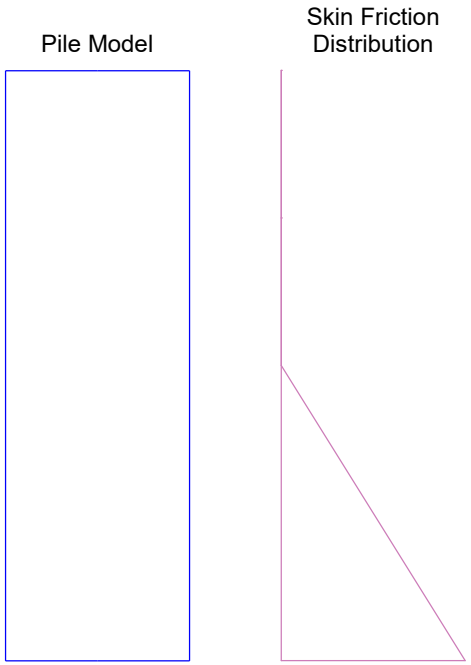
GZA GeoEnvironmental Inc.
Bay Road Bridge D36 70' 24"x0.5" CEP CC

02-Apr-2020
GRLWEAP Version 2010



DELMAG D 36-32

Capacity	470.0	kips
Ram Weight	7.93	kips
Efficiency	0.800	
Pressure	1500 (100%)	psi
Helmet Weight	3.90	kips
Hammer Cushion	109975	kips/in
COR of H.C.	0.800	
Skin Quake	0.100	in
Toe Quake	0.250	in
Skin Damping	0.050	s/ft
Toe Damping	0.150	s/ft
Pile Length	70.00	ft
Pile Penetration	47.00	ft
Pile Top Area	36.91	in2



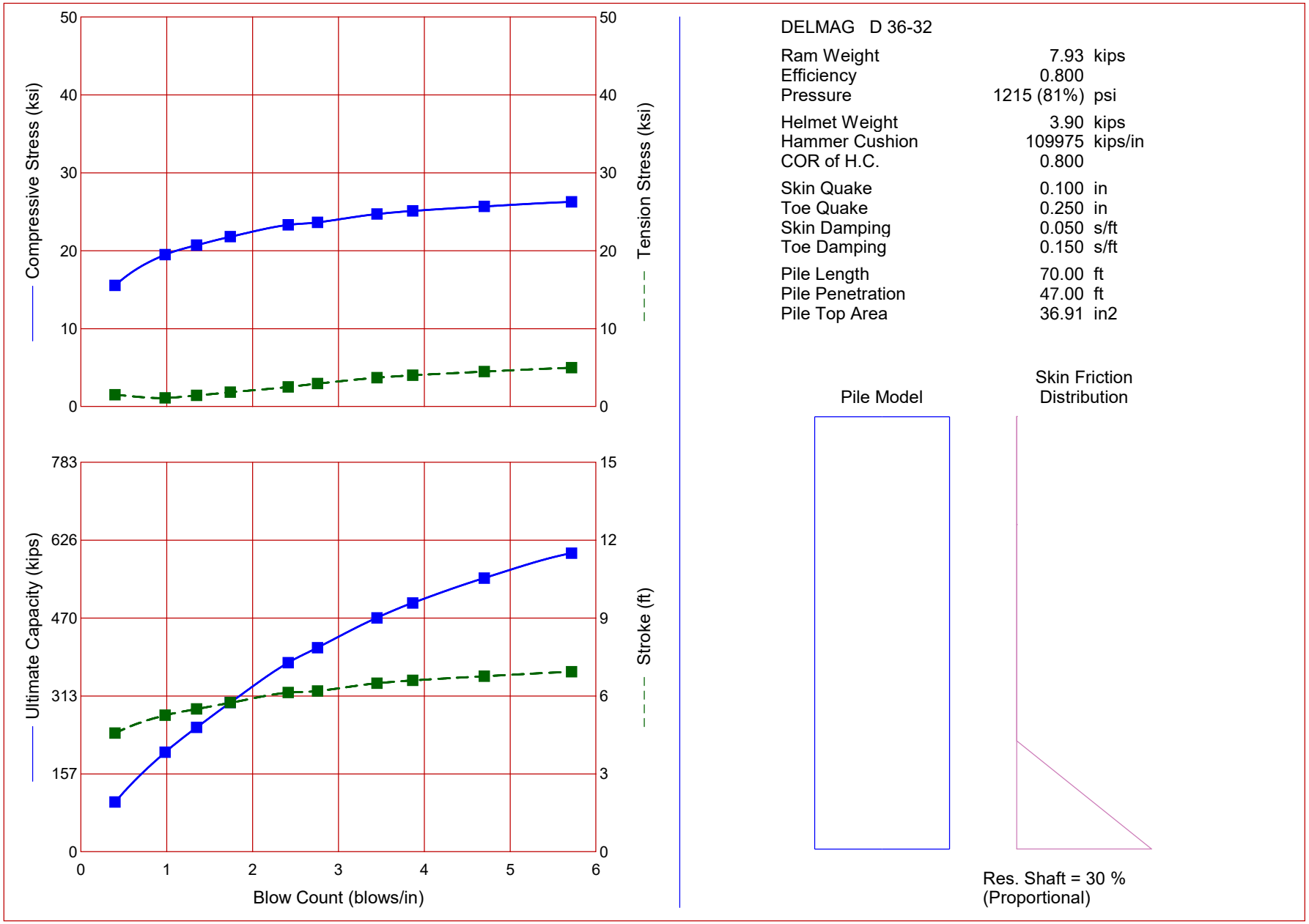
Res. Shaft = 30 %
(Proportional)

GZA GeoEnvironmental Inc. 02-Apr-2020
Bay Road Bridge D36 70' 24"x0.5" CEP CC GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
470.0	12.17	2.63	16.9	3.00	11.94
470.0	15.28	2.78	5.8	4.00	20.31
470.0	19.46	2.78	3.9	5.00	26.97
470.0	22.96	2.77	3.1	6.00	33.11
470.0	25.97	2.71	2.6	7.00	38.89
470.0	28.70	2.65	2.3	8.00	44.64
470.0	31.23	2.59	2.0	9.00	50.32
470.0	33.53	2.52	1.9	10.00	55.62
470.0	35.78	2.50	1.7	11.00	61.19
470.0	37.84	2.48	1.6	12.00	66.41

GZA GeoEnvironmental Inc.
Bay Road Bridge D36F2 70'24"x0.5" CEP VC

02-Apr-2020
GRLWEAP Version 2010



DELMAG D 36-32

Ram Weight	7.93	kips
Efficiency	0.800	
Pressure	1215 (81%)	psi
Helmet Weight	3.90	kips
Hammer Cushion	109975	kips/in
COR of H.C.	0.800	
Skin Quake	0.100	in
Toe Quake	0.250	in
Skin Damping	0.050	s/ft
Toe Damping	0.150	s/ft
Pile Length	70.00	ft
Pile Penetration	47.00	ft
Pile Top Area	36.91	in2

Res. Shaft = 30 %
(Proportional)

GZA GeoEnvironmental Inc. 02-Apr-2020
Bay Road Bridge D36F2 70'24"x0.5" CEP VC GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
100.0	15.55	1.51	0.4	4.57	34.41
200.0	19.49	1.11	1.0	5.26	30.87
250.0	20.72	1.44	1.3	5.50	30.12
300.0	21.80	1.85	1.7	5.74	30.12
380.0	23.32	2.52	2.4	6.13	30.75
410.0	23.64	2.95	2.8	6.19	30.79
470.0	24.70	3.71	3.4	6.49	31.82
500.0	25.11	4.02	3.9	6.60	32.06
550.0	25.68	4.49	4.7	6.76	32.64
600.0	26.27	4.99	5.7	6.93	33.59

Attachment 1 for:
APPENDIX H – PRELIMINARY WAVE EQUATION ANALYSIS OF PILES (WEAP)

Bay Road (Route 47) Bridge Over Fort River
GZA Project No. 173284.10

Soil Parameters & Pile Load Information for WEAP Analysis

Soil Stratum	Depth to Top of Layer Below Roadway or Mudline (ft)		Unit Weight (pcf)	Friction Angle ϕ' (deg)
	Abutments	Intermediate Piers		
Fill	0	Not Encountered	120	30
Medium Dense Sand and Gravel	17	0	125	32
Dense Sand and Gravel	53	33	130	34
Depth to Groundwater	17	0	-	-

Foundation Location	Foundation Type	Factored Axial Load per Pile (Strength I)	Resistance Factor	Required Nominal Geotech. Resistance	Estimated Pile Embedment Below Roadway or Mudline Based on Static Calculations	Notes
Abutments	HP12x84 Pile	153 kips	0.80	192 kips	65 ft	Resistance from fill was ignored in static calculations and should be ignored in WEAP
Intermediate Piers	24" OD x 0.5" WT Closed End Pipe Pile	305 kips	0.65	469 kips	45 ft**	Pile cutoff elevation is 18.5 feet above mudline surface. **Lateral resistance controls pile tip. Estimated embedment depth is 38 feet below mudline for axial resistance and 45 feet below mudline for lateral resistance.

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DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

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Project Utilities Coordination (PUC) Form

CONTACTS AND GENERAL UTILITY INFORMATION

3/17/2025

Revision Date:

City/Town:	Project File #:	PUC Completed by:	Utility Pole Set:	
Hadley	608460	Paul Kelly	Verizon	
Route/Street:	**Resident Engineer:**	**Mass DOT PM:**	**Scheduled Ad Date:**	**Total Poles Relocated:**
Bay Road (Route 47)		Anthony Christakis	4/26/2025	4

5/23/2025 PRINTED

Consultant:	Contact:	Office #	Cell #	Email
Benesch	Anthony Timperio, PE	617-288-0900	617-416-8827	Atimperio@benesch.com

Utility Company	Contact	Office #	Cell #	Email	Scope, Budget, Duration Submitted		Reimbursement			Potential for District Initiated Early Relocation *		Utilities On Bridge/Structure		Utilities Underground (UG) /Aerial (OH)	
					Yes	No	Agreement	Non-Reimb'le	Notes	YES	NO	YES	NO	UG	OH
Verizon	Paul Styspeck			Paul.M.Styspeck@verizon.com	X		X				X		X		x
Eversource	Nicholas Langone			"Langone, Nicholas" <nicholas.langone@eversource.com>	X		X				X		X		x
Charter	John Yurkevicius			"Yurkevicius, John A" <John.Yurkevicius@charter.com>	X		X				X		X		x
Five College Network	Thomas Brennan			"tebrennan@fivecolleges.edu" <tebrennan@fivecolleges.edu>	X		X				X		X		x

Utility Relocation Notes for MassDOT Contractor

Unless otherwise noted by Contract, the MassDOT Contractor is to provide the District Construction Office with 7 Calendar Days advance notification in order to validate the current progress and provide the required 30 Days advance notice-to-proceed for the first Utility - and each subsequent Utility. These advance notifications are to be identified in the Contractor's Schedules (Pre-Con preparation, Baseline, Subnets, and Updated/Monthly Schedules) as specified in Subsection 8.02 (for DBB Contracts) and/or Section 9 (of DB Contracts). Note: The durations included below do not include these lead-times. See Additional 'Important Basis notes for Contractor' - on last PUC Form page.

Additional notes:

Suggested Sequence of Relocation (Based on Consultant proposed construction staging)

The sequence as detailed on the following pages is based on the consultants proposed staging plan. This information was compiled through meetings that included all of the utilities listed below along with the designer and the Town of Granby. The information provided is the best available information prior to project advertisement.

Proposal No. 608460-130088

PUC FORM - CONTINUED

Is 'enabling' (prep) work, by the Contractor, necessary prior to the start of the first series of utility relocations:	Yes	No
	X	

Has any of the Utility work been identified to work concurrently	Yes	No
		X

5/23/2025
PRINTED

massDOT Massachusetts Department of Transportation Highway Division

	RESPONSIBLE PARTY		DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work Contractor note: In planning and executing the work, the Access Restraints listed in the Special Provisions, takes precedence over the checklist in these 4 columns.				Access Restraint & Limitations of Operations Notes Should an AR be considered for the Contractor ?	
	C = Contractor	U = Utility Co.			Exclusive Utility on site Utility working with no other Utilities in vicinity	Concurrent Utilities Utility working with other Utilities on site	Contractor Off-Site No Contractor physical construction operations on-site (while Utility is	Contractor Concurrent Contractor and Utility are working on-site - but NOT in the same vicinity	Potential Access Restraint (Yes/No)	Reason/Note (optional)
Stage : 1 Phase : A			Enabling' work by the Contractor - Phase 1 of the bridge construction will need to be complete prior to the utility relocations. - Approve the proposed staked locations of utility poles with the Resident Engineer.							
			UTILITY OPERATIONS - _____							
Task: 1			***Verizon***							
		u	Verizon sets new poles, guy wires and anchors.	7	x		x		Yes	AR FOR BRIDGE WORK
			Sub-Total	**7**						
			UTILITY OPERATIONS - _____							
Task: 2			***Eversource***							
		u	Eversource frames poles	4	X		X		Yes	AR FOR BRIDGE WORK
		u	Eversource Install Primary and Secondary Wires	3	X		X		Yes	AR FOR BRIDGE WORK
		u	Eversource Cutover Primary and Secondary Wires	1	X		X		Yes	AR FOR BRIDGE WORK
		u	Eversource Remove Primary, Secondary and Poletops	3	X		X		Yes	AR FOR BRIDGE WORK
		u	Eversource Tree Trimming and Removal	2	X		X		Yes	AR FOR BRIDGE WORK
			Sub-Total	**13**						
			UTILITY OPERATIONS - _____							
Task: 3_			***Five College Network***							
		u	Five College Network Prep word for transfer, transfer, secure on new poles	2	x		x		Yes	AR FOR BRIDGE WORK
			Sub-Total	**2**						
			UTILITY OPERATIONS - _____							
Task: 2			***Charter***							
		u	Charter Strand	7	x		x		Yes	AR FOR BRIDGE WORK
		u	Charter Coax	10	x		x		Yes	AR FOR BRIDGE WORK
		u	Charter De-lash/Relash	10	x		x		Yes	AR FOR BRIDGE WORK
		u	Charter Splice and Activate	2	x		x		Yes	AR FOR BRIDGE WORK
			Sub-Total	**29**						
			UTILITY OPERATIONS - _____							
Task: 1			***Verizon***							
		u	Verizon Place/Transfer Cable	10	x		x		Yes	AR FOR BRIDGE WORK
		u	Verizon Spice/Trimout Cables	10	x		x		Yes	AR FOR BRIDGE WORK
		u	Verizon Remove Cables	4	x		x		Yes	AR FOR BRIDGE WORK
		u	Verizon Remove Poles After TEL/COM Have Transferred to New Facilities	1	X		X		Yes	AR FOR BRIDGE WORK
			Sub-Total	**25**						
			Total	**76**						

IMPORTANT BASIS NOTES - FOR CONTRACTOR

1	Unless otherwise specified in the MassDOT Construction Contract, or unless specifically noted within this PUC Form, these durations (herein) are based upon the Contractor providing *unimpeded access* to the Utility company to perform Utility relocations (see Note 5 - Access).
2	"Concurrent Utilities" operations noted herein, are to signify those Utility Company operations that can be worked concurrently (e.g. Utility A and Utility B work on-site together) - MassDOT and the Contractor are to prepare NTPs to Utilities accordingly.
3	"Potential Access Restraints" noted within this PUC Form are for planning purposes. See MassDOT Contract for Contractual Access Restraints (refer to Subsections 8.02, 8.03, and/or 8.06 for Design Bid Build Contracts and Volume II Section 9 for Design Build Contracts).
4	Utility non-work periods - For planning purposes, the durations above contain some non work days (contingency) for New England conditions (precipitation, high temperatures, low temperatures, snow, ice). Gas line work however, typically has a seasonal restriction and can NOT be installed from 15-November to 15-March. Municipally Owned Electric and Gas Utilities are also restricted from proceeding from 15-November to 15-March. The Contractor shall (and the CTD plan) reflect this calendar restriction within the schedule (unless otherwise note).
5	Access - Unless otherwise noted in the Contract, and in addition to the 'enabling' notes above, the Contractor must provide safe and unimpeded access (for trucks, lifts, cranes, etc.) to the Utilities, to allow for the proposed relocation(s) - including but not limited to snow removal, clearing and grubbing, guard rail removal, barrier removal, tree removal, and grading.
6	For all MassDOT construction contracts issued after January 2014, the new Utility Coordination/documentation specification is required. This is Section 8.14 in Design-Bid-Build Contracts (see Design-Build index reference for applicable section #).
7	Prior to starting any and all enabling work for Utilities, the Contractor is to plan in advance with submittals and approved durations.

RESPONSIBLE PARTY		DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work Contractor note: in planning and executing the work, the Access Restraints listed in the Special Provisions, takes precedence over the checklist in these 4 columns.				Access Restraint & Limitations of Operations Notes Should an AR be considered for the Contractor ?	
C = Contractor U = Utility Co.				Exclusive Utility on site Utility working with no other Utilities in vicinity	Concurrent Utilities Utility working with other Utilities on site	Contractor Off-Site No Contractor physical construction operations on-site (while Utility is	Contractor Concurrent Contractor and Utility are working on-site - but NOT in the same vicinity	Potential Access Restraint (Yes/No)	Reason/Note (optional)
8	* Potential District Initiated Early Utility Relocation - if noted herein, the District reserves the right to initiate early utility relocation in advance of the Contract NTP. In submitting a bid price and in the development/basis of the Baseline Schedule, the Contractor shall not plan the Work with the potential benefit of any form of 'early utility relocation.' As a requirement of the Baseline submission, unless otherwise noted in this Specification, the earliest that the first Utility company is to receive the 30 days advance notification to mobilize to the site, will be 7 calendar days after the pre-construction meeting and never sooner than 7 days after the Contract NTP.								
6									

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DOCUMENT A00810

MassDOT Herbicide Use Report

Proposal No. 608460-130088

MassDOT Herbicide Use Report

Date Submitted:

Use multiple sheets for multiple application techniques or sites as needed.

Contractor Performing Work:

Project or Contract No:

Town/s:

Associated Route:

Project Description:

MDAR ALERT*:

Treatment Description:

Area Treated (as applicable)

Acres: **Sq Yds:** **Miles:**

Weeds Targeted:

Gallons Formula Used:

Application Method:

Date/Time Began:

Date/Time End:

Product Used:

Name: _____	Name: _____	Name: _____
EPA Reg. No: _____	EPA Reg. No: _____	EPA Reg. No: _____
% Active Ingredient	% Active Ingredient	% Active Ingredient
Dry: _____	Dry: _____	Dry: _____
Liquid: _____	Liquid: _____	Liquid: _____
Formulation (dilution rate): _____	Formulation (dilution rate): _____	Formulation (dilution rate): _____

Additional products used (surfactants, etc.) or other information:

Applicators: **License Numbers:**

* Please note:
EDRR Species (MAM, Hogweed, Pepperweed, Kudzu, etc.)
Tree of Heaven 1) stands of >20 trees; 2) >5 trees near nursery, landscape company, or highway rest area where trucks stop

Upon completion, please submit form to MassDOT District Engineer and Landscape Design Section in Boston office.

07/18/2018

DOCUMENT A00811

WATERING LOG
for
MassDOT Plantings

Watering Log for MassDOT Plantings

Project Description:

Contract No:

Project No:

Plant Locations/s: (Attach planting plan/s as necessary)

Notes:

	Separate logs shall be kept to track areas or plants with different watering schedules. Trees shall receive a minimum of 10 gallons with each watering and shrubs a minimum of 5 gallons. Provide note that if watering is not performed as scheduled due to rain. Record date of rainfall and amount.												
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													

Each week, following watering, Log shall be submitted to the MassDOT Engineer.

6/15/2018

DOCUMENT A00818

HYDRAULIC REPORT

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HYDRAULIC STUDY REPORT

BAY ROAD (ST 47) ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS
HAMPSHIRE COUNTY- DISTRICT 1
BRIDGE NO. H-01-005 (12J)
PROJECT FILE No. 608460



February 27, 2018

Prepared by

Hydraulics Unit
Bridge Section
10 Park Plaza, Suite 6430
Boston, MA 02116

The Commonwealth Of Massachusetts
Massachusetts Department of Transportation
Highway Division
Interoffice Memorandum

To:	**Thomas P. Donald, P.E., Director of Bridge Project Management**
From:	**Hanan Fouad, P.E., Hydraulic Engineer**
Date:	**February 27, 2018**
Subject:	**Hadley: Br. No. H-01-005, Bay Road (ST 47) Over Fort River** **Project Hydraulic Study Report, Project File No. 608460**

Transmitted herewith is the Hydraulic Study Report prepared for the subject bridge. If you have questions regarding the content of this document, please contact Bindu Thomas at 857.368.9386 or at Bindu.Thomas@dot.state.ma.us

HF
cc: James M. Dalton, Project Manager

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1.0 Executive Summary

The purpose of this report is to present the results of a study conducted at the subject bridge site to evaluate the hydraulic performance of the replacement alternative for the Bay Road (ST 47) Bridge in the Town of Hadley considered in the Bridge Type Study. This investigation was conducted in a manner consistent with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA), and Massachusetts Department of Transportation (MassDOT) guidelines for preparation of hydraulic studies at bridge sites.

The scope of this investigation consisted of review of pertinent hydrologic analysis data for the Fort River at the project site and a detailed hydraulic analysis. Data collected, hydraulic model input/output and scour calculations are presented in the appendices of this report. A narrative discussion of the problem statement, engineering methods, as well as results and conclusions of the hydraulic study follows.

2.0 Project Description

The bridge is located on Bay Road (ST Route 47) over Fort River in the Town of Hadley, Hampshire County, Massachusetts **(Figure 2-1).**

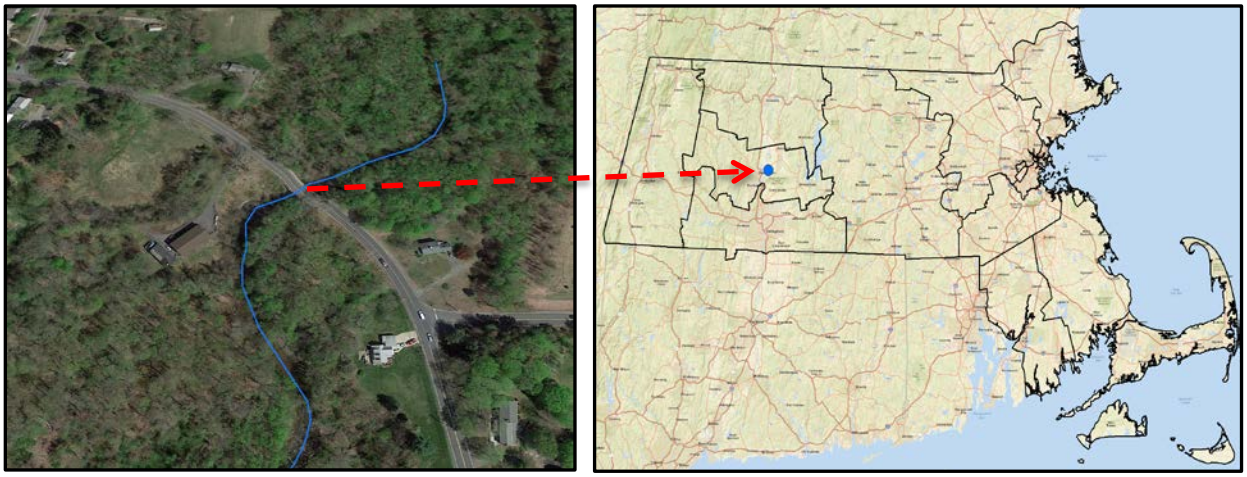


Figure 2-1: Bridge Location

2.1 Existing Structure

The subject bridge is located in the Town of Hadley in Hampshire County, Massachusetts. It is designated as Bridge No. H-01-005 (12J) in the NBIS inventory. The existing bridge was built in 1935. The structure has a National Bridge Inspection Standard (NBIS) Item 113 (Scour Critical Bridges) of 4, *Bridge foundations determined to be stable for calculated scour conditions; field review indicates action is required to protect exposed foundations from effects of additional erosion and corrosion* (**Reference-1**).

The existing bridge superstructure consists of eight span continuous reinforced concrete slabs and is supported by two reinforced concrete abutments on timber piles and seven open bent piers with reinforced concrete pier caps on timber piles. The bridge has a total span of approximately 126 feet. The bridge supports a deck out to out width of 37.7 feet and has a skew of 0 degree. (**Figure 2-2**)



Figure 2-2: Existing Bridge

2.1.1 Crossed Waterway at the Bridge Location

The Fort River is one of the major and longest free flowing tributary of the Connecticut River. The River originates from the Atkins reservoir and flows through the heavily forested uplands in the south westerly direction. The river flows through the towns of Shutesbury, Pelham, Amherst, and Hadley. The river crosses the subject bridge in the southwest direction in the Town of Hadley and finally discharges 0.7 miles downstream of the bridge into Connecticut River. The Fort River's drainage area at the crossing site is estimated to be 54.6 square miles (**Figure 2-3**).

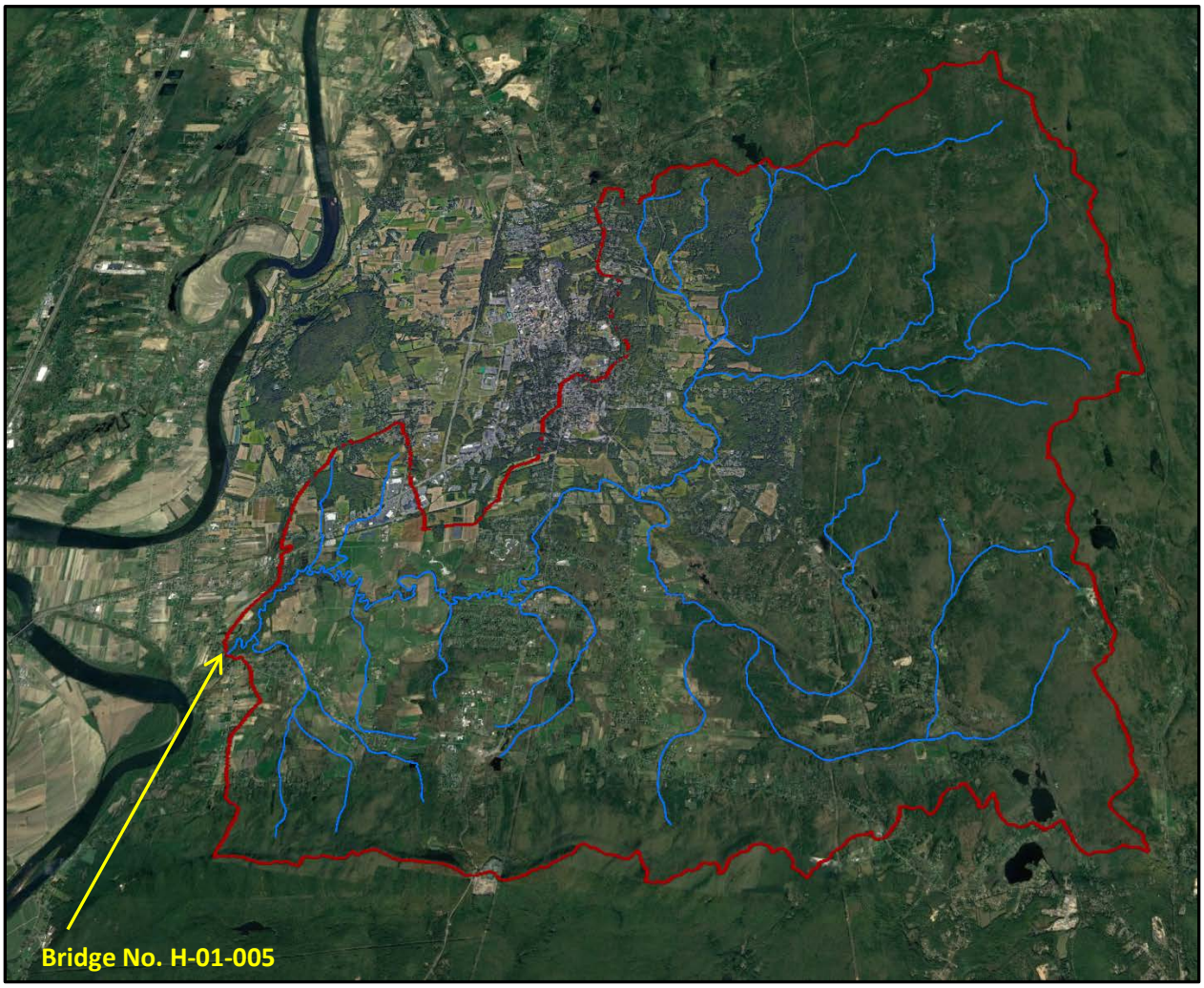


Figure 2-3: Drainage Area at Bridge Crossing

2.1.2 Highway Conveyed

The Bay Road (ST 47) is classified as an Urban Arterial Road. It conveys an average daily traffic (ADT) load of about 6983 vehicles per day, with 9% of which may be trucks (**Reference-1**).

2.1.3 Land Use in the vicinity of the bridge

Land use near the bridge is a mix of forest, forested wetland and low density residential (**Figure 2-4**).

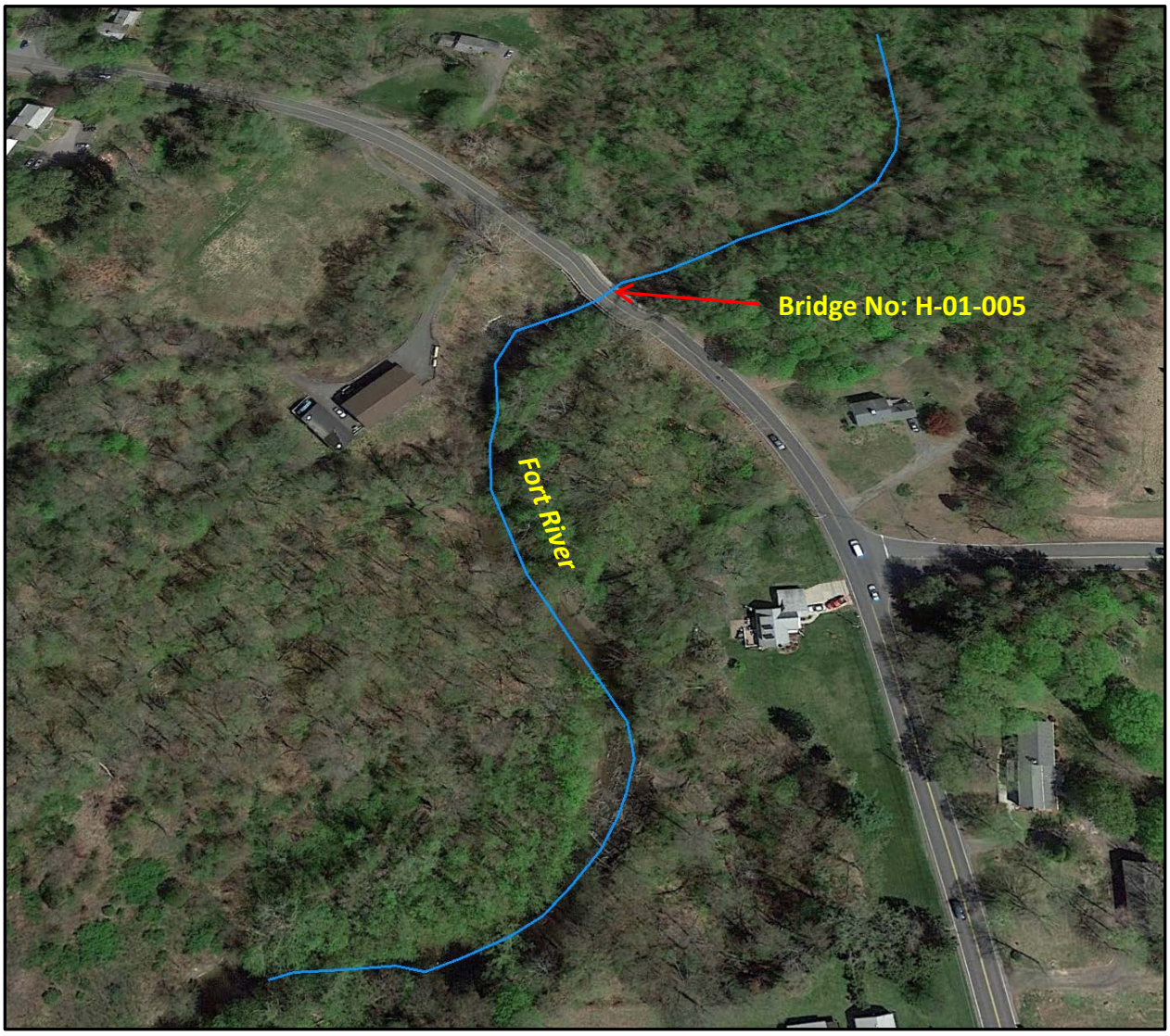


Figure 2-4: Land Use at the Bridge Location

2.1.4 Special Site Considerations

No detailed hydrologic/hydraulic study of Fort River in Hadley is known to exist. Nonetheless, due to the existing bridge's proximity to Fort River's confluence with the Connecticut River, this crossing site is subject to the former's backwater flooding influence and has been incorporated within the Connecticut River's local base (100-year) Special Flood Hazard Area (SFHA) Zone A delineation in the 1977 Town of Hadley Flood Insurance Study (FIS) (**References-2**). As the river is not studied in the NFIP in detail, **NO-RISE** analysis is **NOT** performed in this study. Detailed hydraulic analysis performed within this present hydraulic study indicates that project activities will have no adverse impact on any Fort River's or Connecticut River's regulatory flood delineation width, or at any location within the Town of Hadley (**Figure 2-5**).

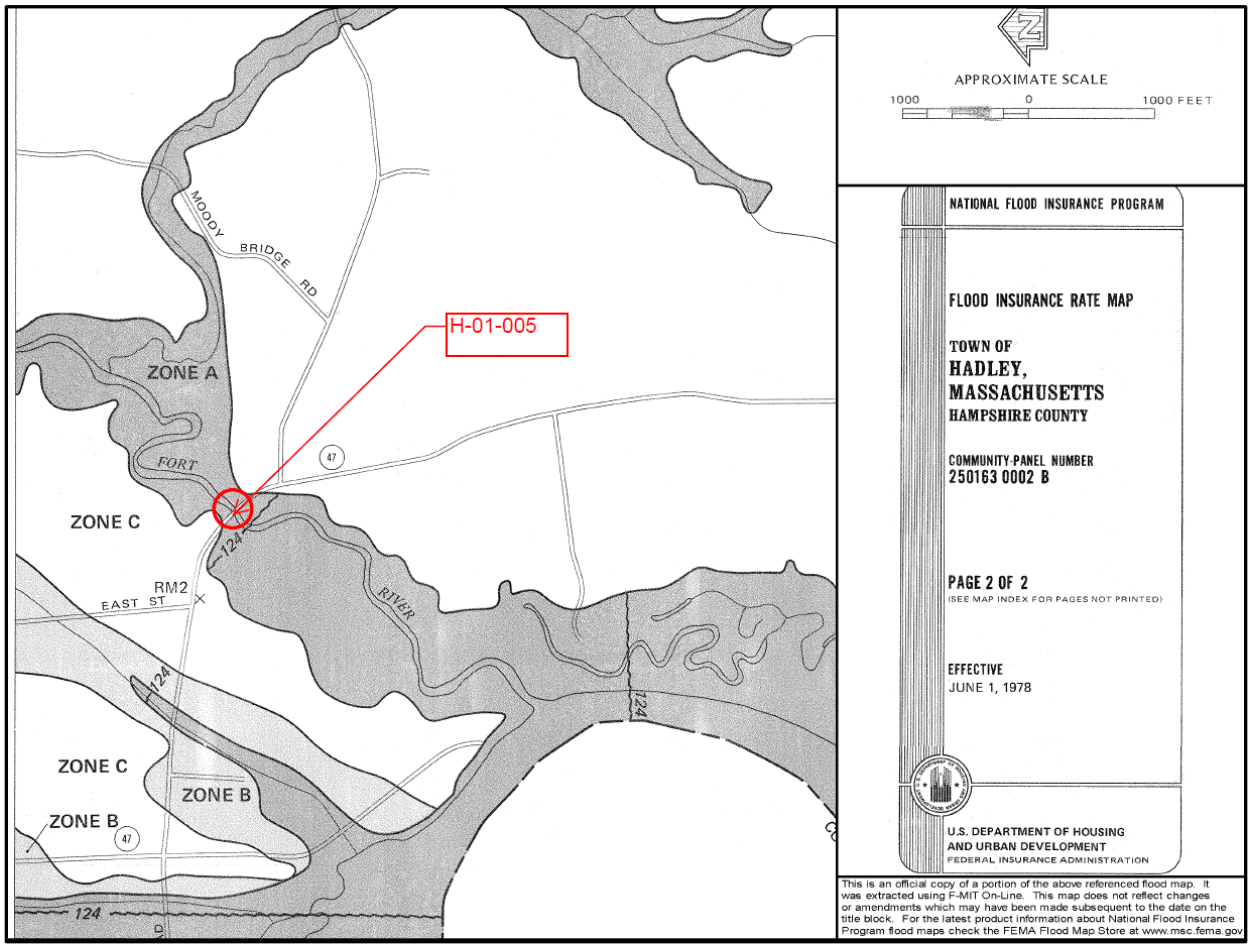


Figure 2-5: Floodway Map

2.2 Proposed Action

The principle project objectives are to upgrade the existing load and service capacity to current highway standards along Bay Road (ST 47). The proposed action is a full replacement of the existing superstructure and abutments for the widening of the bridge. Four alternatives considered in this study are the following.

(a) Alternative-1 - Three Span Continuous Steel Beam with an out to out width of 42.5 ’;

(b) Alternative-2 - Two Span Continuous Steel Beam with an out to out width of 42.5’and;

(c) Alternative-3 - Three Span Precast Deck Beam with an out to out width of 43’.

(d) Alternative-4 - Three Span Separated Precast Deck Beam with an out to out width of 42.5’.

The proposed bridge alternatives are shown in **Figure 2-6 through 8**.

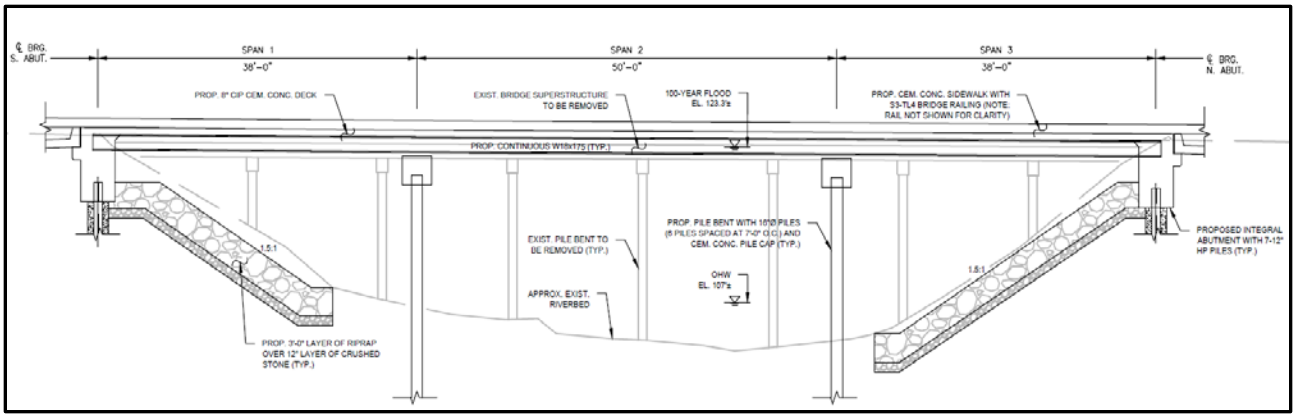


Figure 2-6: Alternative-1 -Three Span Continuous Steel Beam

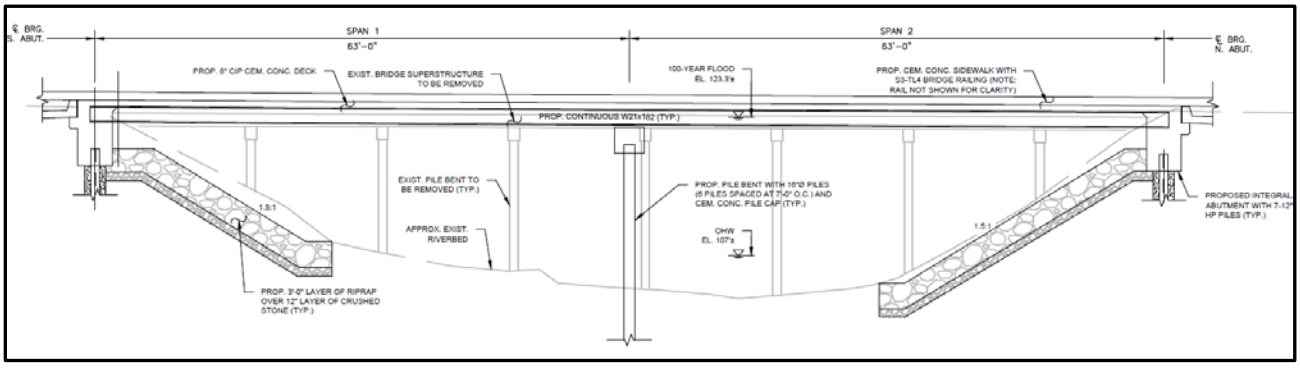


Figure 2-7: Alternative-2 -Two Span Continuous Steel Beam

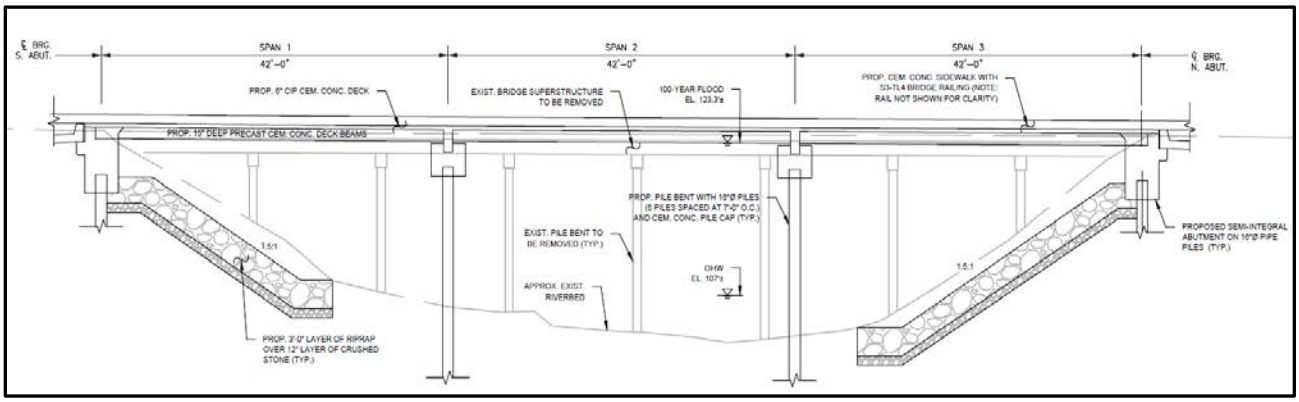


Figure 2-8: Alternative-3 - Three Span Precast Deck Beam

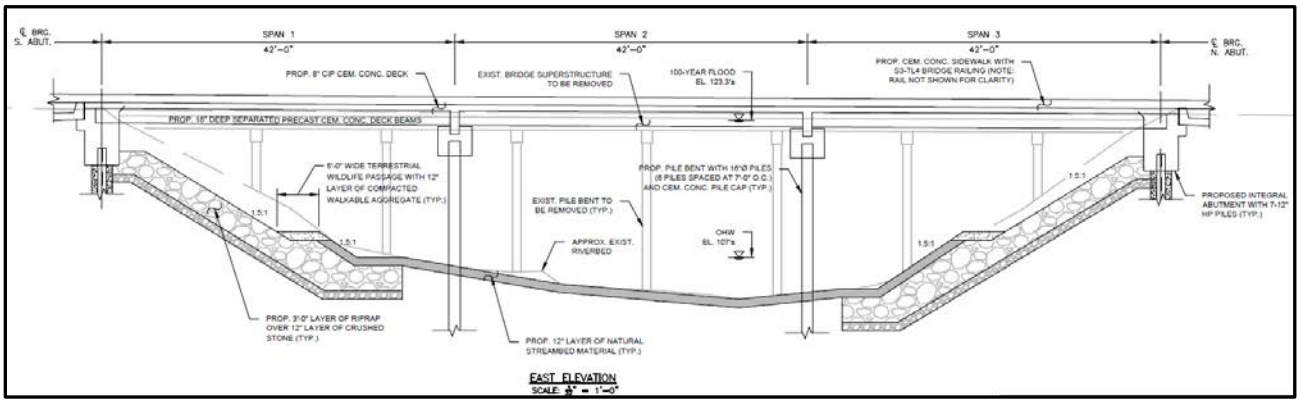


Figure 2-9: Alternative-4 - Three Span Separated Precast Deck Beam

3.0 Data Collection

The following reference and report on the study area were available and were used as guidance during the hydraulic and hydrologic model development and Analysis:

- Town of Hadley, Hampshire County Flood Insurance Study (FIS), December, 1977 (**Reference-2**);
- River Sediment Sampling Results by GZA GeoEnvironmental Inc., January 11 2018 (**Appendix 7-3**);
- Base plans for Fort River;

4.0 Engineering Methods

Hydrologic and hydraulic analyses were conducted to estimate the peak discharge and water surface elevation respectively, at the bridge location. The following sections briefly describe the methodology.

4.1 Hydrologic Analysis

The Peak 10% (10-yr), 4% (25-yr), 2% (50-yr), 1% (100-yr), 0.5% (200-yr) and 0.2% (500-yr) annual chance peak flood discharges for Fort River were adopted from the hydrologic model developed in this study. The design annual chance event for an Urban Principal Arterial Road is 2% (50-yr).

The river's drainage area at the subject bridge was delineated using USGS StreamStat Web Application (**Reference-4**). See section 2.1.1 for delineated drainage area at the bridge. The peak flows were estimated using USGS regression equation based on the 2017 report on magnitude of flood flows for streams in Massachusetts (**Reference-6)**. The computed peak flows are presented in **Table 4-1**. See **Appendix 7-1** for hydrologic computations.

Table 4-1: Summary of Peak Flood Discharges

Fort River	Drainage Area (Square Miles)	10% Annual Chance [10-yr] (CFS)	4% Annual Chance [25-yr] (CFS)	2% Annual Chance [50-yr] (CFS)	1% Annual Chance [100-yr] (CFS)	0.5% Annual Chance [200-yr] (CFS)	0.2% Annual Chance [500-yr] (CFS)
@ Bay Road	54.6	2,160	2,870	3,460	4,080	4,760	5,720

4.2 Hydraulic Analyses

Water surface profiles for 10%, 4%, 2%, 1%, 0.5% and 0.2% annual chance peak discharge events were developed in a manner consistent with the standards used to develop water surface profiles under the National Flood Insurance Program (NFIP). USACOE HEC-RAS Version 5.0.3 application was used to develop flood elevation profile for various return events at the project site (**References-12**). The datum used in all hydraulic models is NAVD 1988.

Since the bridge does not fall under the NFIP regulatory floodway delineation, **NO-RISE** analysis is **not** required in this study.

4.2.1 Existing Condition Analysis

The Existing Condition HEC-RAS Model was developed by incorporating relevant cross section data upstream and downstream of the subject bridge. The cross section data for the existing condition upstream and downstream of the bridge were extracted using ArcGIS HEC-GeoRAS modeling tool and using recent survey and LiDAR data (**Reference-5, 11, 13**). The model parameters such as channel and overbank roughness coefficients (Manning's 'n') were determined from the aerial maps and from the site visit notes. The HEC-RAS model cross section locations are shown in **Figure 4-1**.

All flood simulations performed using HEC-RAS model were done in a subcritical flow mode with FEMA WSEL at the confluence of Fort River with Connecticut River as downstream boundary condition and employed Peak discharges from Table 4-1 for the flow data.

The existing condition analysis yielded a design and Base Flood Elevation (BFE) of 121.15’ and 123.16’ respectively at the upstream cross section of subject Bridge.



Figure 4-1: HEC-RAS Cross Section Layout Plan

4.2.2 Proposed Condition Analysis

The proposed condition analyses were performed for all four alternatives described under Section 2.2: (a) Alternative-1 - Three Span Continuous Steel Beam with an out to out width of 42.5 ’; (b) Alternative-2 - Two Span Continuous Steel Beam with an out to out width of 42.5’; (c) Alternative-3 - Three Span Precast Deck Beam with an out to out width of 43’ and (d) Alternative-4 - Three Span Separated Precast Deck Beam with an out to out width of 42.5’.

Table 4-2: Summary of Hydraulic Performance

Project Alternative	Annual Chance Event (%)	Discharge (CFS)	WSEL (Feet, NAVD)	Velocity (Ft/s)
Existing Condition	10%	2,160	116.25	1.83
	4%	2,870	119.07	1.84
	2%	3,460	121.15	1.88
	1%	4,080	123.16	1.92
	0.5%	4,760	125.57	1.70
	0.2%	5,720	128.41	1.57
Proposed Alternative-1	10%	2,160	116.23	2.12
	4%	2,870	119.04	2.18
	2%	3,460	121.12	2.23
	1%	4,080	123.12	2.27
	0.5%	4,760	125.58	1.99
	0.2%	5,720	128.42	1.73
Proposed Alternative-2	10%	2,160	116.22	2.14
	4%	2,870	119.04	2.20
	2%	3,460	121.11	2.25
	1%	4,080	123.12	2.27
	0.5%	4,760	125.57	1.98
	0.2%	5,720	128.42	1.71
Proposed Alternative-3	10%	2,160	116.23	2.01
	4%	2,870	119.04	2.08
	2%	3,460	121.12	2.12
	1%	4,080	123.13	2.16
	0.5%	4,760	125.57	1.91
	0.2%	5,720	128.42	1.67
Proposed Alternative-4	10%	2,160	116.20	2.21
	4%	2,870	119.03	2.24
	2%	3,460	121.11	2.27
	1%	4,080	123.10	2.29
	0.5%	4,760	125.53	2.26
	0.2%	5,720	128.42	1.71

The proposed condition analysis was performed after revising the existing condition model by changing the existing bridge width to accommodate the proposed road and changing the ineffective areas locations and elevations. The peak discharges, boundary conditions and cross sections locations from the existing model were not changed. The summary of existing and

proposed condition alternatives HEC-RAS analysis at the upstream cross-section of the bridge is presented in **Table 4-2.**

The model results for all four alternatives showed that there is less than 0.1' reduction in water surface elevation upstream of the bridge. The reduction is very less because of the flood plain extent. Hence, there will not be any adverse project impact due to increased hydraulic opening at the bridge for all proposed openings. However, it is observed that there is slight increase in velocity due to this reduction in WSEL.

Appendix 7.2 shows the results of HEC-RAS modeling at the bridge and WSEL profiles of Fort River.

4.3 Scour Safety and Stability Analysis

Scour potential at the crossing site under existing and proposed conditions was analyzed using the guidelines set forth by the FHWA Hydraulic Engineering Circular No.18 (HEC-18) "*Evaluating scour at bridges"* (**Reference-8**) and AASHTO LRFD Bridge Design Specifications, Sections 2.6.4.4.2 and 3.7.5. In accordance with Section 1.3.4 of LRFD Bridge Manual (**Reference-3**), for *Urban Principal Arterial* Highway Functional Classification, the river's 1% (100-year) and 0.5% (200-year) chance flood events were respectively used in this analysis as the scour design and scour check events.

In this study the abutment scour is calculated using National Cooperative Highway Research Program (NCHRP 24-20) method described in HEC-18. Total scour at the pier is computed using guidelines provided in HEC-18. Prediction of pressure flow scour under the deck is calculated using HEC-18 guidelines. Calculations showed no pressure flow scour under the deck for both design and check flood events. Since the hydraulic results for all four proposed alternatives showed only minor differences, abutment, contraction and pressure scour calculations are performed only for the worst case scenario. A summary of computed 1% and 0.5% chance flood scour depths under existing and proposed site conditions is presented in **Table 4-3.** See **Appendix 7-3** for the detailed scour calculations.

Table 4-3: Summary of Calculated Scour

Alternative	Annual Chance Flood (%)	Contraction Scour Depth (Feet)	Maximum Pier Scour Depth (Feet)	Design Abutment Scour (Feet)
Existing Condition	1%	0.0	2.4	13.4
	0.5%	0.0	2.3	10.3
Proposed Alternative-1	1%	0.0	2.6	11.9
	0.5%	0.0	2.5	13.2
Proposed Alternative-2	1%	0.0	2.6	11.9
	0.5%	0.0	2.5	13.2
Proposed Alternative-3	1%	0.0	2.5	11.9
	0.5%	0.0	2.5	13.2
Proposed Alternative-34	1%	0.0	2.6	11.9
	0.5%	0.0	2.6	13.2

5.0 Conclusions & Recommendations

5.1 Conclusions

1. The project hydraulic model predicts that both the existing bridge and the preferred replacement bridge type will safely convey the 50-year hydraulic design flood event.
2. Analysis performed within this hydraulic study indicates that project activities will not result in any increase in flood elevations within the community during the occurrence of Fort River's base flood discharge.

5.2 Recommendations

1. The information in **Table 5-2, 3, 4 or 5** for the recommended alternative should be presented within the Hydraulic Data Tables in the General Notes of the Bridge Sketch and Construction Plan sets.
2. The grades that will exist at the proposed abutments should be stabilized with flexible revetments consisting of MassDOT Standard Specification M2.02.2 Dumped Riprap over a composite filter medium consisting of a layer of MassDOT Standard Specification M2.02.01, Crushed Stone placed over an appropriate MassDOT Standard Specification 9.50.0 Geotextile Fabric membrane.
3. The calculated 1% (100-year) chance flood event total scour depth presented in **Table 5-2, 3, 4 or 5** for the recommended alternative should be considered for use as a bridge foundation condition in LRFD strength and service limit state foundation stability determination. Similarly, the calculated 0.5% (200-year) scour depth should be considered for use as a bridge foundation condition in the LRFD extreme event limit state foundation stability determination. Also, the design engineer should be cognizant that the proposed bridge substructure will meet the foundation scour stability requirements set forth in MassDOT Bridge LRFD Manual (**Reference-3**), Section 3.2.9.4, and presented below.

For new bridges or full bridge replacements, the substructures shall be designed to meet the requirements of Paragraphs 3.2.9.2 and 3.9.2.3 for the calculated design and check scour without using scour countermeasures.

Table 5-1: Hydraulic Design Data (Existing Condition)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	1.88 Feet Per Second
Design Flood Elevation:	121.15 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.16 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	13.4 Feet
Design Flood Pier Scour Depth	2.4 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	10.3 Feet
Check Flood Pier Scour Depth	2.3 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-2: Hydraulic Design Data (Proposed Alternative - 01)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.23 Feet Per Second
Design Flood Elevation:	121.12 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.12 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.6 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.5 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-3: Hydraulic Design Data (Proposed Alternative - 02)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.25 Feet Per Second
Design Flood Elevation:	121.11 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.12 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.6 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.5 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-4: Hydraulic Design Data (Proposed Alternative - 03)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.12 Feet Per Second
Design Flood Elevation:	121.12 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.13 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.5 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.5 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-5: Hydraulic Design Data (Proposed Alternative - 04)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.27 Feet Per Second
Design Flood Elevation:	121.11 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.10 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.6 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.6 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

6.0 References

6.1 Data Sources

1. MassDOT NBIS Bridge Inspection File, Br. No. H-01-005
2. Town of Hadley Flood Insurance Study (FIS), December 1977
3. MassDOT Bridge Load and Resistance Factor Design (LRFD) Manual, June 2013
4. United States Geological Survey (USGS), USGS Streamstat in Massachusetts website http://water.usgs.gov/osw/streamstats/massachusetts.html
5. Mass GIS Datalayers - http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/layerlist.html
6. Zarriello, P.J., 2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 54 p., https://doi.org/10.3133/sir20165156
7. United States Geological Survey (USGS) Water-Supply Paper 2214, "Estimating Peak Discharges of Small, Rural Streams in Massachusetts", by S. William Wandle Jr., 1983
8. Federal Highway Administration (FHWA), Hydraulic Engineering Circular, HEC-18 "Evaluating Scour at Bridges", May 2012
9. Federal Highway Administration (FHWA), Hydraulic Design Series, HDS-7 "Hydraulic Design of Safe Bridges", April 2012
10. Federal Highway Administration (FHWA), Hydraulic Engineering Circular, HEC-23 "Bridge Scour and Stream Instability Countermeasures", September 2009

6.2 Data Applications

11. ESRI ArcGIS version 10.4.1 mapping software
12. US Army Corps of Engineer (USACOE), Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 5.0.3
13. US Army Corps of Engineer (USACOE), Hydrologic Engineering Center, HEC-GeoRAS, Version 10 for ArcGIS 10

7.0 Appendix

7.1 Hydrologic Analyses

7.1.1 Drainage Area Delineation
7.1.2 Peak Flow Estimation

7.2 Hydraulic Analyses

7.2.1 Existing Condition Bridge Cross Section
7.2.2 Existing Condition Channel Profile
7.2.3 Existing Condition WSEL Upstream of the Bridge
7.2.4 Existing Condition Analysis Summary Table
7.2.5 Proposed Condition Bridge Cross Sections
7.2.6 Proposed Condition Channel Profiles
7.2.7 Proposed Condition WSEL's Upstream of the Bridge
7.2.8 Proposed Condition Analysis Summary Tables

7.3 Scour and Countermeasures Calculations

7.3.1 Scour Sediment Sampling Results
7.3.2 Scour Calculations

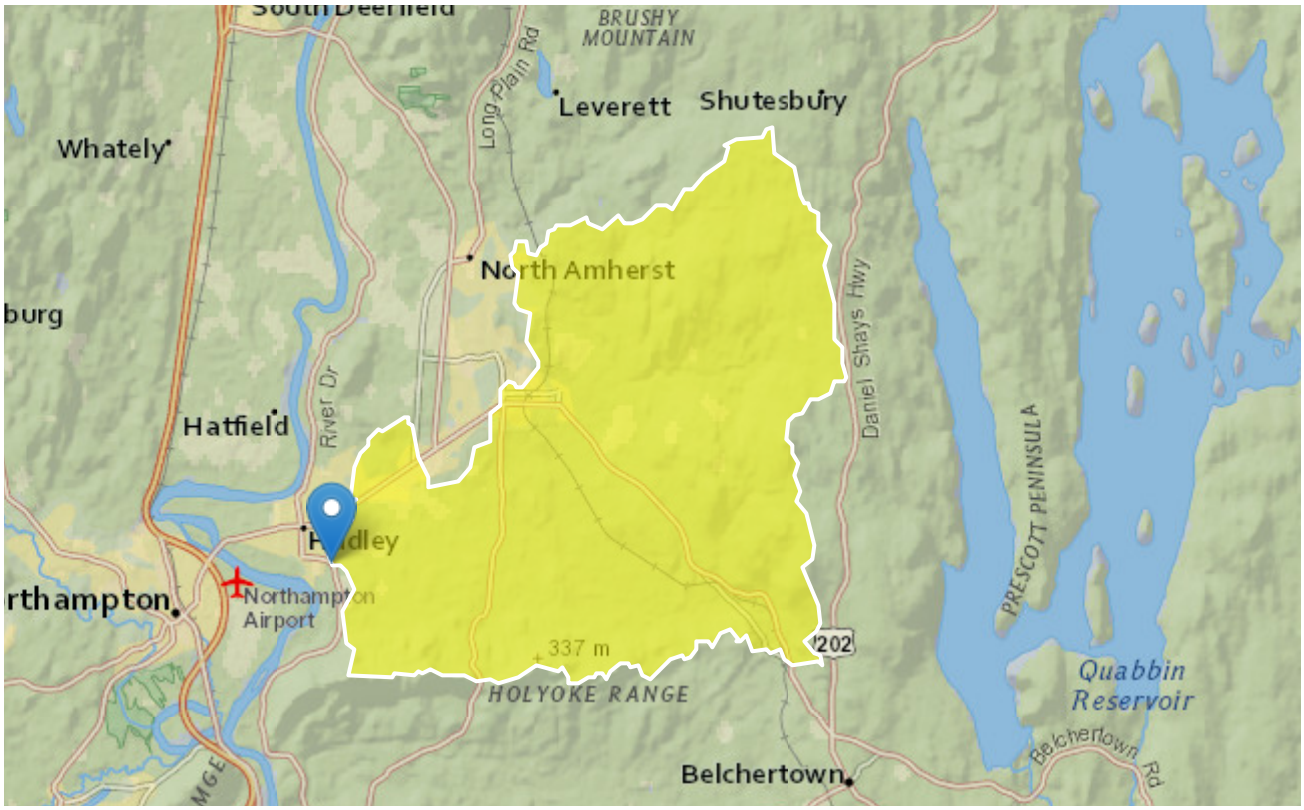
7.1 Hydrologic Analyses

7.1.1 Drainage Area Delineation

7.1.2 Peak Flow Estimation

H-01-005 StreamStats Report

Region ID: MA
Workspace ID: MA20171129201209044000
Clicked Point (Latitude, Longitude): 42.33273, -72.57871
Time: 2017-11-29 15:12:28 -0500



H-01-005 StreamStats Report WATER FORT RIVER, ST 47 BAY RD

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	54.6	square miles
ELEV	Mean Basin Elevation	491	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	8.43	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.21	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	1	dimensionless
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.843	percent
ACRSDFT	Area underlain by stratified drift	27.1	
BSLDEM10M	Mean basin slope computed from 10 m DEM	8.32	percent
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	119255.9	

Parameter Code	Parameter Description	Value	Unit
CENTROIDY	Basin centroid vertical (y) location in state plane units	901529.2	
CRSDFT	Percentage of area of coarse-grained stratified drift	42.35	percent
FOREST	Percentage of area covered by forest	59.8	percent
LAKEAREA	Percentage of Lakes and Ponds	0.6	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	13.2	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	3.08	percent
MAXTEMPC	Mean annual maximum air temperature over basin area, in degrees Centigrade	14.3	
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	111095	
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	898585	
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	42.35	percent
PRECPRIS00	asin average mean annual precipitation for 1971 to 2000 from PRISM	47	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	131	miles
WETLAND	Percentage of Wetlands	7.49	percent

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	0.16	512
ELEV	Mean Basin Elevation	491	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	8.43	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	1030	ft^3/s	531	2020	42.3
5 Year Peak Flood	1670	ft^3/s	845	3290	43.4
10 Year Peak Flood	2160	ft^3/s	1070	4370	44.7
25 Year Peak Flood	2870	ft^3/s	1370	6000	47.1
50 Year Peak Flood	3460	ft^3/s	1610	7470	49.4
100 Year Peak Flood	4080	ft^3/s	1840	9070	51.8
200 Year Peak Flood	4760	ft^3/s	2080	10900	54.1
500 Year Peak Flood	5720	ft^3/s	2420	13500	57.6

Peak-Flow Statistics Citations

Zarriello, P.J.,2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (https://dx.doi.org/10.3133/sir20165156)

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.21	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	4.843	percent	0.32	24.6

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
50 Percent Duration	56.5	ft^3/s	31	102	17.6	17.6
60 Percent Duration	44.1	ft^3/s	19.5	99.2	19.8	19.8
70 Percent Duration	38.1	ft^3/s	15.4	93.5	23.5	23.5
75 Percent Duration	33.2	ft^3/s	13.5	80.7	25.8	25.8
80 Percent Duration	29.5	ft^3/s	12.1	71.1	28.4	28.4
85 Percent Duration	24.7	ft^3/s	10.2	58.7	31.9	31.9
90 Percent Duration	21.1	ft^3/s	8.52	51	36.6	36.6
95 Percent Duration	14.9	ft^3/s	5.27	40.8	45.6	45.6
98 Percent Duration	10.8	ft^3/s	3.23	34.1	60.3	60.3
99 Percent Duration	8.76	ft^3/s	2.45	29.4	65.1	65.1

Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.843	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.21	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
7 Day 2 Year Low Flow	14.1	ft^3/s	4.45	43.2	49.5	49.5
7 Day 10 Year Low Flow	8.86	ft^3/s	2.27	32.2	70.8	70.8

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

August Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.843	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.21	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1

August Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
August 50 Percent Duration	26.9	ft^3/s	11	65.1	33.2	33.2

August Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	8.32	percent	2.2	23.9

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
Bankfull Width	74.6	ft	21.3
Bankfull Depth	3.07	ft	19.8
Bankfull Area	229	ft^2	29
Bankfull Streamflow	855	ft^3/s	55

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (http://pubs.usgs.gov/sir/2013/5155/)

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	42.35	percent	0	100
FOREST	Percent Forest	59.8	percent	0	100
MAREGION	Massachusetts Region	1	dimensionless	0	1

Probability Statistics Disclaimers [Perennial Flow Probability]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Probability Statistics Flow Report [Perennial Flow Probability]

Statistic	Value	Unit
Probability Stream Flowing Perennially	0.999	dim

Probability Statistics Citations

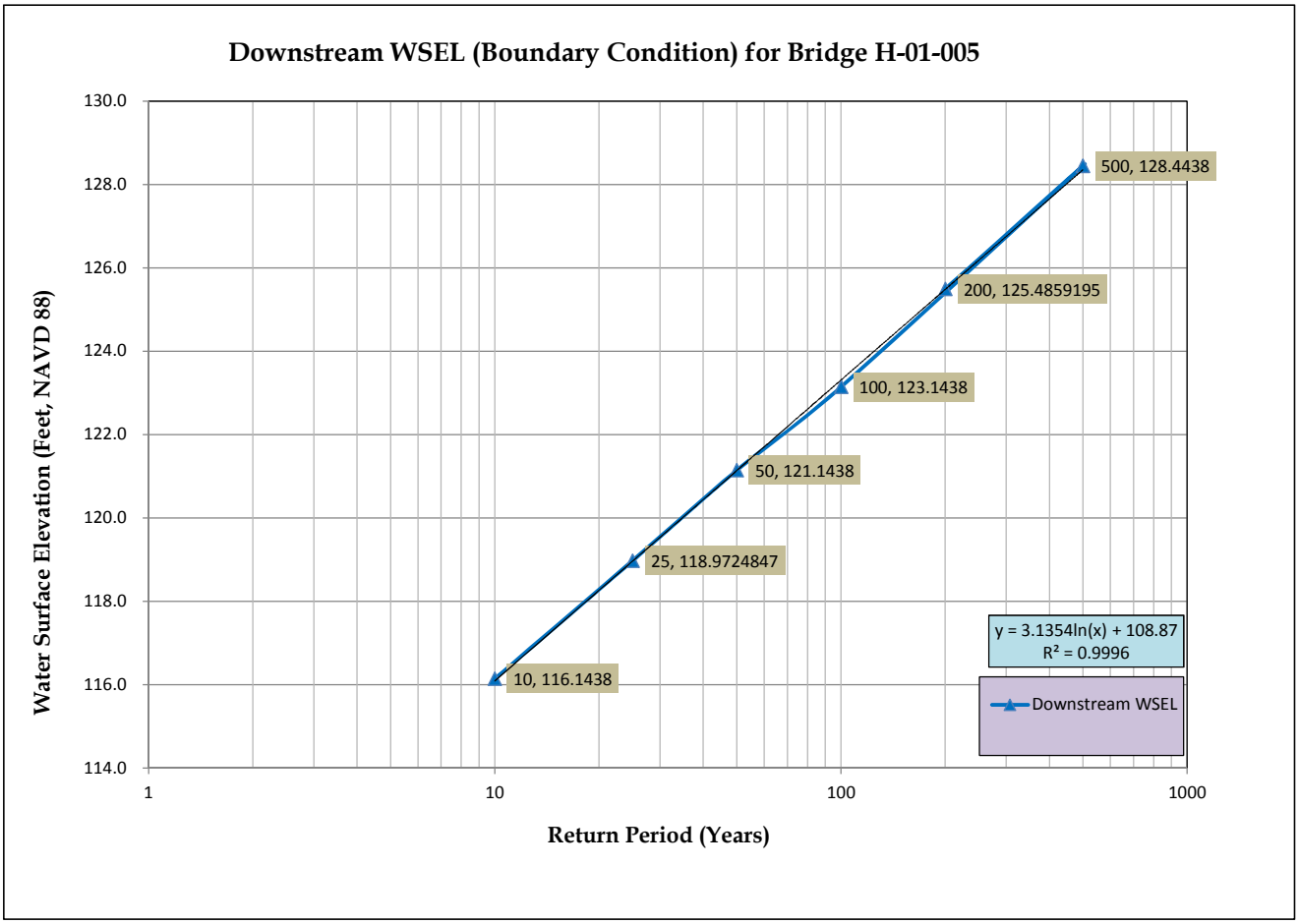
Bent, G.C., and Steeves, P.A.,2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006–5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

Boundary Condition Estimation

River: Fort River
County: Hampshire County
Hadley (H-01-005) Boundary Condition Calculation

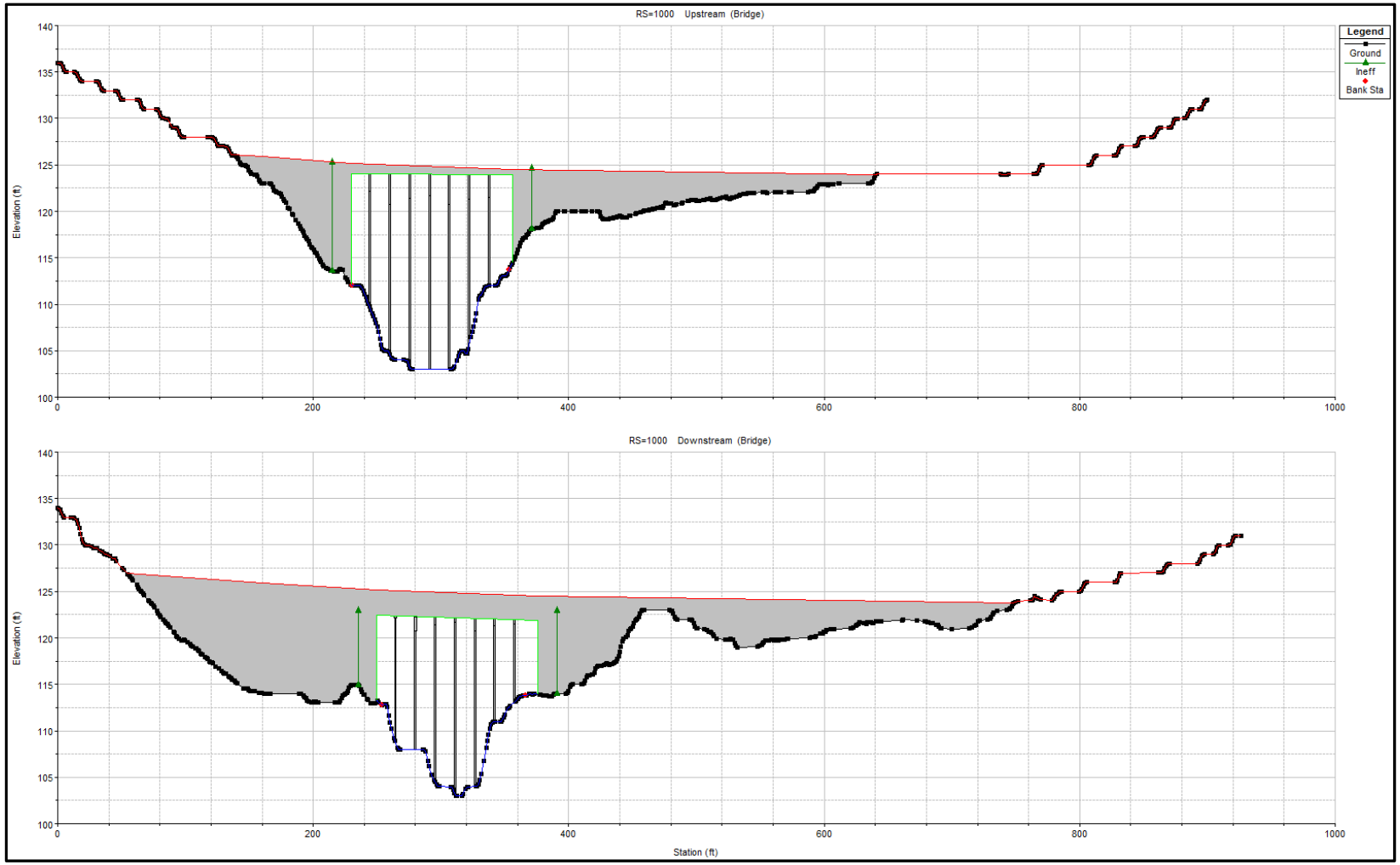
Based on FEMA FIS, the following water surface elevations have been used as downstream boundary condition. WSEL for Q_{25} is calibrated using other FEMA values.

WSEL at confluence of Fort River with Connecticut River(Feet)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)	Q_{500} (cfs)	Q_{200} (cfs)
	10	*25*	*50*	*100*	*500*	200
NGVD 29	116.8		121.8	123.8	129.1	
NAVD 88	116.1	119.0	121.1	123.1	128.4	125.5

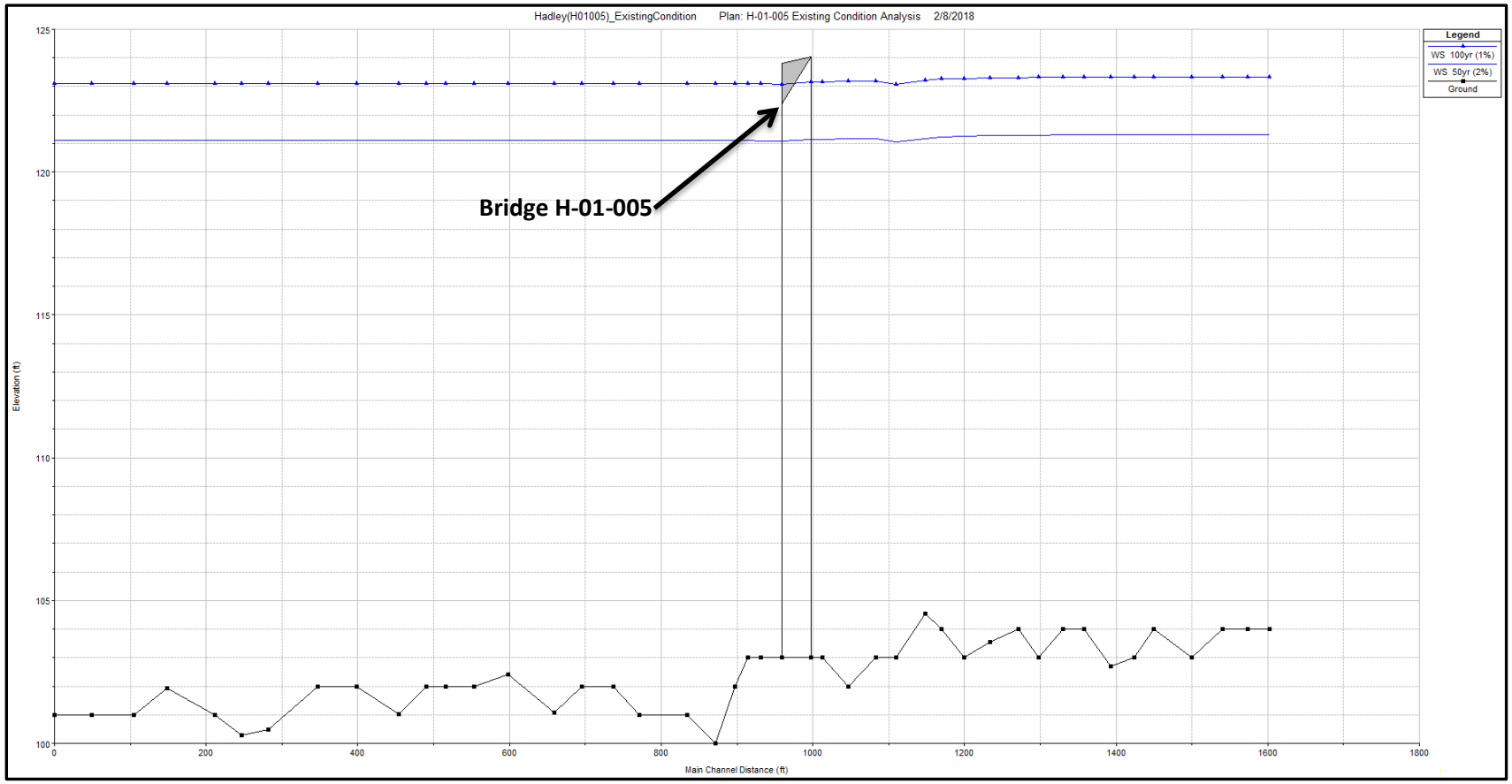


7.2 Hydraulic Analyses

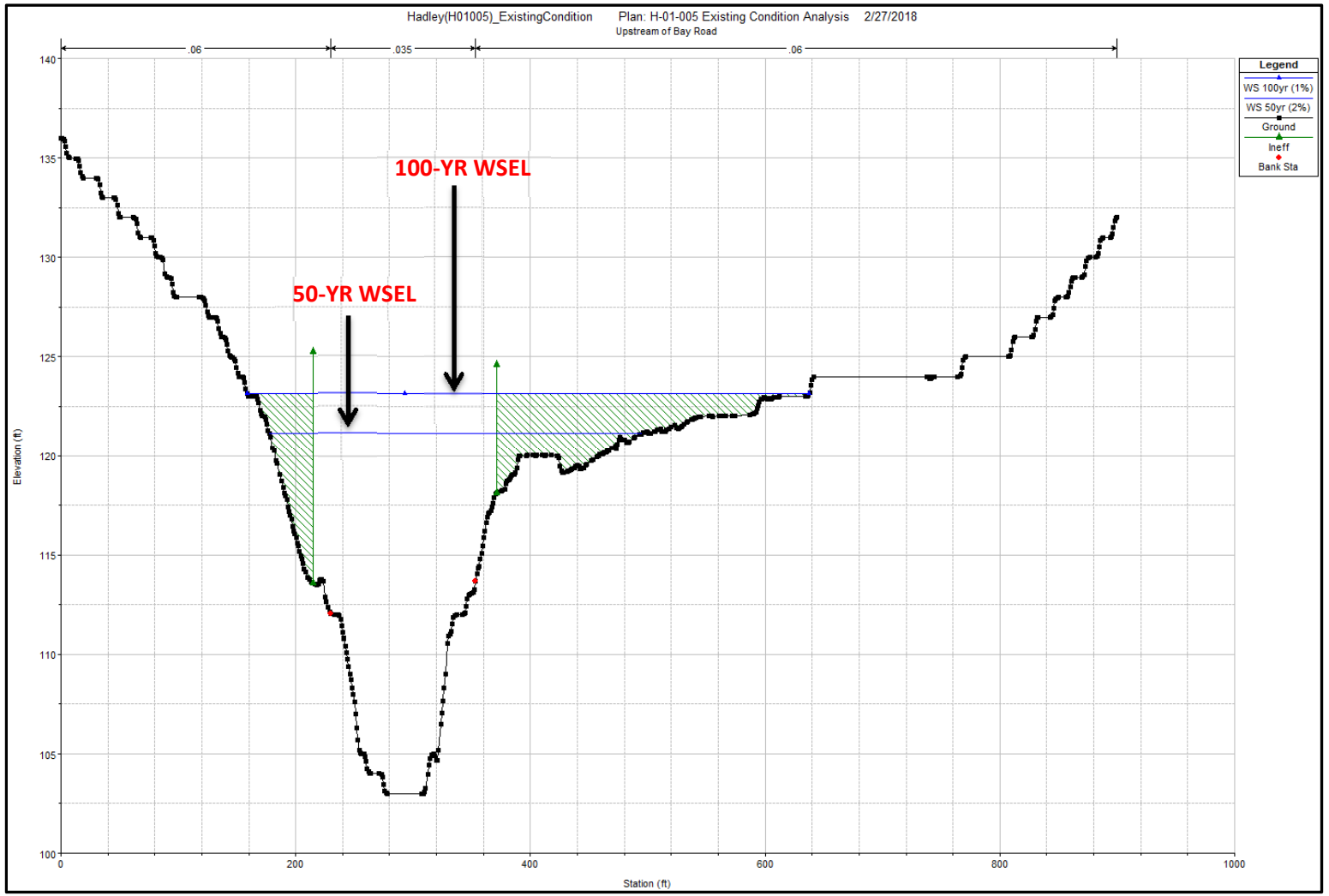
7.2.1 Existing Condition Bridge Cross Section
7.2.2 Existing Condition Channel Profile
7.2.3 Existing Condition WSEL Upstream of the Bridge
7.2.4 Existing Condition Analysis Summary Table
7.2.5 Proposed Condition Bridge Cross Sections
7.2.6 Proposed Condition Channel Profiles
7.2.7 Proposed Condition WSEL's Upstream of the Bridge
7.2.8 Proposed Condition Analysis Summary Tables



7.2.1 Existing Condition Bridge Cross Section



7.2.2 Existing Condition Channel Profile

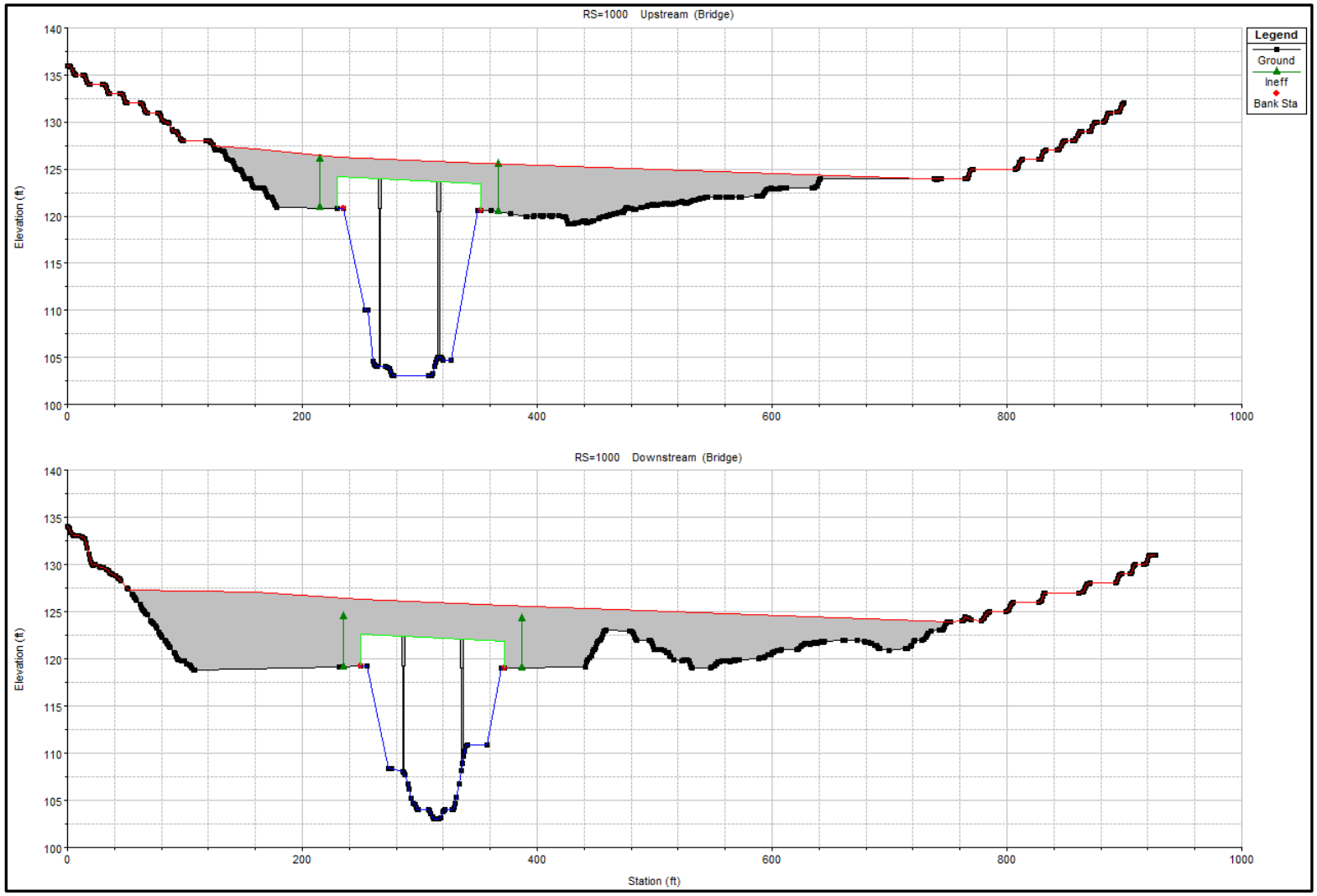


7.2.3 Existing Condition WSEL upstream of the Bridge

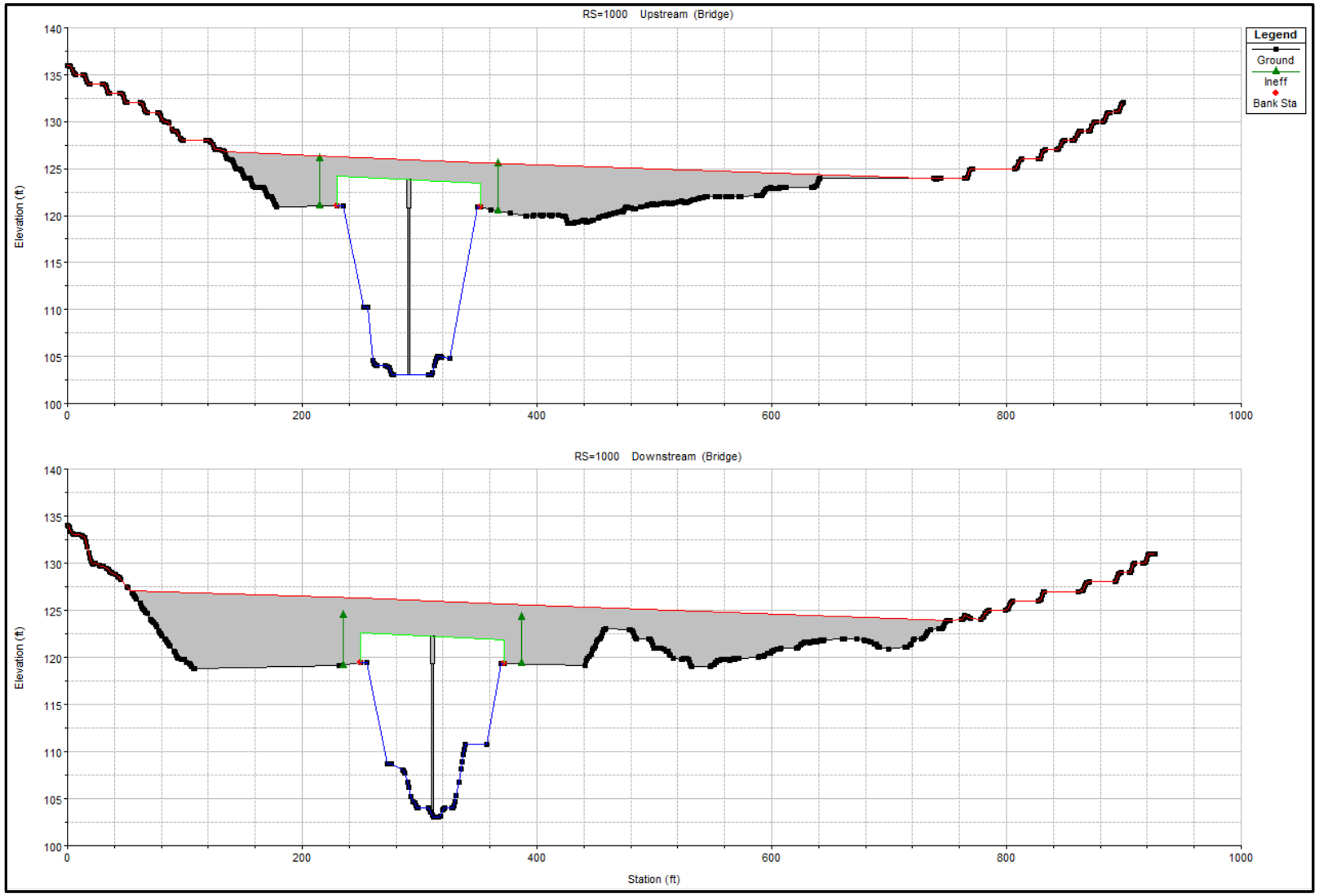
7.2.4 HEC-RAS Existing Condition Analysis

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.31	0.000015	0.97	7072.03	799.44	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.32		123.32	0.000012	0.92	8700.59	818.63	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6858.18	763.36	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.32		123.32	0.000012	0.96	8402.73	771.79	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6823.48	733.19	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.32		123.32	0.000012	0.96	8307.74	742.15	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.3		121.31	0.000018	1.09	6134.46	659.46	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.31		123.32	0.000015	1.05	7475.55	675.09	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.3		121.31	0.000023	1.17	5349.73	541.81	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.31		123.32	0.000018	1.14	6456.41	558.31	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.3		121.31	0.000022	1.19	5087.75	478.09	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.31		123.32	0.000018	1.18	6061.34	489.99	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.29		121.31	0.000026	1.23	4678.6	434.66	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.31		123.32	0.000022	1.24	5571.59	458.71	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.29		121.3	0.000031	1.36	4339.67	418.85	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.3		123.32	0.000026	1.35	5209.6	449.46	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.29		121.3	0.000036	1.49	4110.34	418.07	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.3		123.32	0.000031	1.48	4985.54	452.88	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.28		121.3	0.000039	1.56	3918.4	404.19	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.3		123.31	0.000032	1.54	4754.78	434.86	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.28		121.3	0.000044	1.65	3707.7	396.3	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.29		123.31	0.000036	1.61	4540.33	424.59	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.27		121.3	0.000052	1.8	3633.03	441.64	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.29		123.31	0.00004	1.72	4564.72	478.08	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.24		121.29	0.000075	2.21	2590.65	335.04	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.26		123.31	0.000058	2.11	3280.77	348.7	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.29	0.00009	2.35	2109.02	321.47	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.24		123.3	0.00007	2.26	2848.85	397.55	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.16		121.28	0.000144	2.92	1666.2	275.55	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.19		123.3	0.000113	2.82	2313.13	374.66	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.05		121.26	0.00026	4.07	1097.49	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.04		123.28	0.00024	4.24	1265.96	110.78	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.22	0.000074	2.18	1694.27	227.83	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.15		123.23	0.000065	2.21	2310.37	526.12	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.17		121.21	0.000038	1.69	2942.07	428.67	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.18		123.21	0.000033	1.69	3849.3	557.57	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.15	108	121.2	0.000059	1.88	1977.03	318.01	0.09
Reach1	1060.067	100yr (1%)	4080	103	123.16	108.49	123.21	0.000052	1.92	2290.02	479.3	0.08
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.09	109.84	121.16	0.000086	2.14	1807.9	508.81	0.1
Reach1	979.5606	100yr (1%)	4080	103	123.1	110.34	123.13	0.000043	1.66	4230.08	668.14	0.08
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

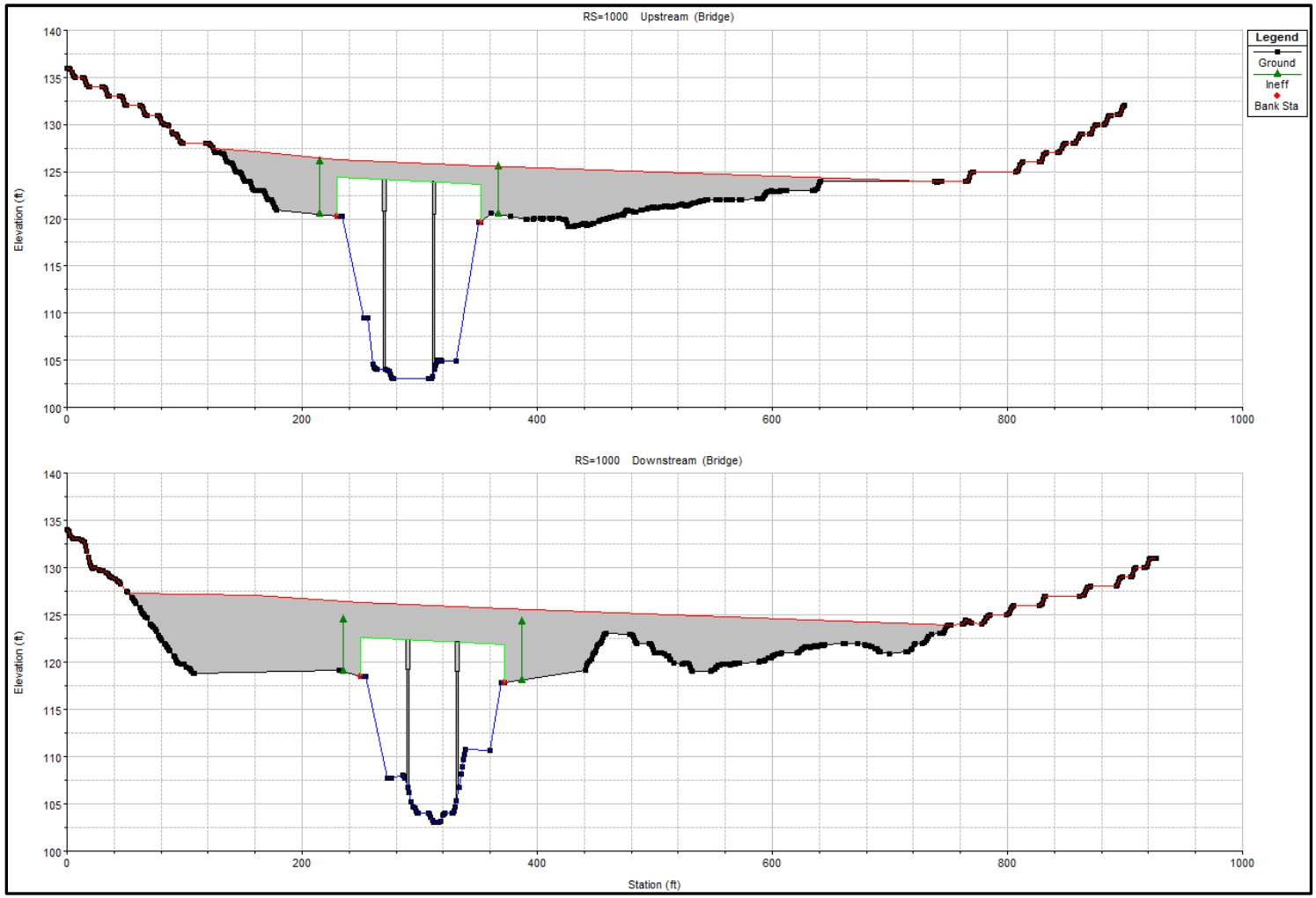
Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04



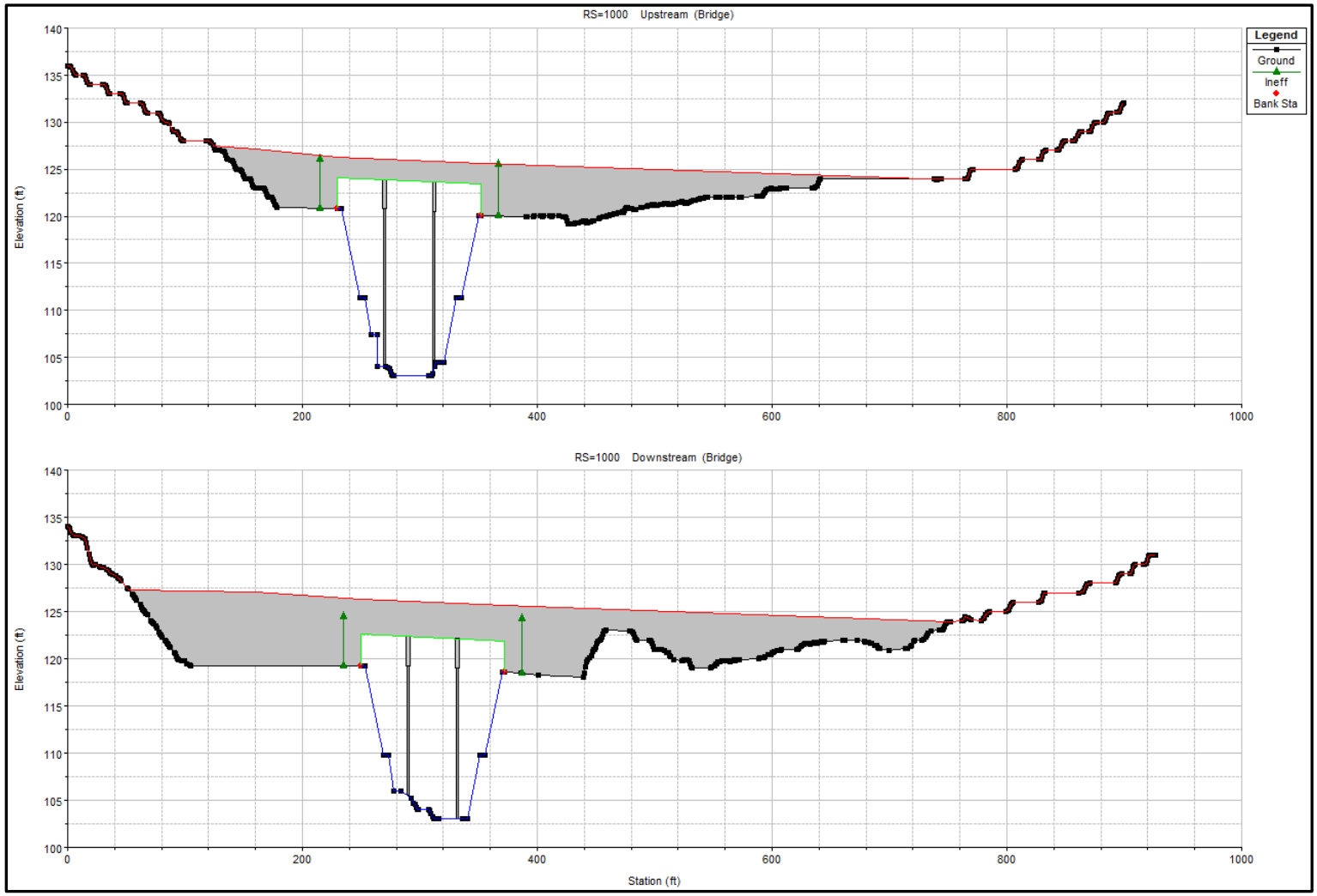
7.2.5 (a) Proposed Alternative-01 Bridge Cross Section



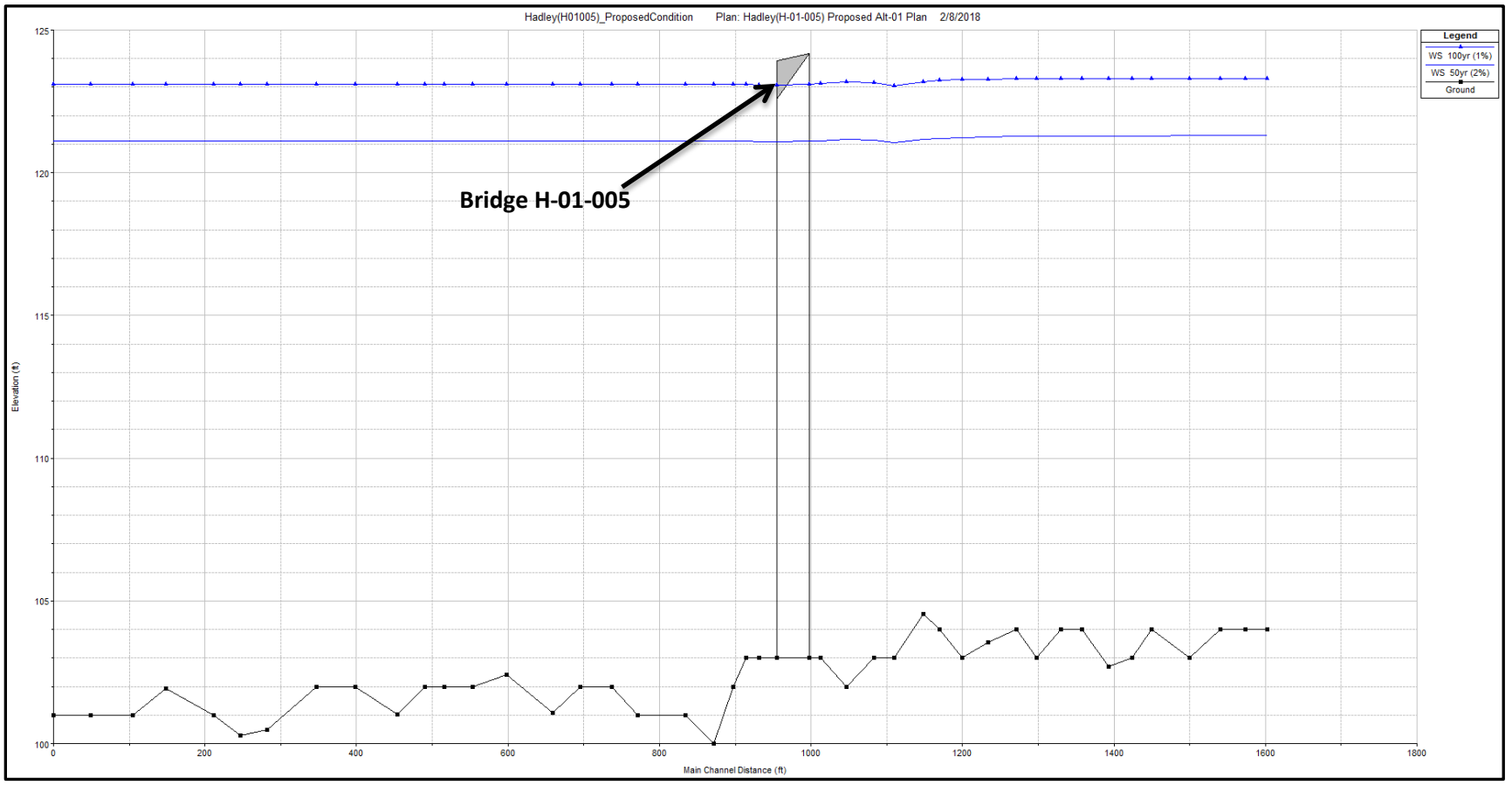
7.2.5 (b) Proposed Alternative-02 Bridge Cross Section



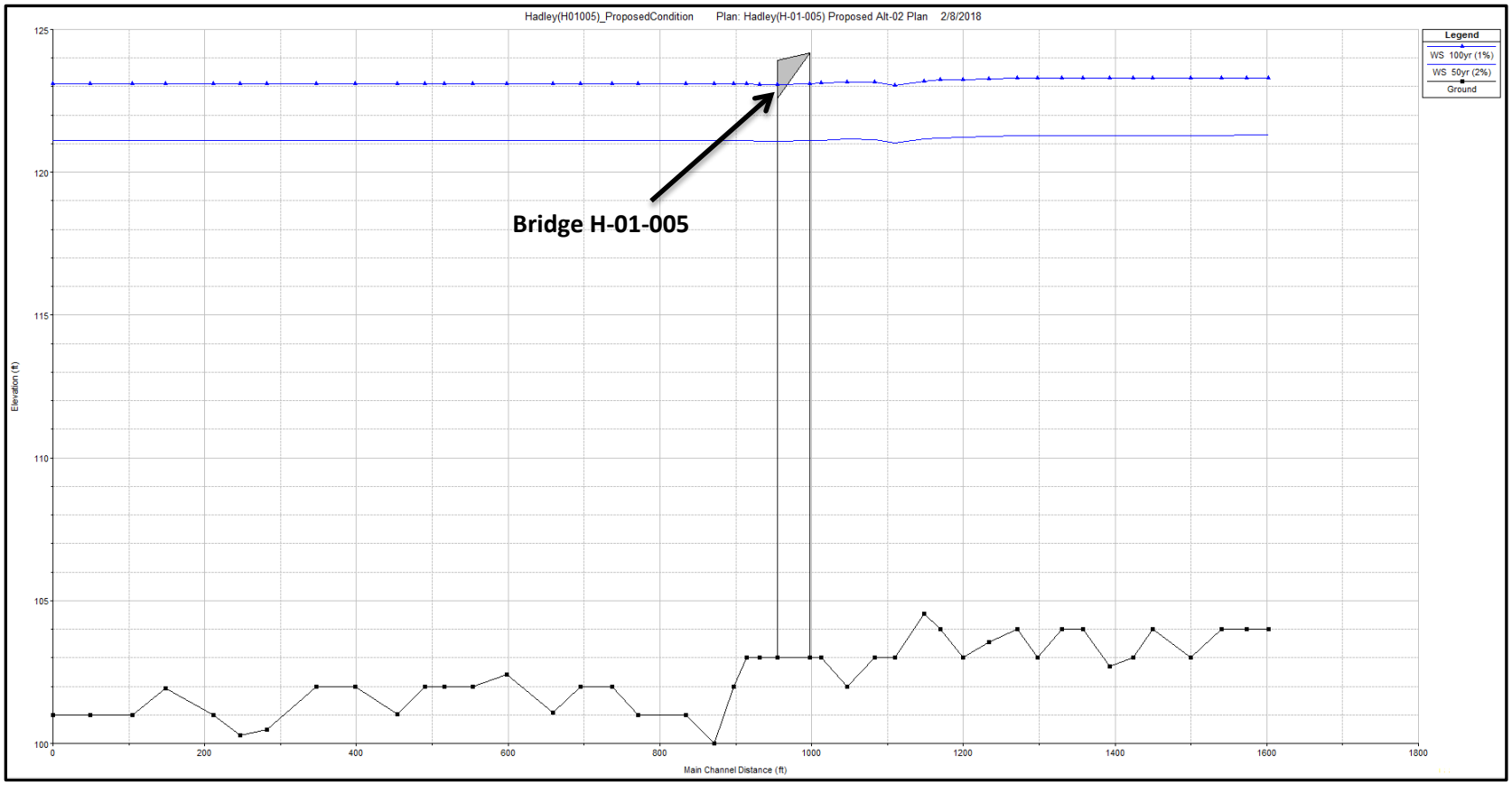
7.2.5 (c) Proposed Alternative-03 Bridge Cross Section



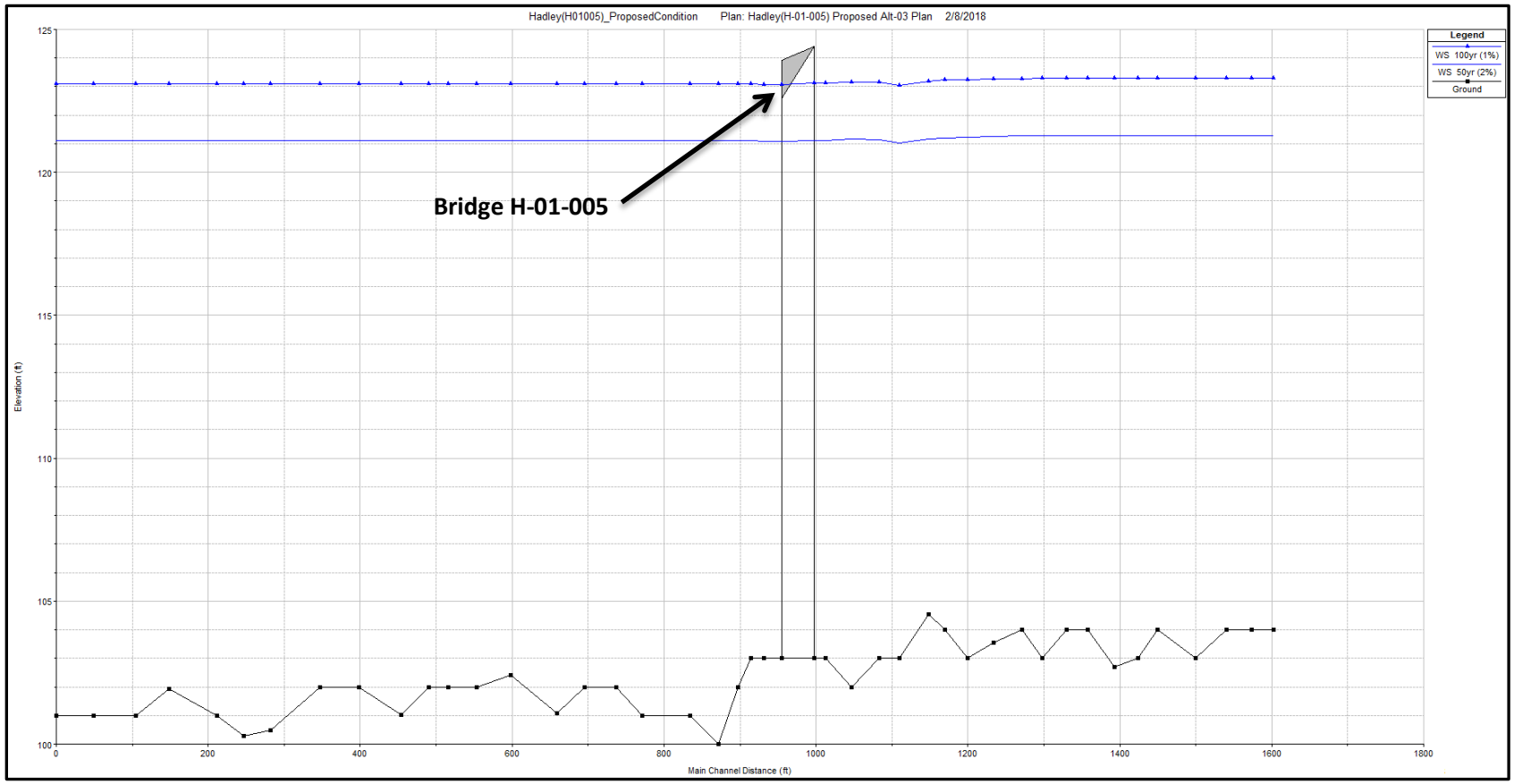
7.2.5 (d) Proposed Alternative-04 Bridge Cross Section



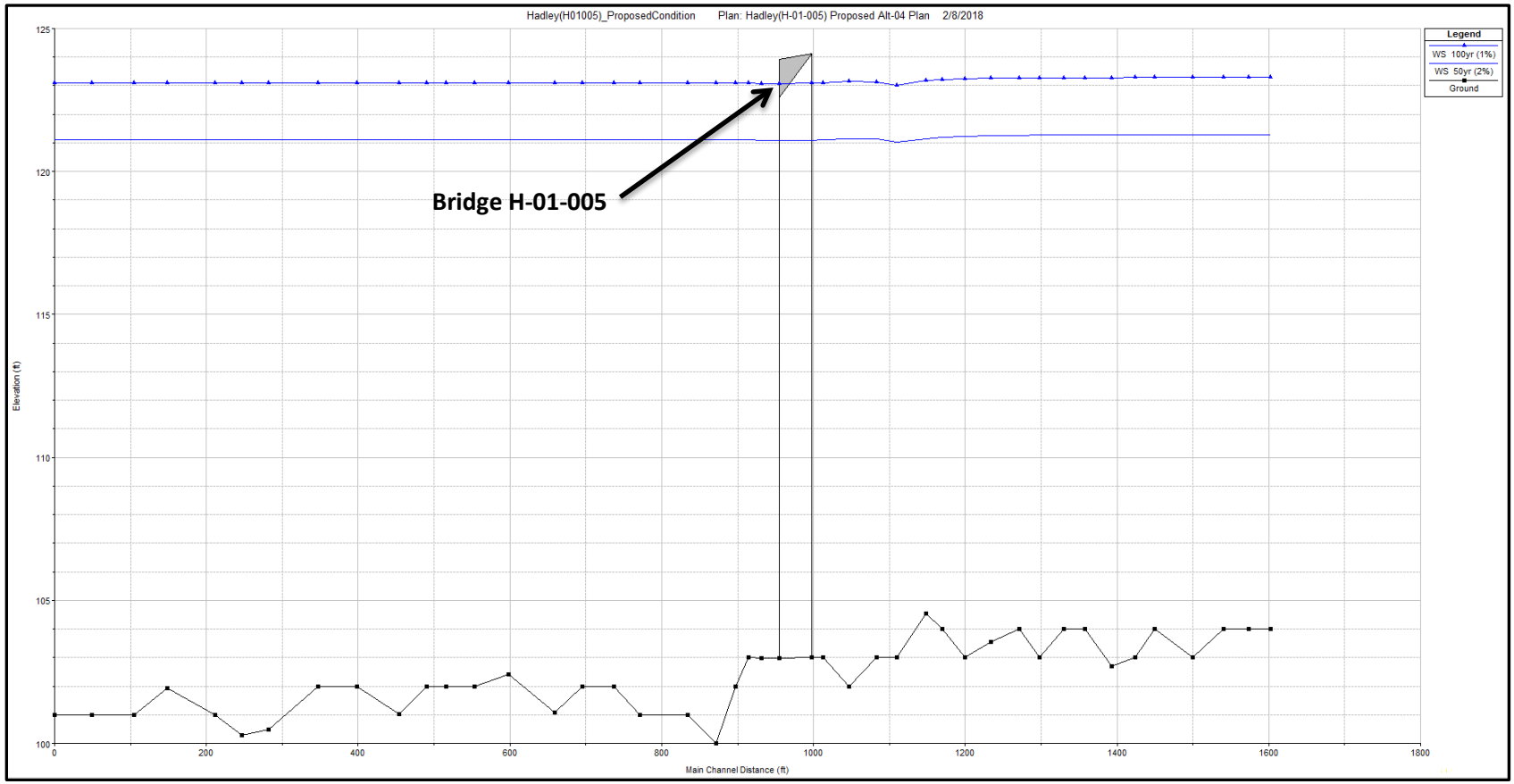
7.2.6 (a) Proposed Alternative-01 Channel Profile



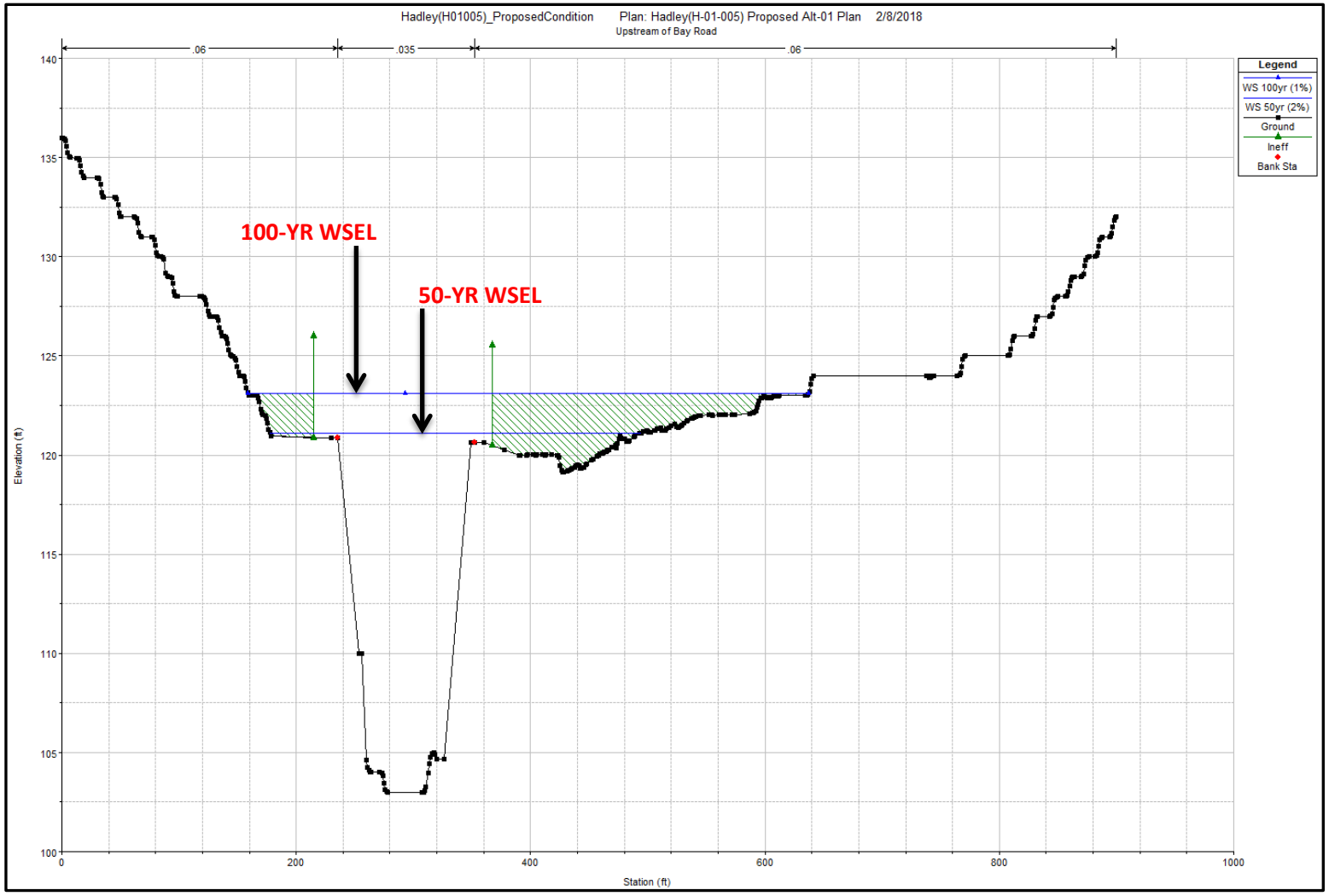
7.2.6 (b) Proposed Alternative-02 Channel Profile



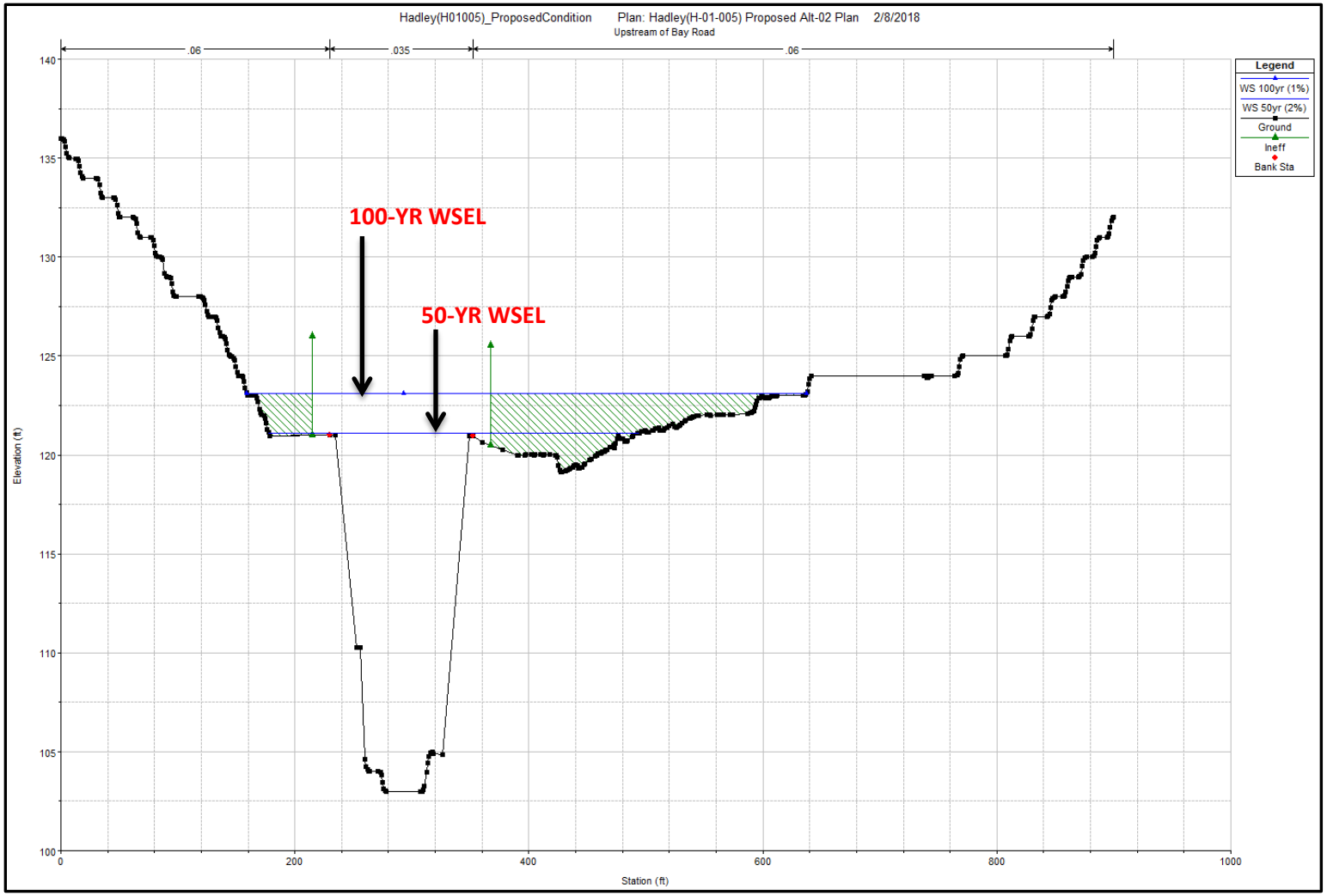
7.2.6 (c) Proposed Alternative-03 Channel Profile



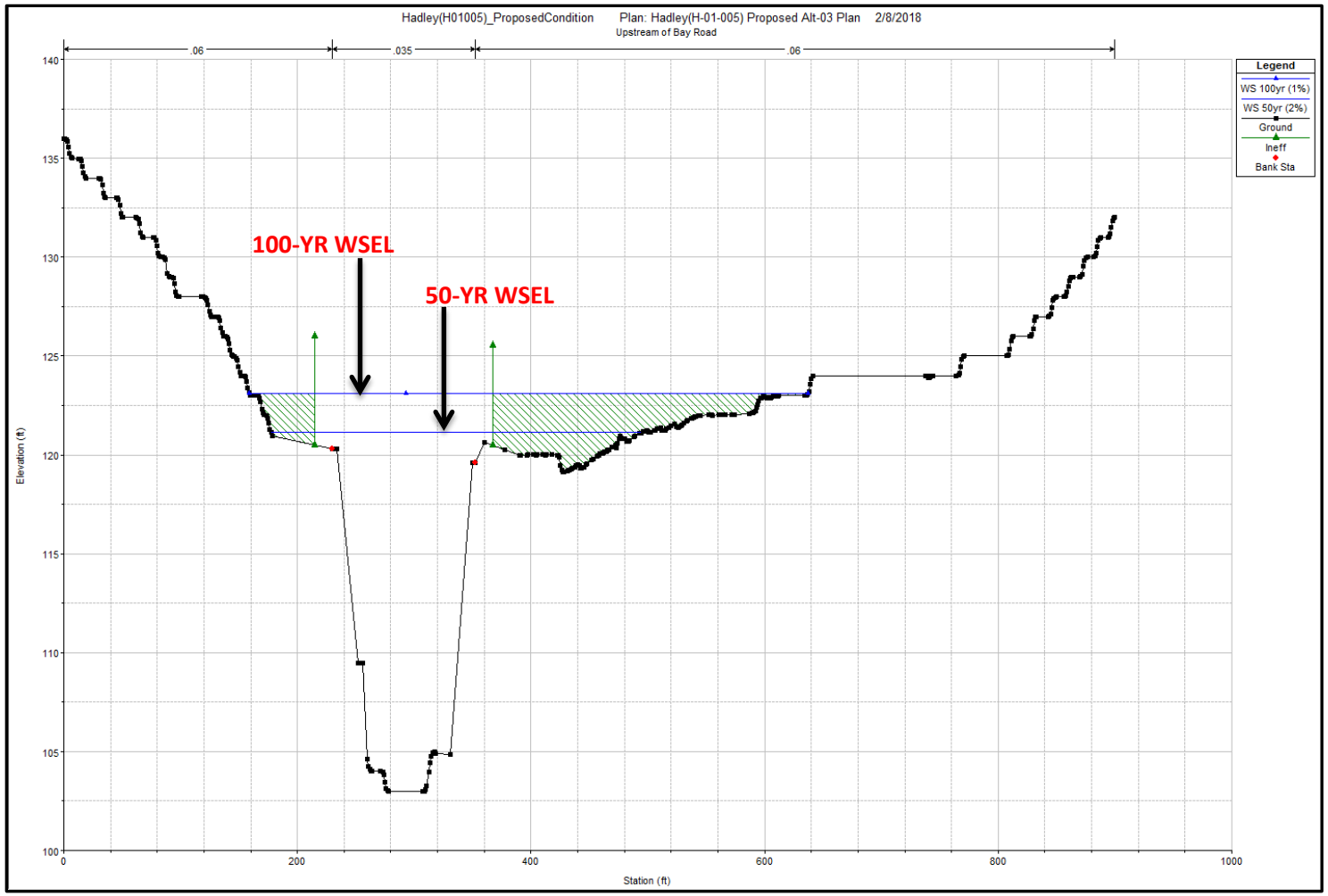
7.2.6 (d) Proposed Alternative-04 Channel Profile



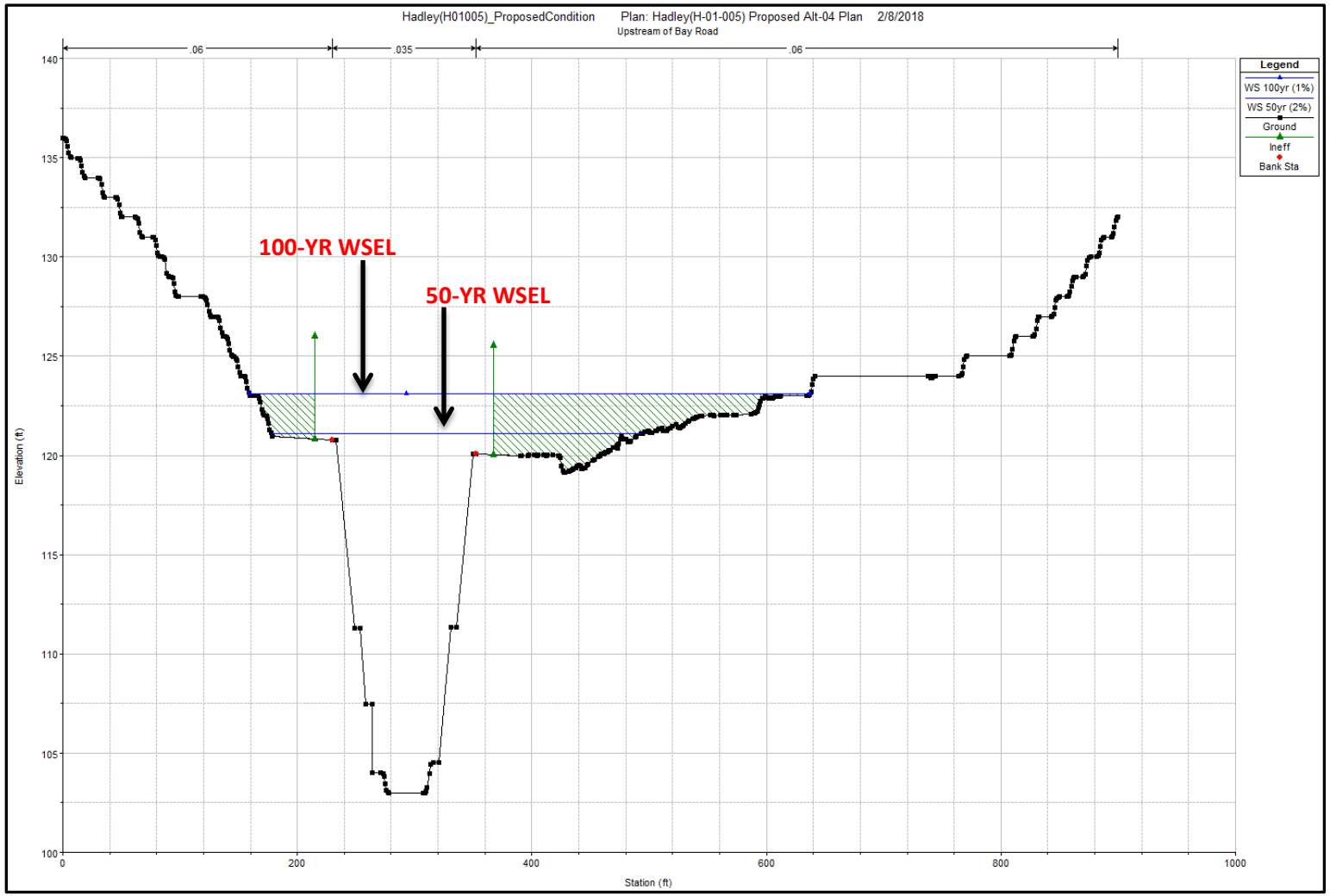
7.2.7 (a) Proposed Alternative-01 WSEL upstream of the Bridge



7.2.7 (b) Proposed Alternative-02 WSEL upstream of the Bridge



7.2.7 (c) Proposed Alternative-03 WSEL upstream of the Bridge



7.2.7 (d) Proposed Alternative-04 WSEL upstream of the Bridge

7.2.8 HEC-RAS Proposed Alternative-01

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.31	0.000015	0.97	7069.46	799.43	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.31		123.32	0.000012	0.92	8696.37	818.59	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6855.72	763.34	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.31		123.32	0.000012	0.96	8398.75	771.77	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6821.12	733.17	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.31		123.32	0.000012	0.96	8303.91	742.13	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.3		121.31	0.000018	1.09	6132.34	659.44	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.31		123.31	0.000015	1.05	7472.06	675.06	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.29		121.3	0.000023	1.17	5347.99	541.78	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.3		123.31	0.000018	1.14	6453.52	558.27	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.29		121.3	0.000022	1.19	5086.22	478.07	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.3		123.31	0.000018	1.18	6058.8	489.96	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.29		121.3	0.000026	1.23	4677.2	434.65	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.3		123.31	0.000022	1.24	5569.21	458.61	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.29		121.3	0.000031	1.36	4338.32	418.83	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.3		123.31	0.000026	1.36	5207.27	449.37	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.28		121.3	0.000036	1.49	4109	418.02	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.29		123.31	0.000031	1.48	4983.19	452.8	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.28		121.3	0.000039	1.56	3917.1	404.15	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.29		123.31	0.000032	1.55	4752.52	434.8	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.27		121.3	0.000044	1.65	3706.42	396.27	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.29		123.31	0.000036	1.61	4538.13	424.56	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.27		121.3	0.000052	1.81	3631.6	441.61	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.28		123.31	0.00004	1.72	4562.24	478.02	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.23		121.29	0.000075	2.21	2589.56	335.02	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.25		123.3	0.000058	2.11	3278.94	348.66	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.29	0.00009	2.35	2107.97	321.1	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.23		123.3	0.000071	2.26	2846.75	397.47	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.16		121.28	0.000144	2.92	1665.29	275.5	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.19		123.29	0.000113	2.82	2311.12	374.57	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.04		121.26	0.000261	4.07	1097.22	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.04		123.27	0.00024	4.24	1265.36	110.66	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.21	0.000074	2.18	1693.52	227.72	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.15		123.22	0.000065	2.21	2307.57	525.92	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.16		121.2	0.000038	1.69	2940.67	428.64	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.17		123.21	0.000033	1.69	3846.35	557.47	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.12	107.97	121.2	0.0001	2.23	1560.7	317.19	0.11
Reach1	1060.067	100yr (1%)	4080	103	123.12	108.46	123.2	0.000085	2.27	1865.41	478.78	0.1
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.08	109.93	121.17	0.000132	2.4	1486.82	508.16	0.12
Reach1	979.5606	100yr (1%)	4080	103	123.08	110.48	123.16	0.000106	2.4	1789.75	667.67	0.11
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.2.8 HEC-RAS Proposed Alternative-02

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.3	0.000015	0.97	7066.94	799.42	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.31		123.31	0.000012	0.92	8693.14	818.56	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.3		121.3	0.000016	1.01	6853.31	763.33	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.31		123.31	0.000012	0.96	8395.7	771.76	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.3		121.3	0.000016	1.01	6818.81	733.16	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.31		123.31	0.000012	0.97	8300.98	742.11	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.29		121.3	0.000018	1.09	6130.26	659.43	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.3		123.31	0.000015	1.05	7469.39	675.04	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.29		121.3	0.000023	1.17	5346.28	541.75	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.3		123.31	0.000018	1.14	6451.31	558.24	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.29		121.3	0.000022	1.19	5084.71	478.06	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.3		123.31	0.000018	1.18	6056.86	489.93	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.29		121.3	0.000026	1.23	4675.82	434.63	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.3		123.31	0.000022	1.24	5567.4	458.55	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.28		121.3	0.000031	1.36	4336.99	418.81	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.29		123.31	0.000026	1.36	5205.5	449.3	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.28		121.3	0.000036	1.49	4107.67	417.96	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.29		123.31	0.000031	1.48	4981.4	452.74	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.28		121.3	0.000039	1.56	3915.82	404.1	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.29		123.31	0.000032	1.55	4750.81	434.76	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.27		121.29	0.000044	1.65	3705.16	396.24	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.28		123.3	0.000036	1.61	4536.44	424.54	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.26		121.29	0.000052	1.81	3630.19	441.57	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.28		123.3	0.00004	1.72	4560.34	477.98	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.23		121.29	0.000075	2.21	2588.48	335	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.25		123.3	0.000058	2.11	3277.55	348.63	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.28	0.00009	2.35	2106.94	320.75	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.23		123.3	0.000071	2.27	2845.15	397.41	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.16		121.28	0.000144	2.92	1664.38	275.45	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.19		123.29	0.000113	2.82	2309.59	374.51	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.04		121.26	0.000261	4.07	1096.94	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.03		123.27	0.000241	4.24	1264.91	110.56	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.21	0.000074	2.18	1692.79	227.61	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.14		123.22	0.000065	2.21	2305.45	525.75	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.16		121.2	0.000038	1.69	2939.28	428.62	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.17		123.2	0.000033	1.69	3844.1	557.39	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.11	108.01	121.19	0.000108	2.25	1544.7	317.07	0.11
Reach1	1060.067	100yr (1%)	4080	103	123.12	108.5	123.2	0.000091	2.27	1849.42	478.71	0.1
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.08	109.97	121.17	0.000133	2.41	1477.81	508.14	0.12
Reach1	979.5606	100yr (1%)	4080	103	123.08	110.88	123.16	0.000107	2.4	1780.74	667.66	0.11
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.2.8 HEC-RAS Proposed Alternative-03

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.3	0.000015	0.97	7064.91	799.41	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.31		123.31	0.000012	0.92	8691.25	818.54	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.29		121.3	0.000016	1.01	6851.37	763.32	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.3		123.31	0.000012	0.96	8393.92	771.75	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.29		121.3	0.000016	1.01	6816.94	733.15	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.3		123.31	0.000012	0.97	8299.26	742.1	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.29		121.3	0.000018	1.09	6128.57	659.41	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.3		123.31	0.000015	1.05	7467.83	675.02	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.29		121.3	0.000023	1.17	5344.9	541.73	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.3		123.31	0.000018	1.14	6450.02	558.22	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.29		121.3	0.000022	1.19	5083.49	478.04	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.3		123.31	0.000018	1.18	6055.73	489.91	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.28		121.3	0.000026	1.23	4674.71	434.62	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.29		123.31	0.000022	1.24	5566.34	458.51	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.28		121.3	0.000031	1.36	4335.92	418.8	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.29		123.31	0.000026	1.36	5204.46	449.26	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.28		121.29	0.000036	1.49	4106.6	417.92	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.29		123.3	0.000031	1.48	4980.35	452.7	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.27		121.29	0.000039	1.56	3914.78	404.06	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.28		123.3	0.000032	1.55	4749.79	434.74	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.27		121.29	0.000044	1.65	3704.14	396.22	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.28		123.3	0.000036	1.61	4535.46	424.52	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.26		121.29	0.000052	1.81	3629.06	441.55	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.28		123.3	0.00004	1.72	4559.22	477.96	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.23		121.28	0.000075	2.21	2587.61	334.98	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.25		123.3	0.000058	2.11	3276.73	348.61	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.28	0.00009	2.35	2106.11	320.46	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.23		123.29	0.000071	2.27	2844.21	397.37	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.15		121.27	0.000144	2.92	1663.66	275.41	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.18		123.29	0.000113	2.82	2308.7	374.47	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.04		121.26	0.000261	4.07	1096.72	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.03		123.27	0.000241	4.24	1264.65	110.5	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.21	0.000075	2.18	1692.19	227.52	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.14		123.21	0.000065	2.21	2304.2	525.65	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.16		121.2	0.000038	1.69	2938.16	428.6	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.17		123.2	0.000033	1.69	3842.78	557.34	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.12	107.88	121.19	0.000089	2.12	1650.15	317.26	0.1
Reach1	1060.067	100yr (1%)	4080	103	123.13	108.36	123.2	0.000076	2.16	1954.77	478.82	0.1
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.09	109.83	121.17	0.000114	2.29	1571.32	508.4	0.12
Reach1	979.5606	100yr (1%)	4080	103	123.08	110.35	123.16	0.000093	2.3	1874.16	667.79	0.11
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.2.8 HEC-RAS Proposed Alternative-04

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.29		121.3	0.000015	0.97	7061.05	799.39	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.29		123.3	0.000012	0.92	8681.69	818.44	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.29		121.3	0.000016	1.01	6847.69	763.3	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.29		123.3	0.000012	0.96	8384.91	771.7	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.29		121.3	0.000016	1.02	6813.4	733.12	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.29		123.3	0.000012	0.97	8290.6	742.05	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.29		121.29	0.000018	1.09	6125.39	659.39	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.29		123.3	0.000015	1.05	7459.95	674.95	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.28		121.29	0.000023	1.17	5342.28	541.69	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.29		123.3	0.000018	1.14	6443.5	558.13	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.28		121.29	0.000022	1.19	5081.17	478.02	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.28		123.3	0.000018	1.18	6050.01	489.83	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.28		121.29	0.000026	1.23	4672.61	434.6	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.28		123.29	0.000022	1.24	5560.98	458.3	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.28		121.29	0.000031	1.36	4333.9	418.77	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.28		123.29	0.000026	1.36	5199.21	449.04	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.27		121.29	0.000036	1.49	4104.57	417.84	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.28		123.29	0.000031	1.49	4975.06	452.51	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.27		121.29	0.000039	1.56	3912.82	403.99	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.27		123.29	0.000033	1.55	4744.7	434.62	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.26		121.29	0.000044	1.65	3702.22	396.18	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.27		123.29	0.000036	1.61	4530.48	424.46	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.26		121.28	0.000052	1.81	3626.91	441.5	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.26		123.29	0.00004	1.72	4553.62	477.84	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.22		121.28	0.000075	2.21	2585.97	334.95	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.24		123.28	0.000058	2.12	3272.62	348.52	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.2		121.28	0.00009	2.35	2104.54	319.91	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.22		123.28	0.000071	2.27	2839.49	397.19	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.15		121.27	0.000145	2.92	1662.28	275.33	0.14
Reach1	1195.823	100yr (1%)	4080	104.54	123.17		123.28	0.000114	2.83	2304.18	374.27	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.03		121.25	0.000261	4.07	1096.31	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.02		123.26	0.000241	4.24	1263.34	109.98	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.13		121.2	0.000075	2.18	1691.07	227.35	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.13		123.2	0.000065	2.21	2297.94	525.03	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.15		121.19	0.000038	1.69	2936.04	428.56	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.15		123.19	0.000033	1.69	3836.17	557.1	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.11	108.33	121.19	0.000111	2.27	1544.44	316.83	0.11
Reach1	1060.067	100yr (1%)	4080	103	123.1	108.86	123.18	0.000093	2.29	1848.22	478.46	0.11
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	102.99	121.09	108.39	121.16	0.00009	2.14	1668.75	508.69	0.1
Reach1	979.5606	100yr (1%)	4080	102.99	123.08	108.89	123.16	0.000077	2.17	1971.48	667.87	0.1
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.3 Scour and Countermeasures Calculations

7.3.1 Scour Sediment Sampling Results

7.3.2 Scour Calculations



GZA
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GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

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January 11, 2018
File No. 01.173284.00

Anthony Timperio, P.E.
Alfred Benesch & Company
50 Redfield Street
Boston, Massachusetts 02122

Re: Scour Sediment Sampling Services
Bay Road over Fort River
Bridge No. H-01-005
Hadley, Massachusetts

Dear Tony:

GZA GeoEnvironmental, Inc. (GZA) is pleased to submit the results of our sediment sampling and geotechnical laboratory testing services to Alfred Benesch & Company (Benesch) associated with the scour evaluation of Bay Road (Rt. 47) over the Fort River Bridge (Bridge No. H-01-005) in Hadley, Massachusetts. The objective of our services was to obtain river bottom sediment samples and to perform geotechnical laboratory testing in accordance with the recommendations of the Massachusetts Department of Transportation (MassDOT) Hydraulic Engineer.

Sample Collection

On August 21 and September 25, 2017 GZA representatives collected a total of eight (8) sediment samples for laboratory testing. Sampling dates and locations were coordinated with MassDOT to avoid conflict with bridge (pile) repair work that was ongoing within cofferdams by others. Sample locations were in general accordance with the "Locations of Soil Samples for Scour Evaluation, Multi-Span Bridge," specified by MassDOT. Three sediment samples were obtained at approach locations upstream of the existing bridge, and five sediment samples were obtained at the upstream face of each pier that is located in the water (Pier Nos. 2 through 6). Samples were collected by GZA personnel using hand tools to depths of about 12 to 24 inches below the existing river bottom/ground surface. Samples collected at the piers were taken from within the cofferdams. Samples upstream of the existing bridge were collected in accessible areas located as close as possible to planned sampling locations based on the referenced MassDOT requirements.

Based on our observations, the river bottom is covered by frequent stones, however sufficient material was present to obtain samples within the upper 2 feet of river bottom/flood plain sediment. The sampling locations were located by tape measurements, to the extent feasible from the existing bridge structure. Sediment sampling locations are summarized in **Table 1** and shown on the attached **Figure 2**. A Site Locus is shown on **Figure 1**.

Table 1: Sediment Sampling Locations

Sample No.	Approximate Location	Sampling Depth (feet)
US-NE	Northeast River Bank Approx. 160 ft Upstream of Bridge	0 - 2
US-NW	Northwest River Bank Approx. 160 ft Upstream of Bridge	0 – 2
US-C	North Central w/in River Approx. 168 ft Upstream of Bridge	0 – 2
BR-P2	Bridge – Pier 2	0 – 2
BP-P3	Bridge – Pier 3	0 – 2
BP-P4	Bridge – Pier 4	0 – 2
BP-P5	Bridge - Pier 5	0 – 2
BP-P6	Bridge – Pier 6	0 – 2

Notes:
1. Sampling locations were selected in general accordance with the plan entitled "Locations of Soil Sample for Scour Evaluation, Multi-Span Bridge" provided by MassDOT.
2. Sampling depths are referenced below the existing ground surface or bottom of river.
3. No sampling at Pier Nos. 1 and 7. These piers are located on land.

Geotechnical Laboratory Testing

A total of eight (8) gradation analyses were performed by Thielsch Engineering, Inc. of Cranston, Rhode Island in accordance with ASTM D422. Results of the laboratory testing, including D_{50} and D_{84} particles sizes for the streambed samples as well as additional gradation coefficients are provided in **Appendix A**.

We appreciated the opportunity to assist you on this project. Please call Terese Kwiatkowski (781) 278-3817 or Stephen Spink (781) 278-5838 with any questions or comments.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

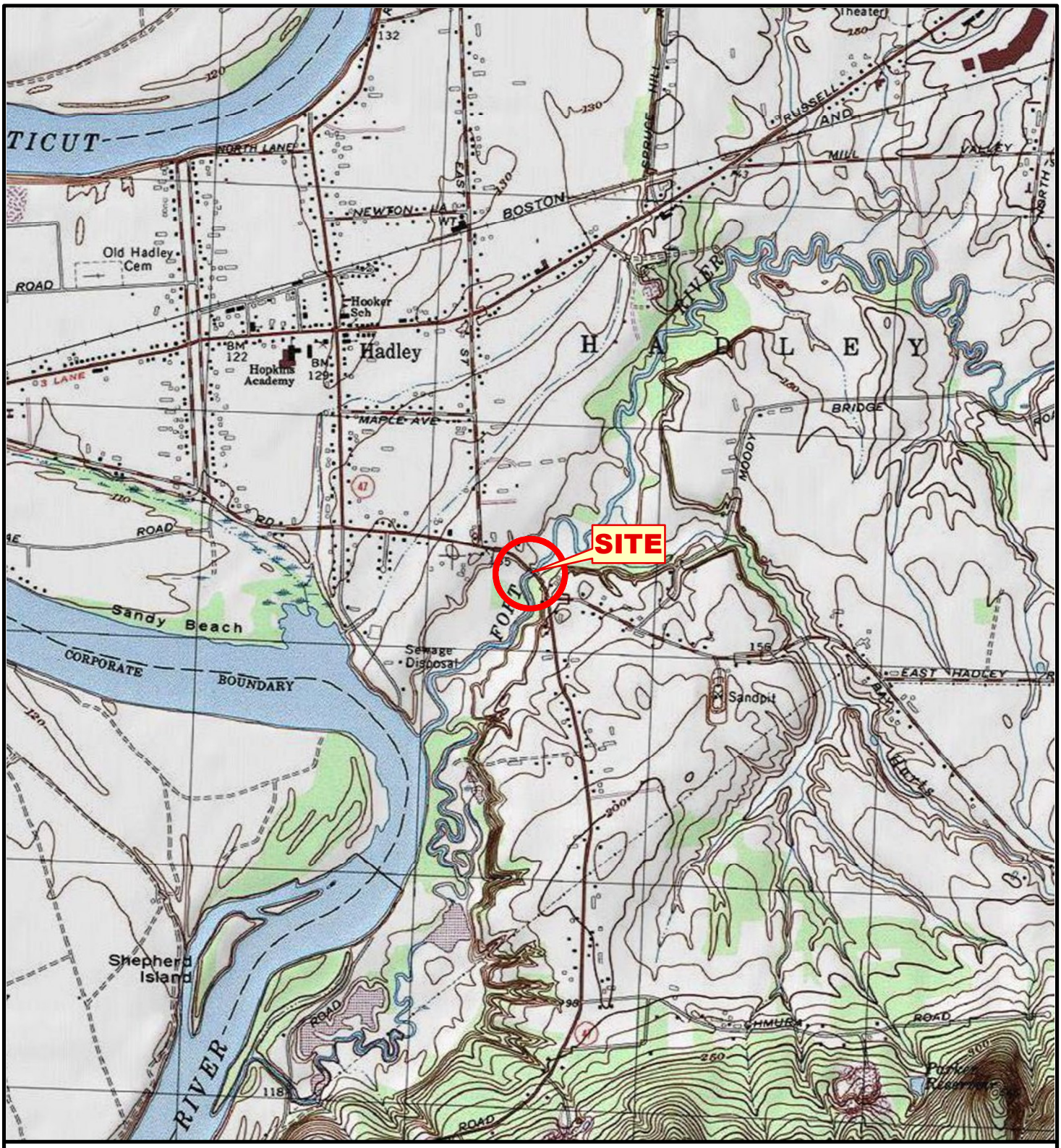
Stephen T. Spink, P.E.
Senior Project Manager

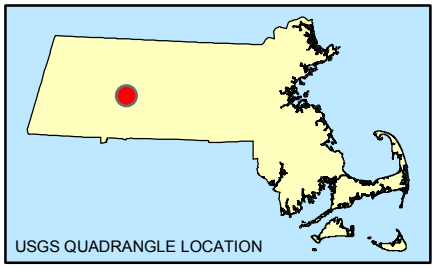
Terese M. Kwiatkowski, P.E.
Senior Principal

Attachments: Figures
Appendix A - Geotechnical Laboratory Test Results

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FIGURES





SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

Data Supplied by : esri

0 1,000 2,000 4,000 6,000

SCALE IN FEET

N W E S

PROJ. MGR.: STS
DESIGNED BY: STS
REVIEWED BY: TMK
OPERATOR: ADP

DATE: 12-04-2017

LOCUS PLAN

JOB NO. 01.0173284.00

MASSDOT PROJ. NO. 608460 - BRIDGE NO. H-01-005
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

FIGURE NO. 1

© 2017 - GZA GeoEnvironmental, Inc., J:\170,000-179,999\173284\173284-00.STS\FIGURES\GIS\MXD\173284_SiteLocus_FIG1.mxd, 12/4/2017, 2:01:40 PM, anthony.pungitore



LEGEND

BR-P2 SCOUR SAMPLE LOCATION

BB-1 BRIDGE BORING

ALIGNMENT A–A'

NOTES:

1. THE BING AERIAL BACKGROUND WAS PROVIDED BY MICROSOFT CORPORATION ON JULY 3, 2017.
2. THE LEVEL 3 ASSESSORS' PARCEL MAPPING DATA SET WAS DEVELOPED THROUGH COMPETITIVE PROCUREMENT FUNDED BY MASSGIS. THE SPECIFICATION FOR THIS WORK WAS LEVEL 3 OF THE MASSGIS DIGITAL PARCEL STANDARD. THIS DATA WAS DISTRIBUTED BY MASSGIS ON APRIL 28, 2017.
3. BORING LOCATIONS BASED ON TAPED MEASUREMENTS AND/OR LINE OF SIGHT FROM EXISTING SITE FEATURES. EXPLORATION LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. BORING LOCATIONS SHOWN HEREIN SHOULD BE CONSIDERED APPROXIMATE.
4. BRIDGE BORINGS (BB SERIES) WERE PERFORMED FROM THE BAY ROAD BRIDGE DECK (BB–2), AND FROM THE ROADWAY (BB–1, BB–3).
5. THE GROUND SURFACE CONTOURS AND EDGE OF WATER WERE GENERATED FROM THE MASSGIS DIGITAL TERRAIN MODEL (DTM) FILES. THIS DATA IS MAINTAINED BY MASS GIS AND WAS LAST UPDATED ON APRIL 9, 2013.

0 20 50 100

SCALE: 1" = 20'

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PROPOSED BRIDGE
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

EXPLORATION LOCATION PLAN

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		benesch	
PROJ MGR: STS	REVIEWED BY: STS	CHECKED BY: TMK	FIGURE
DESIGNED BY: STS	DRAWN BY: ADP	SCALE: 1" = 20 FEET	2
DATE: 12-04-2017	PROJECT NO. 01.0173284.00	REVISION NO.	

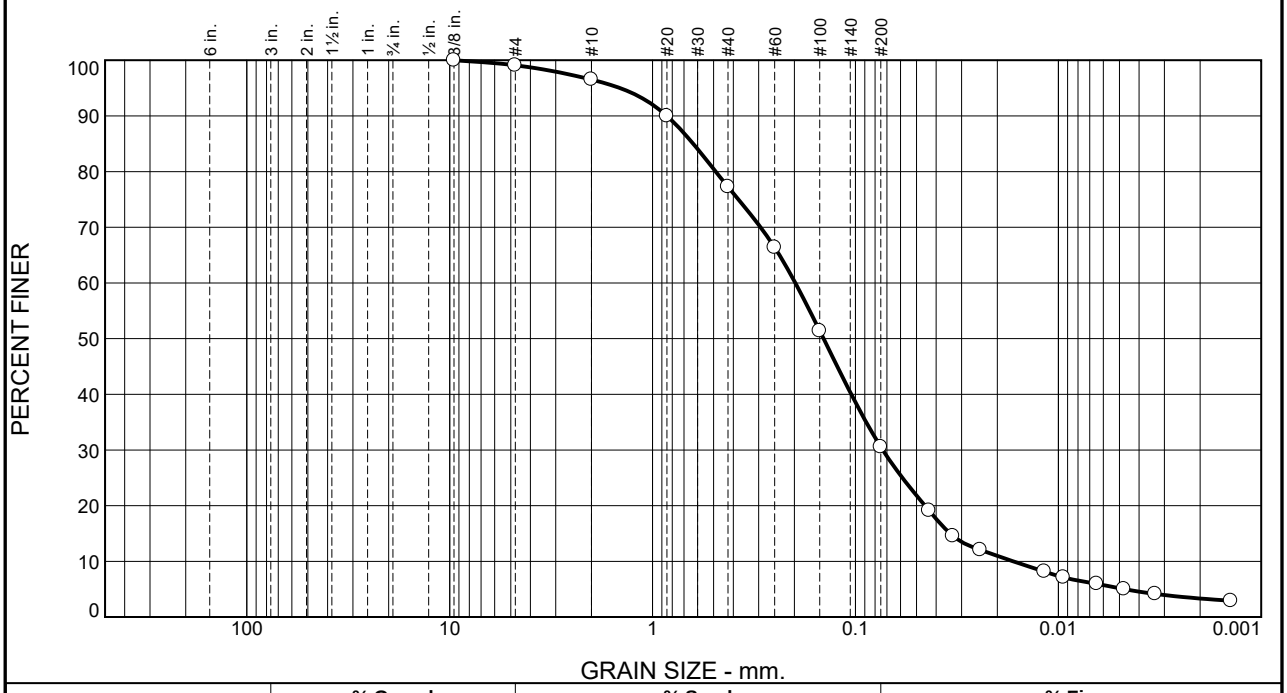
© 2013 – GZA GeoEnvironmental, Inc. G:\ZA–d\170,000–179,999\173284\173284–00.STS\FIGURES\CAD\DWG\608460_BR1–2(H01005).dwg [Sheet1_GZA–TB] December 04, 2017 – 2:08pm anthony.pungitore

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APPENDIX A

GEOTECHNICAL LABORATORY RESULTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	2.6	19.2	46.8	27.2	3.3

Test Results (D7928 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	99.1		
#10	96.5		
#20	90.0		
#40	77.3		
#60	66.4		
#100	51.4		
#200	30.5		
0.0433 mm.	19.1		
0.0331 mm.	14.5		
0.0243 mm.	12.1		
0.0117 mm.	8.2		
0.0094 mm.	7.1		
0.0065 mm.	6.0		
0.0048 mm.	5.0		
0.0033 mm.	4.1		
0.0014 mm.	2.9		

* (no specification provided)

Material Description

Brown f-m SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.8502 D_{85}= 0.6307 D_{60}= 0.1980
D_{50}= 0.1436 D_{30}= 0.0734 D_{15}= 0.0342
D_{10}= 0.0167 C_u= 11.87 C_c= 1.63

Remarks

Material was visually checked for plasticity and appeared non-plastic.

Date Received: 12/28/17 **Date Tested:** 1/5/18

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: US-NE

Thielsch Engineering Inc.

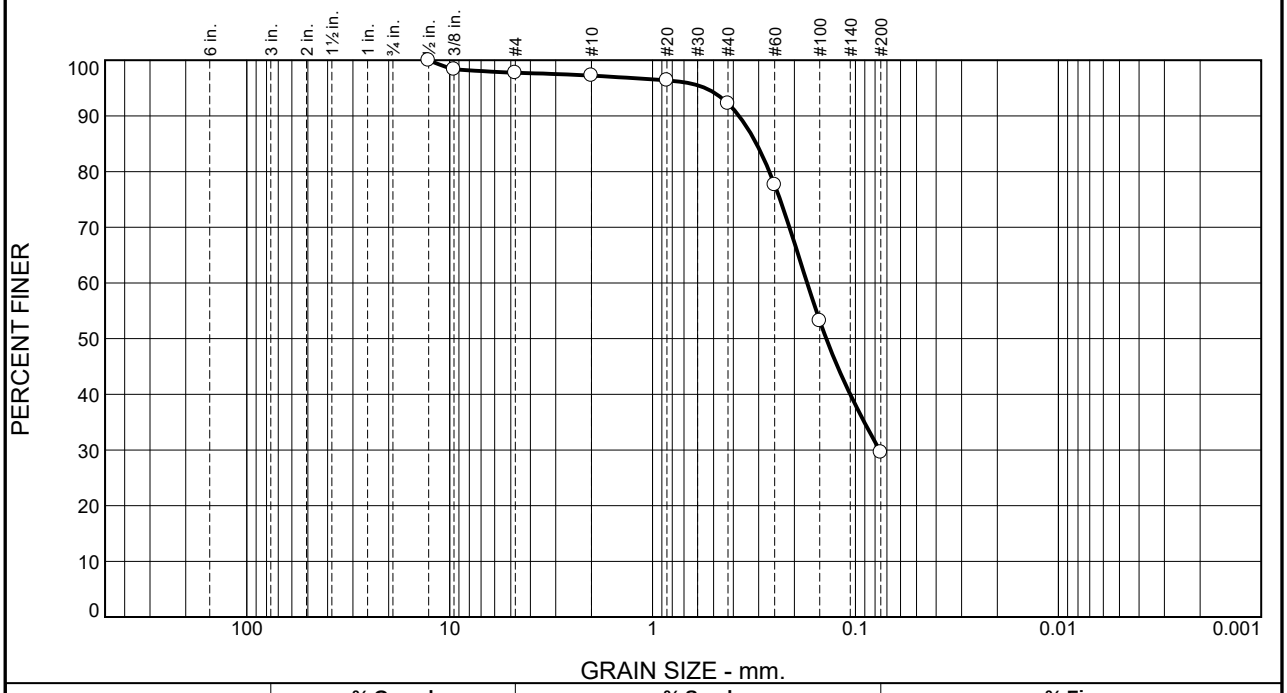
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.3	0.5	5.0	62.6	29.6	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5"	100.0		
0.375"	98.4		
#4	97.7		
#10	97.2		
#20	96.4		
#40	92.2		
#60	77.6		
#100	53.2		
#200	29.6		

* (no specification provided)

Material Description

Brown fine SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.3749 D_{85}= 0.3075 D_{60}= 0.1731
D_{50}= 0.1393 D_{30}= 0.0762 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample contained trace roots.

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: US-NW

Thielsch Engineering Inc.

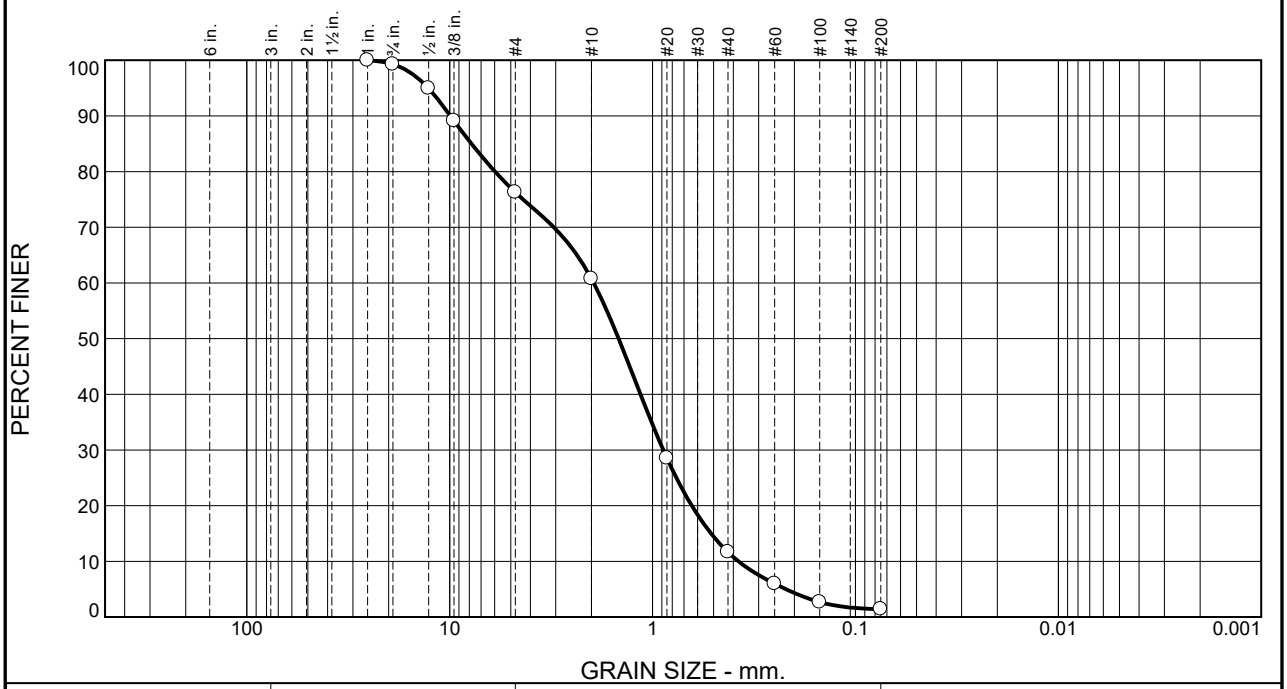
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.7	23.0	15.6	49.1	10.2	1.4	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	99.3		
0.5"	95.0		
0.375"	89.1		
#4	76.3		
#10	60.7		
#20	28.5		
#40	11.6		
#60	6.0		
#100	2.7		
#200	1.4		

* (no specification provided)

Material Description

Brown f-c SAND, some fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 9.9283 D_{85}= 7.8075 D_{60}= 1.9508
D_{50}= 1.4702 D_{30}= 0.8858 D_{15}= 0.5149
D_{10}= 0.3772 C_u= 5.17 C_c= 1.07

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: US-C

Thielsch Engineering Inc.

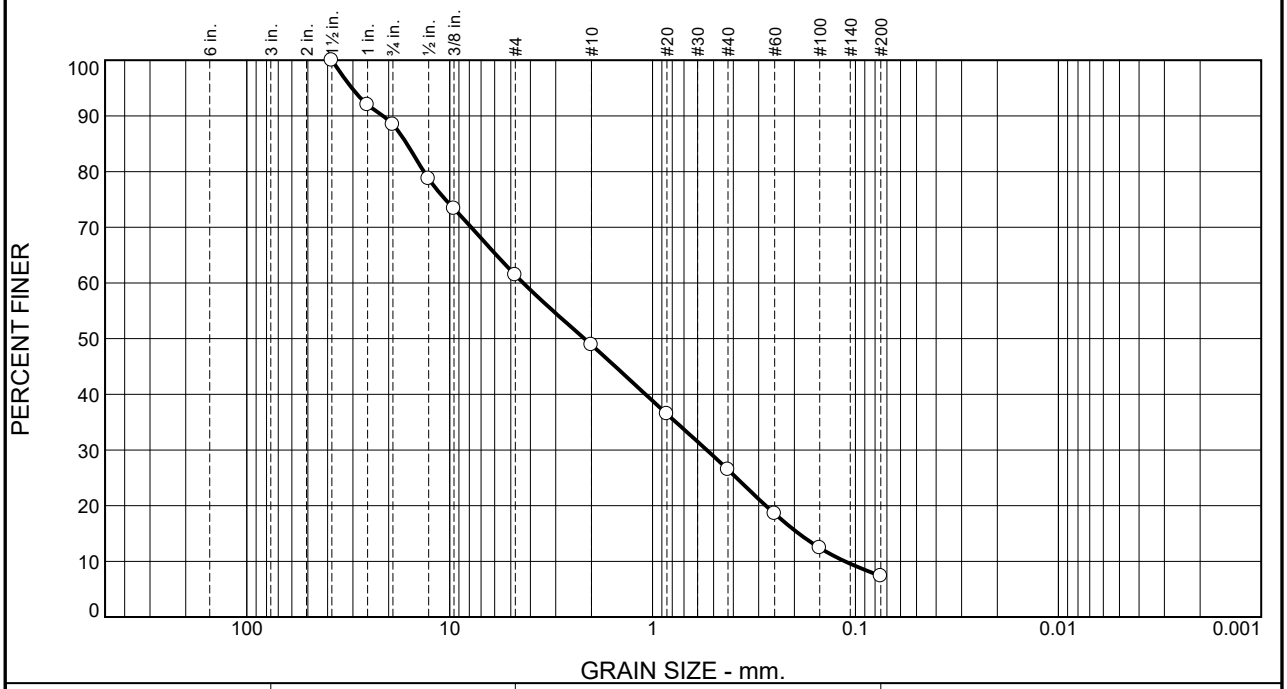
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.5	27.1	12.5	22.4	19.2	7.3	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	92.0		
0.75"	88.5		
0.5"	78.7		
0.375"	73.4		
#4	61.4		
#10	48.9		
#20	36.5		
#40	26.5		
#60	18.5		
#100	12.4		
#200	7.3		

* (no specification provided)

Material Description

Brown f-c SAND and f-c GRAVEL, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 21.2922 D_{85}= 16.2570 D_{60}= 4.3413
D_{50}= 2.1672 D_{30}= 0.5407 D_{15}= 0.1904
D_{10}= 0.1127 C_u= 38.53 C_c= 0.60

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P2

Thielsch Engineering Inc.

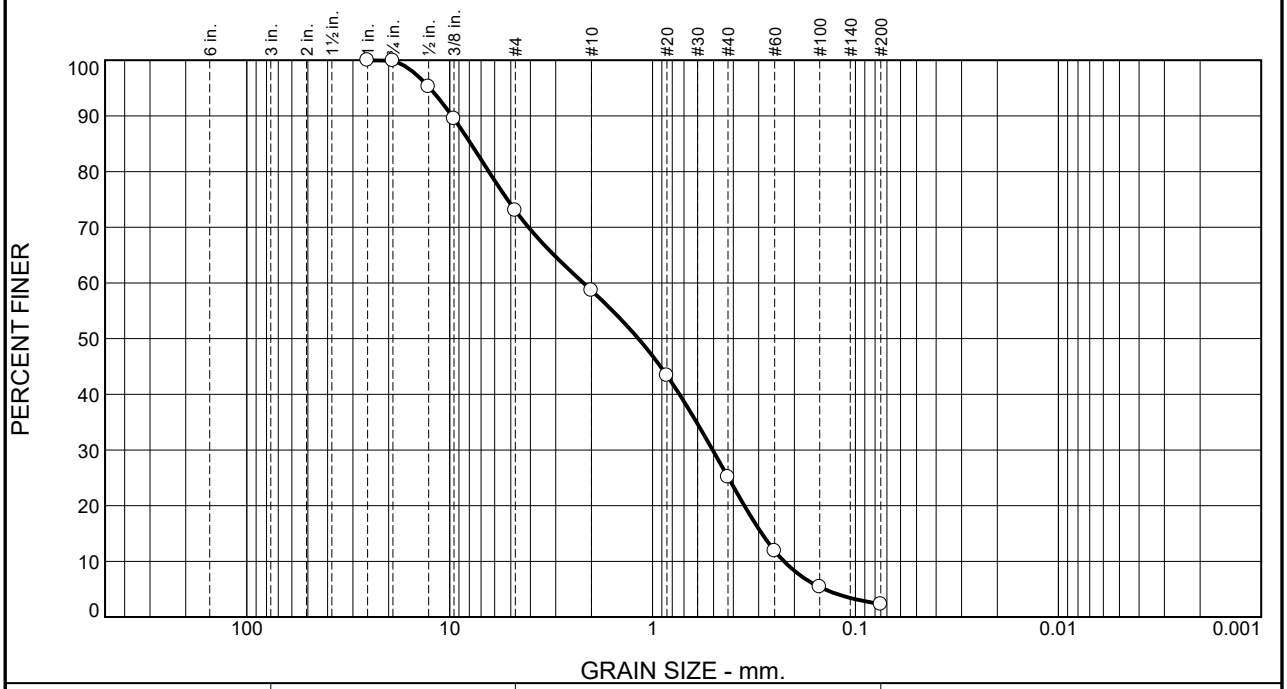
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	26.9	14.4	33.5	22.8	2.3	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	99.9		
0.5"	95.2		
0.375"	89.5		
#4	73.0		
#10	58.6		
#20	43.4		
#40	25.1		
#60	11.9		
#100	5.4		
#200	2.3		

* (no specification provided)

Material Description

Brown f-c SAND, some fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 9.7420 D_{85}= 7.8653 D_{60}= 2.1921
D_{50}= 1.1744 D_{30}= 0.5056 D_{15}= 0.2894
D_{10}= 0.2250 C_u= 9.74 C_c= 0.52

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P3

Thielsch Engineering Inc.

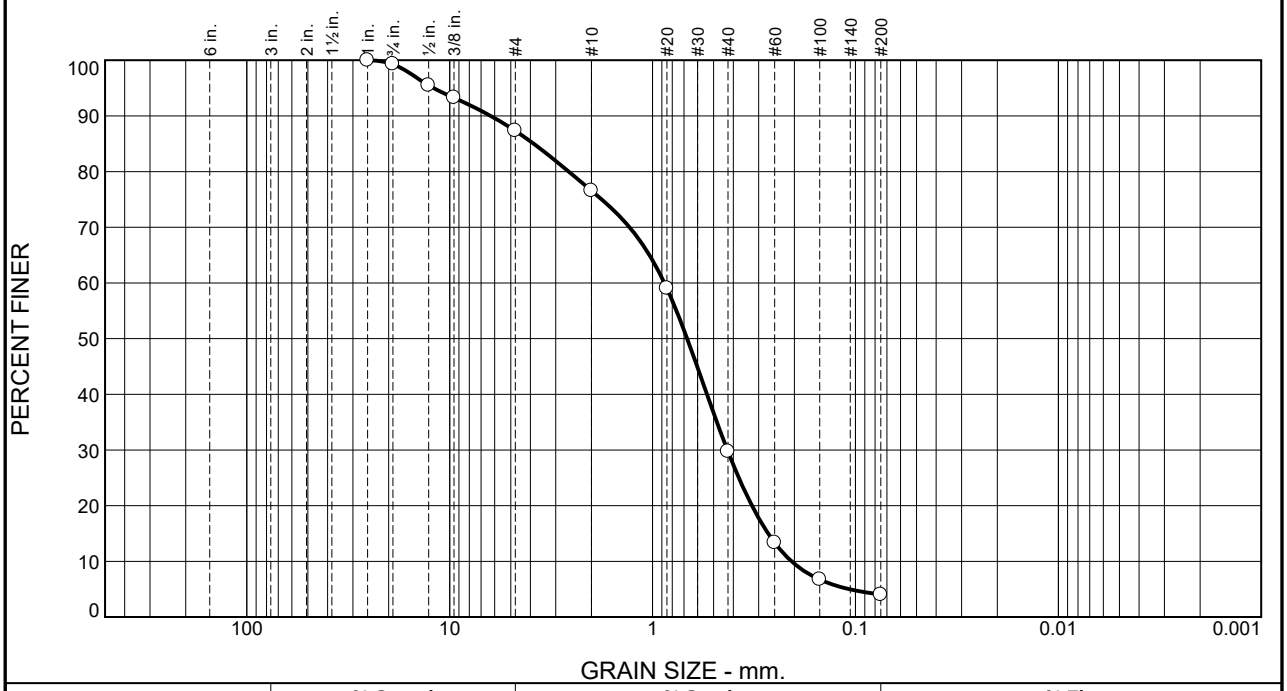
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-5

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.7	12.0	10.7	46.9	25.7	4.0	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	99.3		
0.5"	95.5		
0.375"	93.3		
#4	87.3		
#10	76.6		
#20	59.1		
#40	29.7		
#60	13.3		
#100	6.7		
#200	4.0		

* (no specification provided)

Material Description

Brown f-c SAND, little fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 6.2819 D_{85}= 3.8539 D_{60}= 0.8740
D_{50}= 0.6753 D_{30}= 0.4280 D_{15}= 0.2695
D_{10}= 0.2065 C_u= 4.23 C_c= 1.02

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P4

Thielsch Engineering Inc.

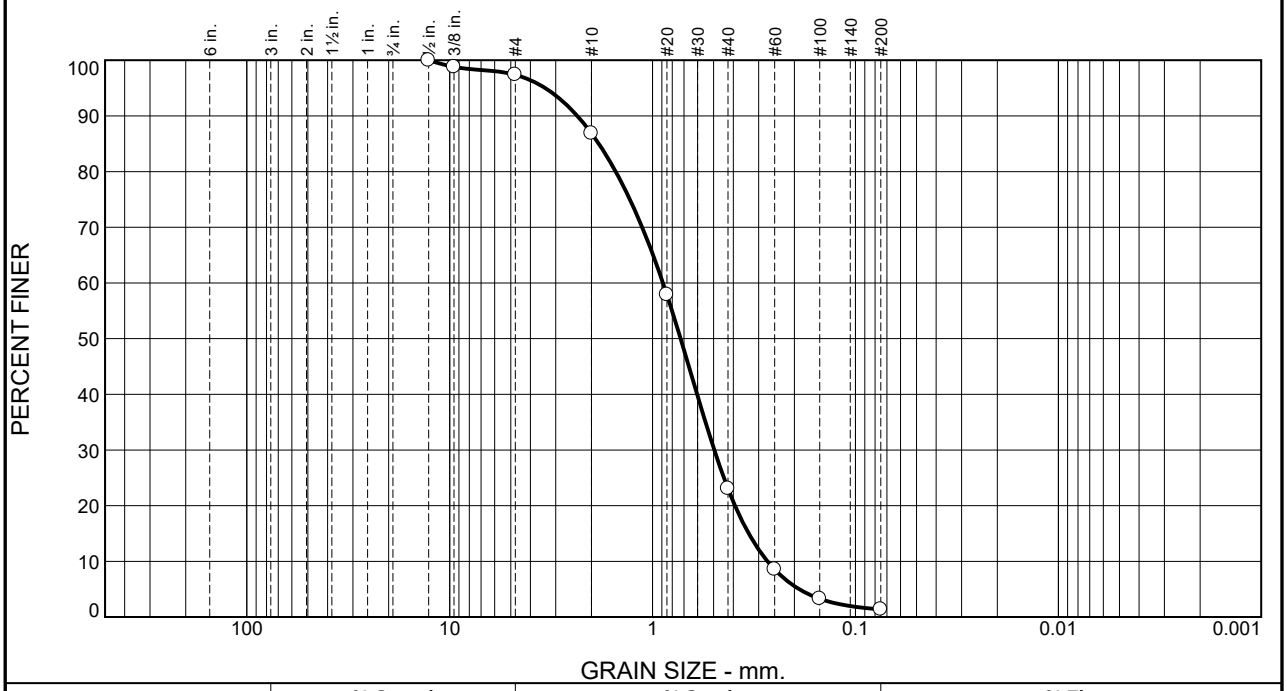
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-6

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.6	10.5	63.9	21.6	1.4	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5"	100.0		
0.375"	98.8		
#4	97.4		
#10	86.9		
#20	57.9		
#40	23.0		
#60	8.5		
#100	3.3		
#200	1.4		

* (no specification provided)

Material Description

Brown f-c SAND, trace fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 2.3495 D_{85}= 1.8408 D_{60}= 0.8885
D_{50}= 0.7276 D_{30}= 0.4962 D_{15}= 0.3358
D_{10}= 0.2713 C_u= 3.27 C_c= 1.02

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P5

Thielsch Engineering Inc.

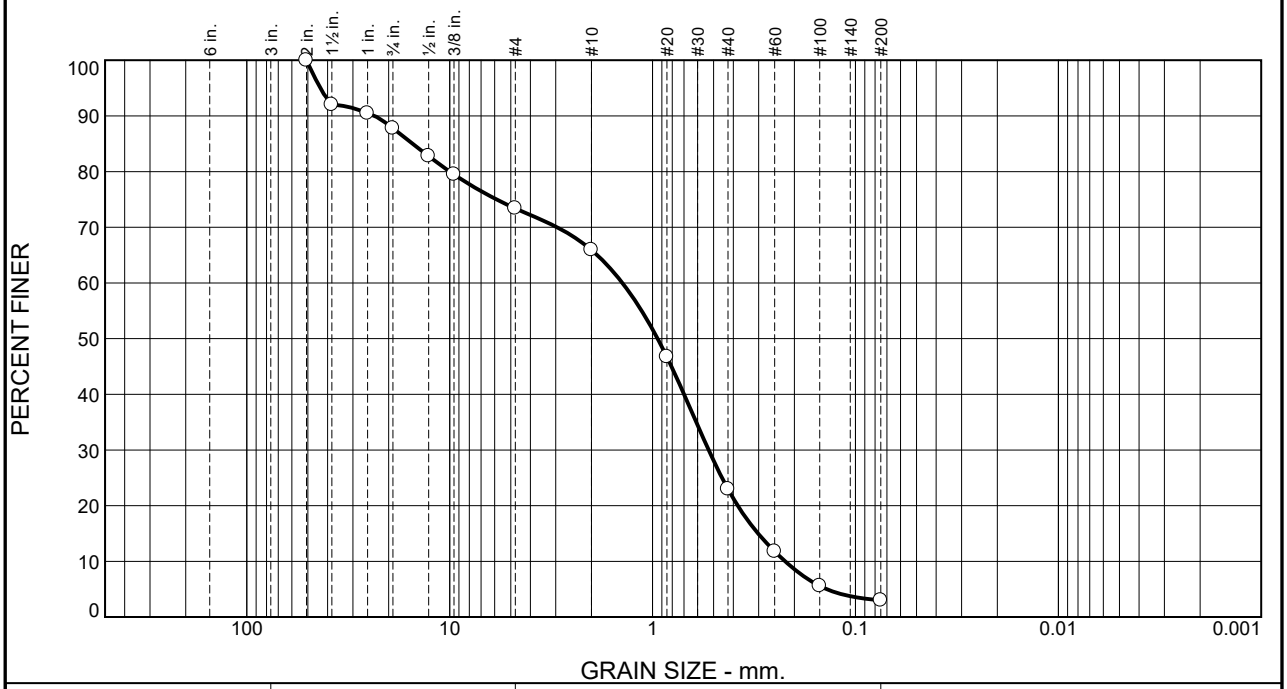
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-7

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.2	14.4	7.5	42.9	20.0	3.0	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100.0		
1.5"	92.0		
1"	90.5		
0.75"	87.8		
0.5"	82.8		
0.375"	79.5		
#4	73.4		
#10	65.9		
#20	46.7		
#40	23.0		
#60	11.8		
#100	5.6		
#200	3.0		

* (no specification provided)

Material Description

Brown f-c SAND, some f-c Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 23.4273 D_{85}= 15.2223 D_{60}= 1.4081
D_{50}= 0.9443 D_{30}= 0.5291 D_{15}= 0.3019
D_{10}= 0.2222 C_u= 6.34 C_c= 0.90

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P6

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-8

Proposal No. 608460-130088

UNDERWATER OPERATIONS TEAM
ROUTINE UNDERWATER INSPECTION REPORT

2-DIST	B.I.N.	BR. DEPT. NO.
02	12J	H-01-005

CITY/TOWN	8-STRUCTURE NO.	LEVEL OF INSPECTION	93B-DATE INSPECTED
HADLEY	H01005-12J-DOT-NBI	IV	MAR 24, 2016

07-FACILITY CARRIED	ACCESS TO BRIDGE	UNDERWATER OPERATIONS ENGINEER
ST 47 BAY RD	EMBANKMENT	RANDI E. BONICA

06-FEATURES INTERSECTED	DEPTH	VISIBILITY	TEAM LEADER (DIVE MASTER)	*Report submitted by:*
WATER FORT RIVER	1.2 m	1 m	JOHN A. MANKOWSKY	

BOTTOM CONDITION	CURRENT	TEAM MEMBERS
SAND, SILT, COBBLES	MODERATE	S. J. AUSEVICH, M. DOSTAL

ITEM 60 *SUBSTRUCTURE* — 7

		DEF
1. Abutments	N	
a. Pedestals	N	-
b. Bridge Seats	N	-
c. Backwalls	N	-
d. Breastwalls	N	-
e. Wingwalls	N	-
f. Slope Paving/Rip-Rap	N	-
g. Pointing	N	-
h. Footings	N	-
i. Piles	N	-
j. Scour	N	-
k. Settlement	N	-
l.	N	-
2. Piers or Bents	N	
a. Pedestals	N	-
b. Caps	N	-
c. Columns	N	-
d. Stems/Webs/Pierwalls	N	-
e. Pointing	N	-
f. Footing	N	-
g. Piles	N	-
h. Scour	N	-
i. Settlement	N	-
j.	N	-
k.	N	-
3. Pile Bents	7	
a. Pile Caps	N	-
b. Piles	7	-
c. Diagonal Bracing	N	-
d. Horizontal Bracing	N	-
e. Fasteners	N	-
UNDERMINING (Y/N)		N

ITEM 61 *CHANNEL & CHANNEL PROTECTION* — 6

		DEF
1. Channel Scour	6	-
2. Embankment Erosion	7	-
3. Debris	6	-
4. Vegetation	7	-
5. Utilities	N	-
6. Rip-Rap/Slope Protection	7	-
7. Aggradation	7	-
8. Fender System	N	-
a. Piles	N	-
b. Diagonal Bracing	N	-
c. Horizontal Bracing	N	-
d. Wales	N	-
e. Fasteners	N	-
f. Ladders	N	-
9.	N	-

ITEM 59 *SUPERSTRUCTURE*

		DEF
	N	-
	N	-
	N	-

ITEM 62 *CULVERTS* — N

		DEF
1. Roof	N	-
2. Floor	N	-
3. Walls	N	-
4. Headwall	N	-
5. Wingwall	N	-
6. Pipe	N	-
7. Protective Coating	N	-
8. Embankment	N	-
9. Wearing Surface	N	-
10. Railing	N	-
11. Sidewalks	N	-
12. Utilities	N	-
13. Member Alignment	N	-
14. Deformation	N	-
15. Scour	N	-
16. Settlement	N	-
17.	N	-
18.	N	-
UNDERMINING (Y/N)		N

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency- - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor scouring, etc.

S= Severe/Major Deficiency- Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroding rebars, Deteriorated timber piles, Considerable settlement, Considerable scouring or undermining, etc.

C-S= Critical Structural Deficiency- A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency- A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Any part of piles or fender system which are projecting outward and may become a safety hazard for the navigational traffic, etc.

URGENCY OF REPAIR:

I=Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her.]

A=ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the responsible party (if not a State owned bridge) upon receipt of the Inspection Report.]

P=Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available.]

X=UNKNOWN **N=NOT APPLICABLE** **H=HIDDEN/INACCESSIBLE** **R=REMOVED**

Proposal No. 608460-130088

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	**12J**	**H-01-005**	**H01005-12J-DOT-NBI**	**MAR 24, 2016**

REMARKS

GENERAL REMARKS

Structure is a pile bent bridge with a continuous concrete deck slab.

Orientation:

Per bridge plans, State 47 travels north and south over the Fort River, which flows from east to west.

When facing downstream, the 8 spans & 7 bents are numbered from left (south) to right (north).
Piles are numbered from downstream to upstream.

The water fluctuates by approximately 10' at this structure following big storm events. At the time of this inspection, both abutments and Bents 1, 2, & 7 were dry. Please see Plan Sketch.

General:

In March, 2016, a three ton load restriction was posted for the bridge due to the deterioration in some timber piles above water.
At the request of the D2 DBIE, divers were summoned to inspect the pile bents underwater. Divers were also used to stabilize the ladder underwater while inspectors checked the upper portions of each pile. Team Leader Dennis Sullivan and Team Member Will Morin were on site to conduct the Special Inspection.

ITEM 60 - SUBSTRUCTURE

Item 60.3 - Pile Bents

Item 60.3.b - Piles

The 10" diameter timber piles located in the water are wrapped with steel jackets, 1.5' diameter x approximately 10' high. Jackets are filled with concrete. The steel jackets exhibit various levels of deterioration from light rust to 100% section loss. Please see details below:

Bent 3 (Piles 6, 7, 8, & 9 have steel jackets)

Pile 9 - The timber pile is exposed below the steel jacket, 1.6' height, and is in good condition.

Bent 4 (All piles have steel jackets)

Pile 1 - The steel jacket has 100% loss along the lower 0.5'. The concrete filler is still intact.
Pile 2 - The steel jacket has 100% loss along the lower 0.3'. The concrete filler is still intact.
Piles 5, 6, 7, & 8 - The steel jacket has random small rust holes along the lower 2'. The concrete filler is still intact.
Pile 9 - The timber pile is exposed below the steel jacket, 0.7' height, and is in good condition.

Bent 5 (All piles have steel jackets)

Pile 3 - Minor rust holes are present in the jacket, up to 0.2' diameter.
Piles 5-8 - Numerous rust holes are present along the lower 2'. The concrete filler is still intact.
Pile 9 - The timber pile is exposed below the jacket, 1.0' height along the upstream face.

Bent 6 (All piles have steel jackets)

Pile 1 - The steel jacket has rust holes up to 0.1' diameter.
Piles 2 & 3 - A minor hole at the base of the jacket extends to the timber pile. Timber piles were probed and are solid.
Pile 6 - Timber pile is exposed below the jacket, 0.6' height at the upstream left side.
Pile 7 - Timber pile is exposed below the jacket, 0.7' height at the upstream left side.

Proposal No. 608460-130088

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	**12J**	**H-01-005**	**H01005-12J-DOT-NBI**	**MAR 24, 2016**

REMARKS

Item 60.3 - Pile Bents
Item 60.3.b - Piles (Cont'd)

Pile 8 - Timber pile is exposed below the jacket, 1.0' height along the left side.

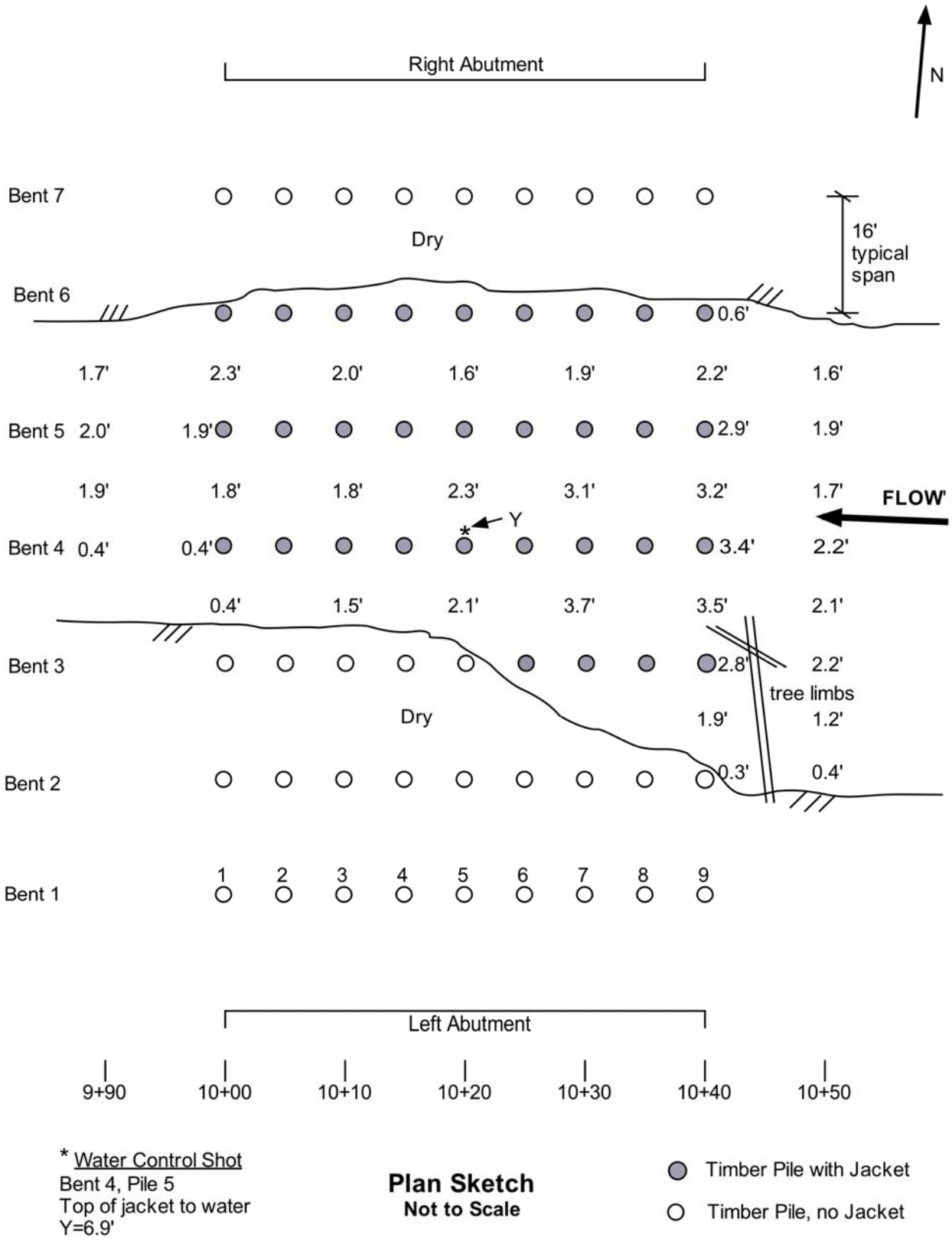
ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.1 - Channel Scour
At the upstream ends of Bents 3, 4, & 5, minor scour has exposed the timber piles below the steel jacket. See soundings on Plan Sketch.

Sketch Log
Sketch 1 : Plan Sketch

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	12J	H-01-005	H01005-12J-DOT-NBI	MAR 24, 2016

SKETCHES



* Water Control Shot
Bent 4, Pile 5
Top of jacket to water
Y=6.9'

Plan Sketch
Not to Scale

Timber Pile with Jacket

Timber Pile, no Jacket

Sketch 1: Plan Sketch

Report Date: January 23, 2018

Proposal No. 608460-130088

State Information

BDEPT#= H01005 Agency Br.No.

Town= Hadley L.O. MHD

B.I.N= 12J AASHTO= 052.4

RANK= 758 H.I.= 85.7 % FHWA Select List= Y

Identification

(8) Structure Number H0100512JDOTNBI

(5) Inventory Route 131000470

(2) State Highway Department District 02

(3) County Code 015 (4) Place code 27690

(6) Features Intersected **WATER FORT RIVER**

(7) Facility Carried **ST 47 BAY RD**

(9) Location .1 M S JCT MIDDLE ST.

(11) Kilometerpoint 0010.621

(12) Base Highway Network Y

(13) LRS Inventory Route & Subroute 000000000000

(16) Latitude 42 DEG 19 MIN 57.63 SEC

(17) Longitude 72 DEG 34 MIN 43.27 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Concrete continuous Code 201

Slab Jointless bridge type: INTEGRAL (timber

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 008

(46) Number of approach spans 0000

(107) Deck Structure Type - Concrete Cast-in-Place Code 1

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - Built-up Code 1

C) Type of deck protection - None Code 0

Age and Service

(27) Year Built 1935

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 02 Under structure 00

(29) Average Daily Traffic 005073

(30) Year of ADT 2016 (109) Truck ADT 11 %

(19) Bypass, detour length 018 KM

Geometric Data

(48) Length of maximum span 0004.9 M

(49) Structure Length 00037.8 M

(50) Curb or sidewalk: Left 01.4 M Right 00.0 M

(51) Bridge Roadway Width Curb to Curb 009.1 M

(52) Deck Width Out to Out 011.5 M

(32) Approach Roadway Width (w/shoulders) 006.1 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared N

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 03.6 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

	Code
(112) NBIS Bridge Length	Y
(104) Highway System	Y
(26) Functional Class - Urban Arterial	14
(100) Defense Highway	0
(101) Parallel Structure	N
(102) Direction of Traffic - 2-way traffic	2
(103) Temporary Structure	Y
(105) Federal Lands Highways	0
(110) Designated National Network	N
(20) Toll - On free road	3
(21) Maintain - State Highway Agency	01
(22) Owner - State Highway Agency	01
(37) Historical Significance undetermined	

Condition

	Code
(58) Deck	5
(59) Superstructure	5
(60) Substructure	5
(61) Channel & Channel Protection	6
(62) Culverts	N

Load Rating and Posting

	Code
(31) Design Load - H 15=M 13.5	2
(63) Operating Rating Method - Load Factor (LF)	1
(64) Operating Rating	32.3
(65) Inventory Rating Method - Load Factor (LF)	1
(66) Inventory Rating	25.4
(70) Bridge Posting	4
(41) Structure - Posted for load	P

Appraisal

	Code
(67) Structural Evaluation	5
(68) Deck Geometry	3
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	0 0 0 0
(113) Scour Critical Bridges	4

Inspections

(90) Inspection Date 10/31/17 (91) Frequency 06 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	03/24/16
(C) Other Special Inspection	Y	06	MO C)	10/31/17
(*) Other Inspection (LN Restriction)	N	00	MO *)	02/26/16
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) UW Special Inspection	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	02/19/08

Rating Loads

Report Date 12/01/15	H20	Type 3	Type 3S2	Type HS
Operating	25.0	37.0	59.0	38.0
Inventory	0.0	0.0	0.0	0.0

Field Posting

Status POSTED Posting Date 02/03/16

	2 Axle	3 Axle	5 Axle
Actual	03	03	03
Recommended	03	03	03

Missing Signs N

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel Y Jointless Bridge

Freeze/Thaw

Accessibility (Needed/Used)

N / N	Liftbucket	N / N	Rigging	N / N	Other
Y / Y	Ladder	N / N	Staging		
N / N	Boat	P / N	Traffic Control		
Y / Y	Wader	N / N	RR Flagperson		
P / N	Inspector 50	P / N	Police		

Inspection Hours: 012

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Existing Condition Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.28	3.43
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.20	21.69	4.99
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.12
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-01 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.28	3.43
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.22	21.71	5.02
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.13
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-02 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.27	3.42
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.22	21.71	5.01
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.13
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-03 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.27	3.42
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.21	21.70	5.01
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.13
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-04 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.02	19.26	3.41
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.20	21.68	4.99
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.12
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Existing Contraction Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

$Y_s = Y_2 - Y_o$ ref: HEC-18, 5th Edition, April 2012, Equation (6.5)

Design Flood Frequency, $Q_s = Q_{100}$

	Left	Channel	Right
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	0.43	4032.83	46.74
D_{50} in mm	0.14	1.47	0.14
Median diameter of bed material (mm), D_{50} =	0.20	1.47	0.20
Median diameter of bed material (ft), D_{50} =	0.000656	0.004823	0.000656
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0008	0.0060	0.0008
Bottom width of the contracted section less pier width(s),(ft), W =	0.24	112.55	2.87
K_u =	0.0077	0.0077	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	1.56	11.50	10.34
Average existing depth in the contracted section (ft), Y_o =	11.06	16.43	9.01
Average contraction scour depth (ft), Y_s =	**-9.50**	**-4.93**	**1.33**

Check Flood Frequency, $Q_c = Q_{200}$

	Left	Channel	Right
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	1.57	4346.35	412.08
D_{50} in mm	0.14	1.47	0.14
Median diameter of bed material (mm), D_{50} =	0.20	1.47	0.20
Median diameter of bed material (ft), D_{50} =	0.000656	0.004823	0.000656
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0008	0.0060	0.0008
Bottom width of the contracted section less pier width(s),(ft), W =	33.68	123.05	457.05
K_u =	0.0077	0.0077	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	0.07	11.36	0.87
Average existing depth in the contracted section (ft), Y_o =	0.25	16.50	1.35
Average contraction scour depth (ft), Y_s =	**-0.18**	**-5.14**	**-0.48**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternatives Contraction Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

$Y_s = Y_2 - Y_o$ ref: HEC-18, 5th Edition, April 2012, Equation (6.5)

Design Flood Frequency, $Q_s = Q_{100}$

	Channel
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	4080.00
D_{50} in mm	1.47
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.004823
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bottom width of the contracted section less pier width(s),(ft), W =	116.00
K_u =	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	11.32
Average existing depth in the contracted section (ft), Y_o =	14.71
Average contraction scour depth (ft), Y_s =	**-3.39**

Check Flood Frequency, $Q_c = Q_{200}$

	CHANNEL
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	4760.00
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.004823
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bottom width of the contracted section less pier width(s),(ft), W =	116.00
K_u =	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	12.92
Average existing depth in the contracted section (ft), Y_o =	30.14
Average contraction scour depth (ft), Y_s =	**-17.22**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Existing Condition Pressure Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

Separation Zone Thickness

$t = 0.5\,(h_b \,.\, h_t/h_u^2)^{0.2}\ (1- h_w/h_t)^{-0.1} \,.\, h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.16)

Pressure Scour

$Y_s = Y_2 + t - h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.14)

Design Flood Frequency, $Q_s = Q_{100}$ with no overtopping

Upstream channel and bridge opening width, W =	105.0
Total discharge, Q, =	4080.0
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.5
Distance from water surface to lower face of bridge girders, h_t =	0.7
Upstream channel flow depth, h_u =	20.2
Weir flow height, h_w =	0.0
Average depth in contracted section after contraction, Y_2 =	12.3
Separation zone thickness, t =	5.26
Pressure scour, Y_s =	-2.95

Check Flood Frequency, $Q_c = Q_{200}$

Upstream channel and bridge opening width, W =	105.0
Total discharge, Q, =	4305.9
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.5
Distance from water surface to lower face of bridge girders, h_t =	1.6
Upstream channel flow depth, h_u =	22.7
Weir flow height, h_w =	0.7
Average depth in contracted section after contraction, Y_2 =	12.9
Separation zone thickness, t =	6.25
Pressure scour, Y_s =	-1.34

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Proposed Condition Pressure Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

Separation Zone Thickness

$t = 0.5\,(h_b \,.\, h_t/h_u^2)^{0.2}\ (1- h_w/h_t)^{-0.1} \,.\, h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.16)

Pressure Scour

$Y_s = Y_2 + t - h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.14)

Design Flood Frequency, $Q_s = Q_{100}$ with no overtopping

Upstream channel and bridge opening width, W =	119.0
Total discharge, Q, =	4080.0
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.8
Distance from water surface to lower face of bridge girders, h_t =	0.5
Upstream channel flow depth, h_u =	20.1
Weir flow height, h_w =	0.0
Average depth in contracted section after contraction, Y_2 =	11.1
Separation zone thickness, t =	4.93
Pressure scour, Y_s =	-4.83

Check Flood Frequency, $Q_c = Q_{200}$

Upstream channel and bridge opening width, W =	119.0
Total discharge, Q, =	4760.0
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.8
Distance from water surface to lower face of bridge girders, h_t =	1.7
Upstream channel flow depth, h_u =	22.7
Weir flow height, h_w =	1.3
Average depth in contracted section after contraction, Y_2 =	12.6
Separation zone thickness, t =	7.10
Pressure scour, Y_s =	-1.07

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Existing Pier Scour

HEC-18 Pier Scour Equation:

$$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$$

ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	37.83
Pier Width (ft), a =	1.32
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	16.37
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.42**
Maximum Pier Scour	**2.42**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	37.83
Pier Width (ft), a =	1.32
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	18.79
Froude Number directly u/s of the pier, Fr_1 =	0.07
Scour Depth (ft), Y_s =	**2.33**
Maximum Pier Scour	**2.33**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative -01 Pier Scour

HEC-18 Pier Scour Equation:

$$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$$

ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	15.27
Froude Number directly u/s of the pier, Fr_1 =	0.10
Scour Depth (ft), Y_s =	**2.58**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	17.73
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.45**

Town: Hadley
Bridge No.: H-01-005
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Project No.: 608460

Proposed Alternative -02 Pier Scour

HEC-18 Pier Scour Equation:

$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$ ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	14.60
Froude Number directly u/s of the pier, Fr_1 =	0.11
Scour Depth (ft), Y_s =	**2.57**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	17.06
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.46**

Town: Hadley
Bridge No.: H-01-005
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Project No.: 608460

Proposed Alternative -03 Pier Scour

HEC-18 Pier Scour Equation:

$$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$$

ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, Θ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	15.34
Froude Number directly u/s of the pier, Fr_1 =	0.10
Scour Depth (ft), Y_s =	**2.53**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, Θ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	17.79
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.45**

Town: Hadley
Bridge No.: H-01-005
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Project No.: 608460

Proposed Alternative -04 Pier Scour

HEC-18 Pier Scour Equation:

$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$ ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	14.49
Froude Number directly u/s of the pier, Fr_1 =	0.11
Scour Depth (ft), Y_s =	**2.57**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	16.92
Froude Number directly u/s of the pier, Fr_1 =	0.10
Scour Depth (ft), Y_s =	**2.61**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Existing Condition Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Design Flood Frequency, $Q_s = Q_{100}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	19.3
Upstream velocity (ft/s), =	1.7
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3342.0
Total discharge in the bridge opening (cfs), =	4080.0
Flow depth in the contracted section (ft), y_2 =	16.4
Velocity in the contracted section (ft/s), =	2.2
Width of the bridge opening (ft) =	112.6
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	36.3
Upstream unit discharge (ft^2/s), q_1, =	32.5
q_2/q_1 =	1.12
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	12.6
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.60
Maximum flow depth resulting from abutment scour (ft), y_{max} =	32.7
Flow depth prior to scour (ft), Y_0 =	19.3
Abutment scour depth (ft), Y_s =	**13.4**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Existing Condition Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Check Flood Frequency, $Q_c = Q_{200}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	21.7
Upstream velocity (ft/s), =	1.6
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3548.4
Total discharge in the bridge opening (cfs), =	4346.4
Flow depth in the contracted section (ft), y_2 =	16.5
Velocity in the contracted section (ft/s), =	2.1
Width of the bridge opening (ft) =	123.1
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	35.3
Upstream unit discharge (ft^2/s), q_1, =	34.5
q_2/q_1 =	1.02
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	12.3
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.6
Maximum flow depth resulting from abutment scour (ft), y_{max} =	32.0
Flow depth prior to scour (ft), Y_0 =	21.7
Abutment scour depth (ft), Y_s =	**10.3**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Proposed Alternatives Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Design Flood Frequency, $Q_s = Q_{100}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	19.27
Upstream velocity (ft/s), =	1.7
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3343.4
Total discharge in the bridge opening (cfs), =	4080.0
Flow depth in the contracted section (ft), y_2 =	14.7
Velocity in the contracted section (ft/s), =	2.3
Width of the bridge opening (ft) =	119.0
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	34.3
Upstream unit discharge (ft^2/s), q_1, =	32.5
q_2/q_1 =	1.05
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	12.0
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.60
Maximum flow depth resulting from abutment scour (ft), y_{max} =	31.2
Flow depth prior to scour (ft), Y_0 =	19.3
Abutment scour depth (ft), Y_s =	**11.9**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Proposed Alternatives Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Check Flood Frequency, $Q_c = Q_{200}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	21.71
Upstream velocity (ft/s), =	1.6
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3544.7
Total discharge in the bridge opening (cfs), =	4760.0
Flow depth in the contracted section (ft), y_2 =	22.9
Velocity in the contracted section (ft/s), =	2.6
Width of the bridge opening (ft) =	119.0
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	40.0
Upstream unit discharge (ft^2/s), q_1, =	34.5
q_2/q_1 =	1.16
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	13.7
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.6
Maximum flow depth resulting from abutment scour (ft), y_{max} =	34.9
Flow depth prior to scour (ft), Y_0 =	21.7
Abutment scour depth (ft), Y_s =	**13.2**

DOCUMENT A00819

BRIDGE INSPECTION REPORT

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MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
02	12J	H-01-005

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
HADLEY	H01005-12J-DOT-NBI	010.621	A:OPEN	OCT 5, 2023

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
ST 47 BAY RD		1935	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
WATER FORT RIVER	Urban Arterial	M. Barrett

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER
201 : Concrete continuous Slab	State Highway Agency	State Highway Agency	A. Power

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
1 : Concrete Cast-in-Place	Overcast	23°C	J. LENARES

ITEM 58 — 5

DECK

		DEF
1.Wearing Surface	6	M-P
2.Deck Condition	5	M-P
3.Stay in Place Forms	N	-
4.Curbs	6	-
5.Median	N	-
6.Sidewalks	6	-
7.Parapets	N	-
8.Railing	6	-
9.Anti Missile Fence	N	-
10.Drainage System	6	-
11.Lighting Standards	N	-
12.Utilities	6	M-P
13.Deck Joints	N	-
14.	N	-
15.	N	-
16.	N	-

CURB REVEAL (In millimeters)	E	W
	215	240

APPROACHES

		DEF
a. Appr. pavement condition	6	M-P
b. Appr. Roadway Settlement	7	-
c. Appr. Sidewalk Settlement	5	M-P
d.	N	-

OVERHEAD SIGNS (Attached to bridge) (Y/N) N

		DEF
a. Condition of Welds	N	-
b. Condition of Bolts	N	-
c. Condition of Signs	N	-

ITEM 59 — 5

SUPERSTRUCTURE

		DEF
1.Stringers	N	-
2.Floorbeams	N	-
3.Floor System Bracing	N	-
4.Girders or Beams	N	-
5.Trusses - General	N	-
a. Upper Chords	N	-
b. Lower Chords	N	-
c. Web Members	N	-
d. Lateral Bracing	N	-
e. Sway Bracings	N	-
f. Portals	N	-
g. End Posts	N	-
6.Pin & Hangers	N	-
7.Conn Plt's, Gussets & Angles	N	-
8.Cover Plates	N	-
9.Bearing Devices	N	-
10.Diaphragms/Cross Frames	N	-
11.Rivets & Bolts	N	-
12.Welds	N	-
13.Member Alignment	7	-
14.Paint/Coating	N	-
15.Concrete Slab	5	M-P

Year Painted	N

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member: (Y/N) N

Any Cracks: (Y/N) N

ITEM 60 — 5

SUBSTRUCTURE

	Dive	Cur		DEF
1. Abutments			5	
a. Pedestals	N	N		-
b. Bridge Seats	N	H		-
c. Backwalls	N	N		-
d. Breastwalls	N	5		M-P
e. Wingwalls	N	N		-
f. Slope Paving/Rip-Rap	N	5		M-P
g. Pointing	N	N		-
h. Footings	N	N		-
i. Timber Piles	N	H		-
j. Scour	N	5		M-P
k. Settlement	N	7		-
l.	N	N		-
m.	N	N		-
2. Piers or Bents			N	
a. Pedestals	N	N		-
b. Caps	N	N		-
c. Columns	N	N		-
d. Stems/Webs/Pierwalls	N	N		-
e. Pointing	N	N		-
f. Footing	N	N		-
g. Piles	N	N		-
h. Scour	N	N		-
i. Settlement	N	N		-
j.	N	N		-
k.	N	N		-
3. Pile Bents			5	
a. Pile Caps	N	6		-
b. Piles	N	5		M-P
c. Diagonal Bracing	N	6		-
d. Horizontal Bracing	N	6		-
e. Fasteners	N	6		-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )

SCOUR: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

I-60 (Dive Report): 7 *I-60 (This Report):* 5

93B-U/W (DIVE) Insp 03/24/2016

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

RTN(1)7-96

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ITEM 61 6

CHANNEL & CHANNEL PROTECTION

	Dive	Cur	DEF
1.Channel Scour	N	6	-
2.Embankment Erosion	N	6	-
3.Debris	N	5	M-P
4.Vegetation	N	7	-
5.Utilities	N	N	-
6.Rip-Rap/Slope Protection	N	6	-
7.Aggradation	N	6	-
8.Fender System	N	N	-

STREAM FLOW VELOCITY:

Tidal ( ) High ( ) Moderate (X) Low ( ) None ( )

ITEM 61 (Dive Report): 6 *ITEM 61 (This Report):* 6

93b-U/W INSP. DATE: 03/24/2016

ITEM 36 ***TRAFFIC SAFETY***

	36	COND	DEF
A. Bridge Railing	0	6	-
B. Transitions	0	3	S-P
C. Approach Guardrail	0	3	S-P
D. Approach Guardrail Ends	0	3	S-P

WEIGHT POSTING *Not Applicable* X

	H	3	3S2	Single
Actual Posting	N	N	N	N
Recommended Posting	N	N	N	N

Waived Date: 00/00/0000 EJDMT Date: 00/00/0000

Signs In Place (Y=Yes,N=No, NR=NotRequired)	At bridge N	At bridge S	Other Advance N	Other Advance S
Legibility/ Visibility				

CLEARANCE POSTING *Not* X Actual Field Measurement

Posted Clearance	E ft	E in	W ft	W in	meter
		0		0	
		0		0	

Signs In Place (Y=Yes,N=No, NR=Not Required)	At bridge E	At bridge W	Advance E	Advance W
Legibility/ Visibility				

ACCESSIBILITY (Y/N/P)

	Needed	Used
Lift Bucket	N	N
Ladder	N	N
Boat	N	N
Waders	Y	Y
Inspector 50	P	Y
Rigging	N	N
Staging	N	N
Traffic Control	P	Y
RR Flagger	N	N
Police	P	Y
Other:		
	N	N

TOTAL HOURS 28

PLANS (Y/N): Y

(V.C.R.) (Y/N): N

TAPE#: _____

List of field tests performed:

RATING

Rating Report (Y/N): Y

Date: 06/01/2021

Inspection data at time of existing rating

I 58: **5** I 59: **5** I 60: **5** Date : 10/31/2017

Recommend for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

REASON: _____

CONDITION RATING GUIDE

(For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advanced section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stablility. Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].

A = ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

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REMARKS

BRIDGE ORIENTATION
Bridge carries State Route 47, north and south, over the Fort River which flows from east to west.

Per the 7/1/2018 Rating Report, the 7 bents and 8 spans are numbered from south to north. The piles are numbered from west to east. **See Sketches 1 - 3.**

GENERAL REMARKS
Traffic Control:
Two Police Officers are needed a one-lane, alternating traffic set-up if the UBIU (Aspen 62) is to be utilized.

Water Level:
Previous reports note that the water level fluctuates by up to 10' at this structure. High water levels may prevent streambed inspection by above water inspection team.

ITEM 58 - DECK

Item 58.1 - Wearing Surface
Hot mix asphalt (HMA) Wearing Surface has minor longitudinal cracking and a core hole in the southbound lane. **See Photo 1.**

Northbound Lane:
- 20' from north end, there is a pothole, 8" long x 14" wide x 2" deep.
- 25' from north end, there is a patched pothole 18" diameter. **See Photo 2.**

Item 58.2 - Deck Condition
Deck Underside has minor cracking with rust staining and efflorescence, delaminations, and scaling/spalling with corroded rebar. Several various concrete patches in all Spans. **See Sketch 4 and Photos 3 & 4.**

Item 58.4 - Curbs
East & West Curbs have reflective placards along the interior face.

East & West Curbs have some scattered hairline cracking with rust staining and efflorescence.

East Curb:
- 15' from the north end, spalled area with exposed rebar, 4' long x 6" high x 4" deep. **See Photo 5.**
- 60' from the north end, delaminated area 6" wide x 14' long with cracking and rust staining.

Item 58.6 - Sidewalks
Sidewalk Surface had scattered transverse cracking up to 1/8" wide.

Sidewalk Underside has random transverse hairline cracks with efflorescence, delaminations and scaling.

East Fascia Sidewalk Support Beam has some deterioration to the vertical and horizontal faces.
See Photo 6.

See Sketch 4 for sidewalk beam & sidewalk underside defects.

Item 58.8 - Railing
Railing consists of three 4" wide x 6" high concrete rails, the top of which is 3' high off the sidewalk, and 10" x 10" x 3'-3" high concrete posts.

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REMARKS

Railings have minor chips and spalls.

East Railing, south end, has moderate vegetation growth.

Item 58.10 - Drainage System
Bridge Deck Underside around the drain holes has scaling and spalling, with severe corrosion to the old and new drain pipes. **See Sketch 4 & Photo 4.**

Item 58.12 - Utilities
Concrete Supports for the utility pipe are cracked, delaminated, and spalled with exposed and corroded rebars. **See Sketch 4 & Photo 7.**

Bridge has retro-fit galvanized steel utility hangers and U-bolts in all spans except for 1, & 6 - 8. Hanger bolts of the Span 4 retro fit are loose.

In Spans 1, 4, 5, 7, & 8, the insulation wrap is falling off the pipe. Some new insulation and insulation protection installed on the utility pipe in Spans 3 - 6.

APPROACHES

Approaches a - Appr. pavement condition
South Approach:
- Transverse cracking and slight breakup at the deck interface.
- Southbound lane has minor segregation.

North Approach:
- Moderate transverse & longitudinal cracking up to 0.3" wide.
- A few small areas of broken pavement, and a patched pothole 18" wide x 4" long x 2" deep.
- Two patched cores holes in the Southbound Lane near the right wheel path.
- Pothole adjacent to the deck end, southbound lane, near centerline, 8" long x 18" wide x 1.5 deep. **See Photo 8.**

Approaches c - Appr. Sidewalk Settlement
North HMA approach sidewalk has 3" of settlement. **See Photo 9.**

South HMA approach sidewalk has 2" of settlement.

ITEM 59 - SUPERSTRUCTURE

Item 59.15 - Concrete Slab
Refer to Item 58.2. - Deck Condition.

ITEM 60 - SUBSTRUCTURE

Item 60.1 - Abutments
Item 60.1.d - Breastwalls
North & South Breastwalls have large spalled areas along the top edges.

North Breastwall:
- West corner, top is spalled with exposed rebar, 2' wide x 1.3' high x up to 2" deep.
- Center section, top is spalled, 25' wide x 1' high x up to 2" deep.

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REMARKS

South Breastwall, top is spalled with exposed rebar and minor efflorescence, 39' wide x up to 4" deep x up to 2' high. **See Photo 10.**

Item 60.1.f - Slope Paving/Rip-Rap
Some of the Rip-Rap on both slopes have been mortared during a previous repair project.

North Slope has broken off due to river erosion and has settled, up to 8". **See Photo 11.**

South Slope has broken off due to river erosion and has settled, up to 1".

Item 60.1.j - Scour
Mortared Rip-Rap settlement mentioned in **Item 60.1.f - Slope Paving/Rip Rap** is indicative of scour.

Item 60.3 - Pile Bents
Item 60.3.a - Pile Caps
Some efflorescence leaching through the deck slab and onto the concrete caps.

Caps have cracking and delamination:

Bent 3, under the sidewalk, has a small delamination 1' high x 1' wide.

Bent 4, over Pile 5, there is a 0.05" wide vertical crack.

Bent 5:
- Over Pile 9, there is a diagonal crack up to 0.15" wide x 18" long.
- Over Pile 5 there is a 0.05" wide vertical crack.

Bent 6, over Pile 5 - 7, has vertical cracking up to 0.05" wide .

Bent 7, over Pile 5 & 6, has vertical cracking up to 0.05" wide .

Item 60.3.b - Piles
Tops of the timber piles are embedded in the concrete caps.

Bents 2 - 6 bottoms of the timber piles have been encased in a concrete filled steel jacket.

Steel angles holding the jackets closed on the upstream end of **Bents 3 & 5** have been damaged/crushed.

Exterior piles (1 & 9) on each bent have severe deterioration due to increased element exposure.

Bents 1 & 7 are on the abutment slopes, above the average low to high watermarks. These timber piles are unprotected, but are in fair to good condition. **See Photo 11.**

Bents 2 - 6, Piles have been encased with a fiberglass form and then grouted 2' below the mud line to the bottom of the bracing with the previous metal jackets remaining. **See Photo 12.**

Timber piles are weathered with minor scattered delaminations, minor checking up to 1" deep and have creosote loss:

Bent 3

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REMARKS

- Pile 9, has a 1.25" wide x 8' high split for the full-height above the metal jacket and 3 reinforcing steel collars near the top. The splitting and collars on this pile have been noted on inspection reports since 1977. **See Photo 13.**
- Top of Pile 1, has a minor check 4" wide x 18" high x 1" deep.

Bent 4, Pile 7, has two checks with penetrations up to 2", one near the pier cap interface, the other at the lower section of the exposed pile near the jacket interface.

Bent 5:

- Pile 1, is in poor condition having rot and soft, punky wood on the west half of the pile for the full height of exposure, with several checks with up to 4" penetration in this area. **See Photo 14.**
- Pile 7, has one check with up to 2" penetration.
- Pile 9, at the concrete cap - 85% of the top of the pile is not in contact with the cap and the connection pin has moderate corrosion. **See Photo 15.**

Bent 6:

- Pile 1, is in poor condition having rot and soft, punky wood on the west half of the pile for the full height of exposure**.** There are several spits with up to 2" penetration in this area.
- Pile 5, has one check 3' long x up to 2" penetration.
- Pile 9, east side has a 1/8" thick depth of splintering and delaminating wood, and a few scattered checks with up to 1" penetration.

Item 60.3.c - Diagonal Bracing

Bent 1, at the upstream end of the lower upstream diagonal brace there is heavy decay, up to 1' deep.

Bent 6, at the end of the upper downstream diagonal brace there is a 4' long crack up to 0.4" wide.

Item 60.3.d - Horizontal Bracing

Bridge has severe decay & splitting to the horizontal bracing:

- Bent 3, between Pile 6 & 7.
- Bent 4, between Pile 4 & 5.
- Bent 5, between Pile 8 & 9.

Horizontal bracing is missing at Bent 6, between Pile 2 & 3. **See Photo 16.**

Item 60.3.e - Fasteners

Bent 3, Column 9, top collars have moderate surface rust. **See Photo 13.**

Bent 6, top of Column 6 at the diagonal brace connection, has a missing bolt.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.1 - Channel Scour

Channel has minor scour at the noses of Bents 3, 4, & 5.

Channel has increased depth at the upstream ends of Spans 4, 5, & 6.

Item 61.2 - Embankment Erosion

Upstream & Downstream Embankments have erosion with exposed roots and downed trees.
See Photo 17.

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REMARKS

Item 61.3 - Debris

Channel has random timber debris throughout:

- Heavy debris along the south face of Bent 3. **See Photo 18.**
- Moderate to heavy debris across the upstream end of the structure typically spanning from bent to bent in Spans 3 - 6. **See Photo 19.**

Item 61.6 - Rip-Rap/Slope Protection

Grouted Rip-Rap at either abutment is shifted due to erosion.

Item 61.7 - Aggradation

Channel has aggregation within Span 3 as well as a vegetated landmass at the Southwest Embankment which appears to partially overtop during high flows. **See Photo 18.**

TRAFFIC SAFETY

Item 36a - Bridge Railing

Refer to Item 58.8. - Railing.

Item 36b - Transitions

Northwest Approach has steel W-beam approach guardrail not attached to the concrete endpost on steel H-posts.

Southwest Approach has steel W-beam approach guardrail bolted to the concrete endpost, on steel H-posts with plastic offset blocks.

Northeast & Southeast Approaches have older steel beam guardrails that are not attached to the concrete endposts, concrete or timber posts, and single strand cable wires attached to a metal collars that are around the concrete endposts. Transitions are old, loose, weak, and substandard. **See Photo 20.**

Item 36c - Approach Guardrail

Southwest Approach guardrail consists of steel W-beam guardrail on steel H-posts with plastic offset blocks.

Northwest Approach guardrail consists of steel W-beam guardrail on steel H-posts.

Northeast Approach guardrail consists of a single strand cable wire above a single panel steel beam on concrete posts. There are also two sections of W-Beam. One section starts on the third post from the bridge and has two panels on concrete posts. The second section starts on the 15th post from the bridge and has 5 panels on steel posts. In several locations, the metal railing is not attached to the posts and the cable is loose. **See Photo 21.**

Southeast Approach guardrail consist of a single strand cable wire above a single panel steel beam with concrete and/or timber posts. There are also three sections of W-Beam that starts on the fourth, and only, timber post from the bridge. In several locations, the metal railing is not attached to the posts and the cable is loose.

Item 36d - Approach Guardrail Ends

Southwest Approach guardrail has a tangent guardrail end.

Southeast, Northeast, & Northwest Approaches have steel terminal ends that are low to the ground. **See Photo 22.**

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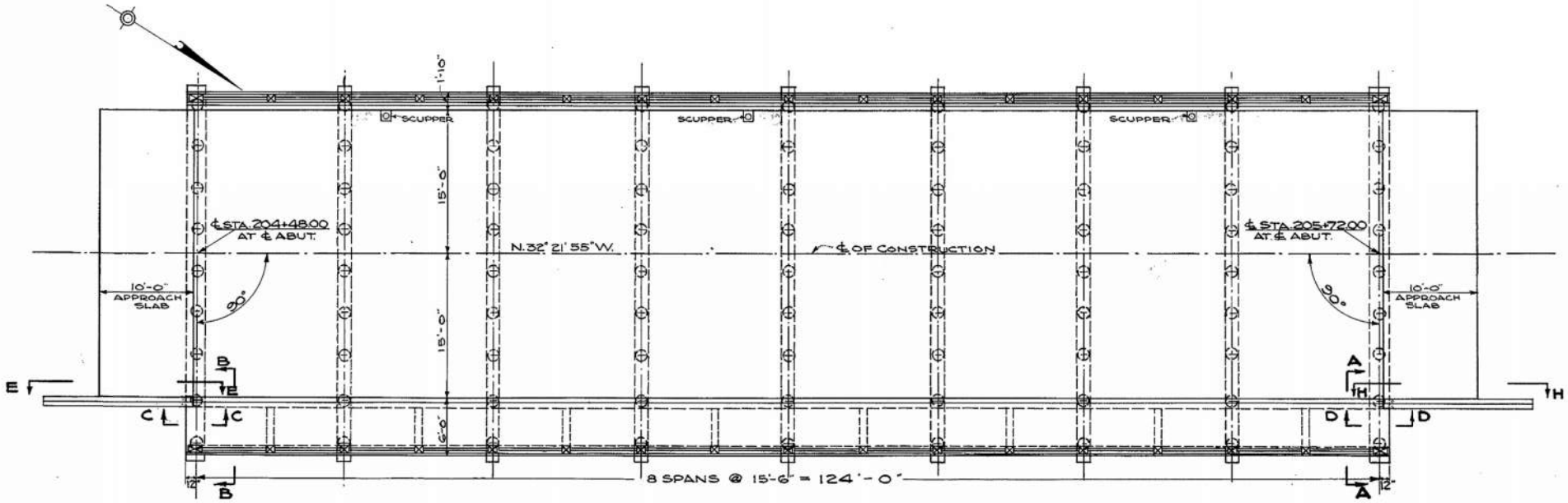
REMARKS

Sketch / Photo Log

Sketch 1 : Plan
Sketch 2 : Elevation
Sketch 3 : Cross Section
Sketch 4 : Plan View - Defects
Photo 1 : Wearing Surface has minor longitudinal cracking and an unfilled core hole in the Southbound Lane.
Photo 2 : Northbound Lane, 20' from north end, there is a pothole, 8" long x 14" wide x 2" deep and 25' from north end, there is a patched pothole 18" diameter.
Photo 3 : Span 3, west deck edge & deck underside have scaling, spalling, cracking and delaminations.
Photo 4 : Deck Underside, Span 4, west end has spalling and exposed rebar.
Photo 5 : East Curb is spalled with exposed rebar.
Photo 6 : East Sidewalk Support Beam, Span 7, has cracking and spalling with exposed rebar.
Photo 7 : Span 5, utility line supports are deteriorated and replaced.
Photo 8 : North Approach has transverse & longitudinal cracks, minor pavement breakup at the deck edge and a pothole at the deck end near the centerline.
Photo 9 : North HMA Approach Sidewalk has 3" of settlement.
Photo 10 : South Breastwall has severe deterioration at the bridge seat. North Breastwall is in similar condition.
Photo 11 : North Slope Paving has settled up to 8" adjacent to Bent 7, Pile 4.
Photo 12 : Pile Bents 2 - 6 are in the channel and have been encased with a fiberglass form and grouted 2' below the mud line to the bottom of metal jackets.
Photo 13 : Bent 3, Pile 9, has a wide split at the top of the pile with a steel collar that is corroded.
Photo 14 : Bent 5, Pile 1 is in poor condition with several checks.
Photo 15 : Bent 5, Pile 9, has minimal contact with the pier cap above. Pile to cap connection pin is starting to corrode.
Photo 16 : Bent 6 has a missing horizontal bracing between Pile 2 and Pile 3.
Photo 17 : Upstream Northeast Embankment has erosion with several downed trees.
Photo 18 : Channel has a heavy debris build-up along the south face of Bent 3. Aggradation in Span 3.
Photo 19 : Channel has moderate to heavy debris caught at the upstream end of the piers. Some debris is under the waterline in this photo.
Photo 20 : Southeast Approach transition is old, loose, weak, and substandard.
Photo 21 : Northeast Approach guardrail is nonconforming.
Photo 22 : Southeast Approach end post is low to the ground.

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SKETCHES



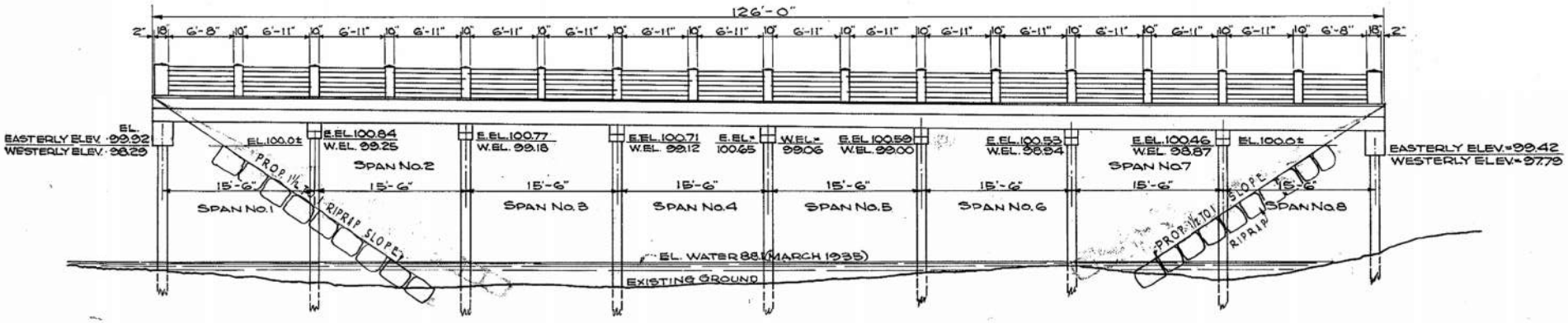
Sketch 1: Plan

A00819 - 11

Proposal No. 608460-130088

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SKETCHES



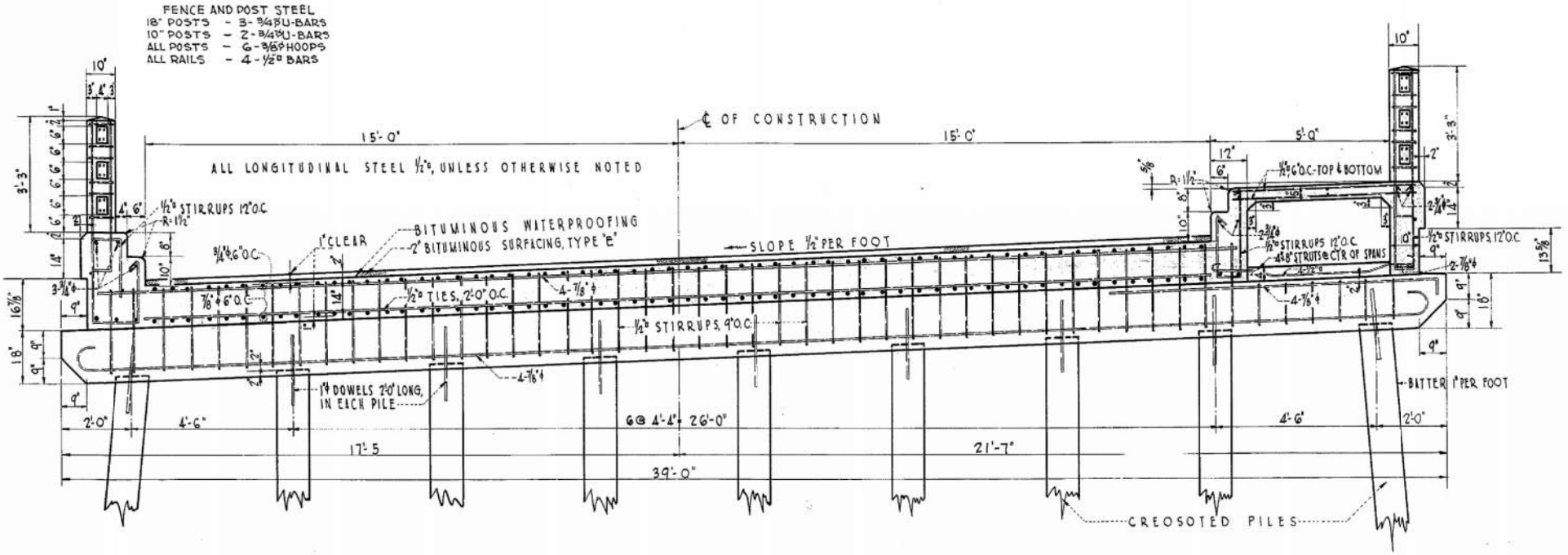
Sketch 2: Elevation

A00819 - 12

Proposal No. 608460-130088

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SKETCHES



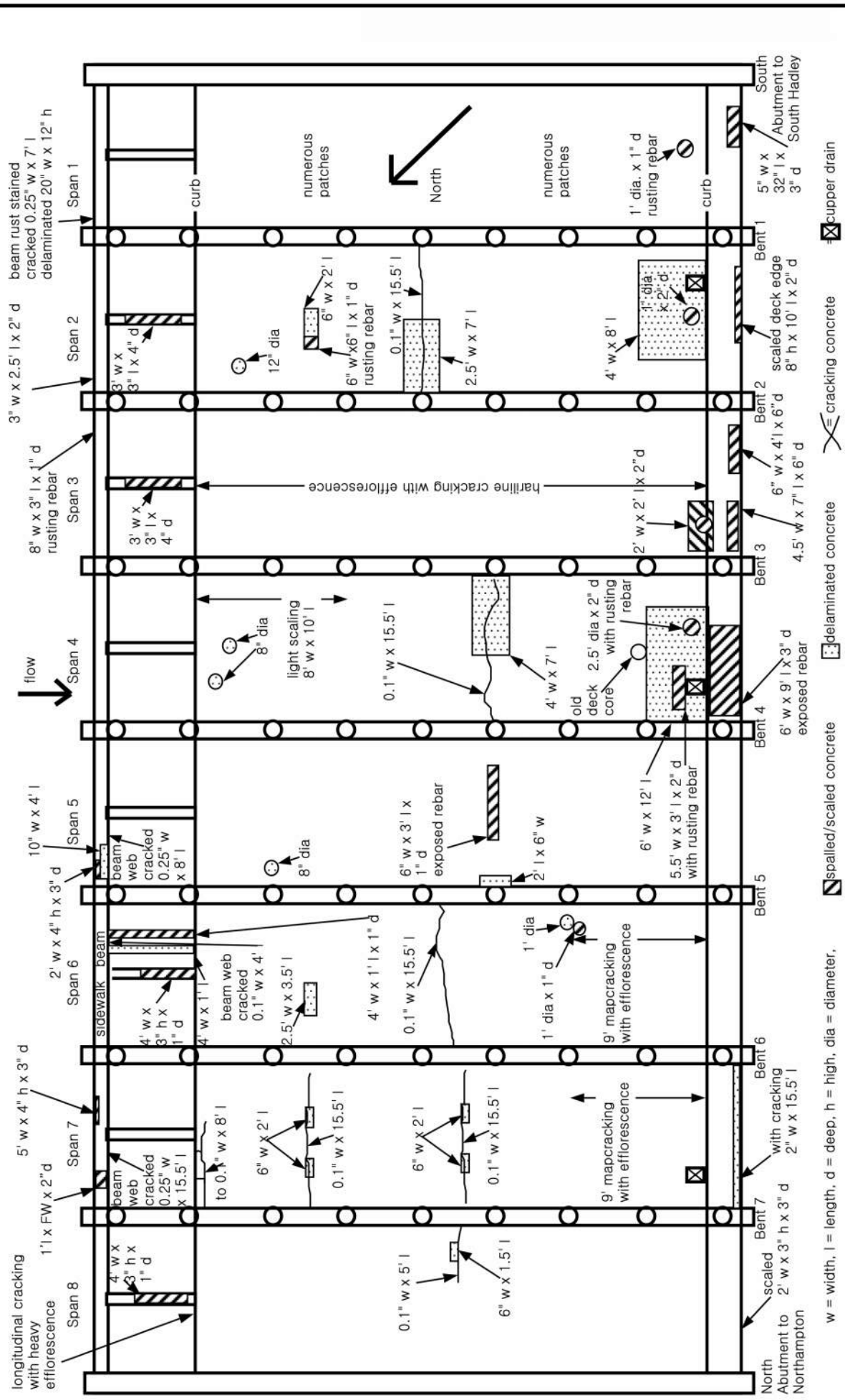
Sketch 3: Cross Section

A00819 - 13

Proposal No. 608460-130088

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SKETCHES



Sketch 4: Plan View - Defects

REM (2)2-21

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PHOTOS



Photo 1: **Wearing Surface has minor longitudinal cracking and an unfilled core hole in the Southbound Lane.**



Photo 2: **Northbound Lane, 20' from north end, there is a pothole, 8" long x 14" wide x 2" deep and 25' from north end, there is a patched pothole 18" diameter.**

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PHOTOS



Photo 3: **Span 3, west deck edge & deck underside have scaling, spalling, cracking and delaminations.**



Photo 4: **Deck Underside, Span 4, west end has spalling and exposed rebar.**

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PHOTOS



Photo 5: East Curb is spalled with exposed rebar.



Photo 6: East Sidewalk Support Beam, Span 7, has cracking and spalling with exposed rebar.

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PHOTOS



Photo 7: **Span 5, utility line supports are deteriorated and replaced.**



Photo 8: **North Approach has transverse & longitudinal cracks, minor pavement breakup at the deck edge and a pothole at the deck end near the centerline.**

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PHOTOS



Photo 9: **North HMA Approach Sidewalk has 3" of settlement.**



Photo 10: **South Breastwall has severe deterioration at the bridge seat. North Breastwall is in similar condition.**

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PHOTOS



Photo 11: **North Slope Paving has settled up to 8" adjacent to Bent 7, Pile 4.**



Photo 12: **Pile Bents 2 - 6 are in the channel and have been encased with a fiberglass form and grouted 2' below the mud line to the bottom of metal jackets.**

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PHOTOS



Photo 13: **Bent 3, Pile 9, has a wide split at the top of the pile with a steel collar that is corroded.**



Photo 14: **Bent 5, Pile 1 is in poor condition with several checks.**

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PHOTOS



Photo 15: Bent 5, Pile 9, has minimal contact with the pier cap above. Pile to cap connection pin is starting to corrode.



Photo 16: Bent 6 has a missing horizontal bracing between Pile 2 and Pile 3.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS



Photo 17: **Upstream Northeast Embankment has erosion with several downed trees.**



Photo 18: **Channel has a heavy debris build-up along the south face of Bent 3. Aggradation in Span 3.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	12J	H-01-005	H01005-12J-DOT-NBI	OCT 5, 2023

PHOTOS



Photo 19: Channel has moderate to heavy debris caught at the upstream end of the piers. Some debris is under the waterline in this photo.



Photo 20: Southeast Approach transition is old, loose, weak, and substandard.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	12J	H-01-005	H01005-12J-DOT-NBI	OCT 5, 2023

PHOTOS



Photo 21: Northeast Approach guardrail is nonconforming.



Photo 22: Southeast Approach end post is low to the ground.

State Information

BDEPT#= H01005 Agency Br.No.

Town= Hadley L.O. MHD

B.I.N= 12J AASHTO= 048.0

RANK= 173 H.I.= 77.4 % FHWA Select List= Y (6/21/2017)

Identification

(8) Structure Number	H0100512JDOTNBI
(5) Inventory Route	131000470
(2) State Highway Department District	02
(3) County Code 015 (4) Place code	27690
(6) Features Intersected	**WATER FORT RIVER**
(7) Facility Carried	**ST 47 BAY RD**
(9) Location	.1 M S JCT MIDDLE ST.
(11) Kilometerpoint	0010.621
(12) Base Highway Network	Y
(13) LRS Inventory Route & Subroute	000000000000
(16) Latitude	42 DEG 19 MIN 57.63 SEC
(17) Longitude	72 DEG 34 MIN 43.27 SEC
(98) Border Bridge State Code	Share %
(99) Border Bridge Structure No. #	

Structure Type and Material

(43) Structure Type Main: Concrete continuous	Code 201
Slab	Jointless bridge type: INTEGRAL (timber
(44) Structure Type Appr: Other	Code 000
(45) Number of spans in main unit	008
(46) Number of approach spans	0000
(107) Deck Structure Type - Concrete Cast-in-Place	Code 1
(108) Wearing Surface / Protective System:	
A) Type of wearing surface - Bituminous	Code 6
B) Type of membrane - Built-up	Code 1
C) Type of deck protection - None	Code 0

Age and Service

(27) Year Built	1935
(106) Year Reconstructed	0000
(42) Type of Service: On - Highway-Ped	
Under - Waterway	Code 55
(28) Lanes: On Structure 02	Under structure 00
(29) Average Daily Traffic	017800
(30) Year of ADT 2023 (109) Truck ADT	03 %
(19) Bypass, detour length	018 KM

Geometric Data

(48) Length of maximum span	0004.7 M
(49) Structure Length	00038.4 M
(50) Curb or sidewalk: Left 00.0 M	Right 01.4 M
(51) Bridge Roadway Width Curb to Curb	009.1 M
(52) Deck Width Out to Out	011.5 M
(32) Approach Roadway Width (w/shoulders)	006.1 M
(33) Bridge Median - No median	Code 0
(34) Skew 00 DEG (35) Structure Flared	N
(10) Inventory Route MIN Vert Clear	99.99 M
(47) Inventory Route Total Horiz Clear	09.1 M
(53) Min Vert Clear Over Bridge Rdwy	99.99 M
(54) Min Vert Underclear ref N	00.00 M
(55) Min Lat Underclear RT ref N	00.0 M
(56) Min Lat Underclear LT	00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway	Code 0
(111) Pier Protection	Code
(39) Navigation Vertical Clearance	000.0 M
(116) Vert-lift Bridge Nav Min Vert Clear	M
(40) Navigation Horizontal Clearance	0000.0 M

Classification

	Code
(112) NBIS Bridge Length	Y
(104) Highway System	Y
(26) Functional Class - Urban Arterial	14
(100) Defense Highway	0
(101) Parallel Structure	N
(102) Direction of Traffic - 2-way traffic	2
(103) Temporary Structure	N
(105) Federal Lands Highways	0
(110) Designated National Network	N
(20) Toll - On free road	3
(21) Maintain - State Highway Agency	01
(22) Owner - State Highway Agency	01
(37) Historical Significance undetermined	

Condition

	Code
(58) Deck	5
(59) Superstructure	5
(60) Substructure	5
(61) Channel & Channel Protection	6
(62) Culverts	N

Load Rating and Posting

	Code
(31) Design Load - H 20=M 18	4
(63) Operating Rating Method - Load Factor (LF)	1
(64) Operating Rating	42.5
(65) Inventory Rating Method - Load Factor (LF)	1
(66) Inventory Rating	25.4
(70) Bridge Posting	5
(41) Structure - Open	A

Appraisal

	Code
(67) Structural Evaluation	5
(68) Deck Geometry	3
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	0 0 0 0
(113) Scour Critical Bridges	4

Inspections

(90) Inspection Date 10/05/23 (91) Frequency 24 MO

(92) Critical Feature Inspection: (93) CFI DATE

(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	03/24/16
(C) Other Special Inspection	N	00	MO C)	10/31/17
(*) Other Inspection (LN Restriction)	N	00	MO *)	02/26/16
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) UW Special Inspection	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	02/19/08

Rating Loads

Report Date 06/01/21	H20	Type 3	Type 3S2	Type HS
Operating	36.0	42.0	68.0	44.0
Inventory	23.0	27.0	43.0	27.0

Field Posting

Status LEGAL Posting Date 10/28/21

	2 Axle	3 Axle	5 Axle	Single
Actual				
Recommended				

Missing Signs N

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel Y Jointless Bridge Freeze/Thaw

Stairs On/Adjacent 0 Stair Owner(s)

Accessibility (Needed/Used)

N / N	Liftbucket	N / N	Rigging	N / N	Other
N / N	Ladder	N / N	Staging		
N / N	Boat	P / Y	Traffic Control		
Y / Y	Wader	N / N	RR Flagperson		
P / Y	Inspector 50	P / Y	Police		

Inspection Hours: 028

DOCUMENT A00820

Massachusetts Department of Transportation
Conditions of Custody

REQUEST FOR RELEASE OF MASSDOT AUTOCAD FILES FORM
(Only to be used following award of contract)

City/Town: HADLEY Project File Number: 608460

Contract Number: 130088

Project Description: Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

All AutoCAD files are provided solely as a courtesy to facilitate public access to information. MassDOT attempts to provide current and accurate information but cannot guarantee so. MassDOT provides such documents, files or other data "as is" without any warranty of any kind, either expressed or implied, including but not limited to, accuracy, reliability, omissions, completeness and currentness. The Commonwealth of Massachusetts and its Consultants shall not be liable for any claim for damages, including lost profits or other consequential, exemplary, incidental, indirect or special damages, relating in any way to the documents, files or other data accessible from this file, including, but not limited to, claims arising out of or related to electronic access or transmission of data or viruses. Because data stored on electronic media can deteriorate undetected or be modified without our knowledge, MassDOT cannot be held liable for its completeness or correctness. MassDOT makes no representation as to the compatibility of these files beyond the version of the stated CAD software.

By signing this form, I agree that it shall be my responsibility to reconcile this electronic data with the conformed contract documents, and that only the conformed contract documents shall be regarded as legal documents for this Project. I understand that this authorization does not give me the right to distribute the files. I agree to the terms above and wish to receive the AutoCAD files.

This signed form shall be emailed to the Highway Design Engineer at the MassDOT -Highway Division at the following email address:

DOTHighwayDesign@dot.state.ma.us
Attn: AutoCAD Files

Name of person requesting AutoCAD files: _____

Affiliation/Company: _____

Address: _____

_____

Telephone number: _____

Email address: _____

Signature/Date: _____

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DOCUMENT A00826

Combined

Army Corps of Engineers
Permit Application
and
Massachusetts Department of Environmental Protection
Water Quality Certificate Application

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Bay Road (Route 47) over Fort River (ID segment MA34-27) MassDOT Project #608460 Hadley, MA

401 MassDEP Water Quality Certification and 404 USACE Pre-Construction Notification

APPLICANT:
MassDOT
10 Park Plaza
Suite 7360
Boston, MA 02116

PREPARED BY:
Benesch
50 Redfield St
Suite 102
Boston, MA 02122

October 7, 2024

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October 7, 2024

Heidi Davis, Senior Environmental Analyst & Highway Unit Supervisor
MassDEP Boston Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: 401 Water Quality Certification and 404 USACE Pre-Construction Notification for the Replacement of the Bay Road (Route 47) Bridge over the Fort River
MassDOT Project File No. 608460

Dear Ms. Davis:

The Massachusetts Department of Transportation, Highway Division (MassDOT) is submitting the enclosed 401 Water Quality Certification/404 USACE Pre-Construction Notification (GP 23) for your review.

A prefiling meeting occurred in the field on May 14, 2024 with attendees from MassDOT Environmental, MassDEP and Benesch (project designer).

The proposed project involves replacement of the current bridge structure that carries Bay Road (Route 47) over the Fort River in the town of Hadley, as well as reconstructing the roadway approaches. The project requires work within Waters of the United States, including approximately 1,500 square feet (SF) of permanent waterway impacts, 8,720 SF of temporary waterway impacts, 374 cubic yards of dredging and 940 SF of temporary Bordering Vegetated Wetland impacts.

Due to the impacts to Waters of the United States, a Pre-Construction Notification will be filed with USACE in addition to the MassDEP Water Quality Certification.

The project is being filed under the MassDOT bridge exemption as specified in the 2014 Transportation Bond Bill. The proposed bridge is substantially the functional equivalent of, and in similar alignment to, the existing bridge.

The project proponent, MassDOT, hereby certifies that all information contained herein is true, accurate and complete to the best of my knowledge and belief.

The project proponent hereby requests that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.

Accompanying the Application are several attachments describing the proposed project in detail. If you have any questions concerning the proposed work, you may contact Courtney Walker, at (857) 262-0757 or courtney.l.walker@dot.state.ma.us .

Sincerely,



Courtney Walker
MassDOT – Highway Division
Wetlands and Water Resources Coordinator

CC:
Michael Joa, MassDOT
Anthony Christakis, MassDOT
Tyler Lewis, MassDEP
Ryan Hale, MassDEP
Kayla Loubriel, Hadley Conservation Commission
Daniel Vasconcelos, USACE
Kevin Newton, USACE

October 7, 2024

Daniel Vasconcelos, Regulatory Division
USACE New England District
696 Virginia Road
Concord, MA 01742

Re: 401 Water Quality Certification and 404 USACE Pre-Construction Notification for the Replacement of the Bay Road (Route 47) Bridge over the Fort River
MassDOT Project File No. 608460

Dear Mr. Vasconcelos:

The Massachusetts Department of Transportation, Highway Division (MassDOT) is submitting the enclosed 401 Water Quality Certification/404 USACE Pre-Construction Notification (GP 23) for your review.

A prefiling meeting occurred in the field on May 14, 2024 with attendees from MassDOT Environmental, MassDEP and Benesch (project designer).

The proposed project involves replacement of the current bridge structure that carries Bay Road (Route 47) over the Fort River in the town of Hadley, as well as reconstructing the roadway approaches. The project requires work within Waters of the United States, including approximately 1,500 square feet (SF) of permanent waterway impacts, 8,720 SF of temporary waterway impacts, 374 cubic yards of dredging and 940 SF of temporary Bordering Vegetated Wetland impacts.

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Sincerely,

Courtney Walker

Courtney Walker
MassDOT – Highway Division
Wetlands and Water Resources Coordinator

CC:
Michael Joa, MassDOT
Anthony Christakis, MassDOT
Tyler Lewis, MassDEP
Ryan Hale, MassDEP
Heidi Davis, MassDEP
Kayla Loubriel, Hadley Conservation Commission
Kevin Newton, USACE

The below Public Notice will be published with the Daily Hampshire Gazette

PUBLIC NOTICE

Massachusetts Department of Environmental Protection
Division of Wetlands and Waterways
MassDEP Boston Office
100 Cambridge Street Suite 900
Boston, MA 02114

Pursuant to 33 U.S.C. 1341 and M.G.L. c. 21 §§ 26 - 53, notice is given of a 401 Water Quality Certification application for the replacement of Bridge #H-01-005, Bay Road over the Fort River in the Town of Hadley, Massachusetts by the Massachusetts Department of Transportation – Highway Division, Ten Park Plaza, Room 7360, Boston, MA 02116. The purpose of the project is to upgrade the existing bridge over the Fort River. The proposed bridge will consist of two pipe pile bents with reinforced concrete pile caps and two integral reinforced concrete abutments. Associated roadwork includes 12-foot wide lanes in each direction, 5-foot wide outside shoulders, and sidewalk on the east side of the bridge. Additional information may be obtained from the Massachusetts Department of Transportation – Highway Division at the above address, attention Courtney Walker or by emailing Courtney.l.walker@dot.state.ma.us. Written comments should be sent to Heidi Davis, MassDEP Wetlands Program, 100 Cambridge Street, Suite 900, Boston, MA 02114 or heidi.davis@mass.gov within twenty-one days of this notice.

Any group of ten persons, any aggrieved person, or any governmental body or private organization with a mandate to protect the environment who submits written comments may appeal the Department's Certification. Failure to submit written comments before the end of the public comment period may result in the waiver of any right to an adjudicatory hearing.

U.S. Army Corps of Engineers (USACE), New England District (NAE)

PRE-CONSTRUCTION NOTIFICATION (PCN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose The information provided will be used in evaluating activities under Pre-Construction Notification procedures within New England.

Routine Uses This information may be shared with other federal, state, and local government agencies during the application review process. Submission

Disclosure of requested information is voluntary. However, if information is not provided the PCN application cannot be fully evaluated nor can USACE render a permit decision.

Instructions The applicant must complete ALL required sections of this document before their submission to USACE. The PCN submission to USACE shall include one set of drawings which show the location and character of the proposed activity, statements that address each required field below, and documentation that supports each field (e.g., emails, letters, description/narrative, phone calls, surveys, reports, etc.). Electronic submissions to the following address are strongly preferred: cenae-r-ma@usace.army.mil. The email subject line shall contain the following: General Permit #, PCN, City/Town, and date submitted. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME
First - Courtney Middle - Last - Walker
Company - MassDOT - Highway Division
E-mail Address - courtney.l.walker@dot.state.ma.us

8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Ashley Middle - Last - Bomely
Company - Benesch
E-mail Address - abomely@benesch.com

6. APPLICANT'S ADDRESS:
Address- 10 Park Plaza, Suite 7360
City - Boston State - MA Zip - 02116 Country - USA

9. AGENT'S ADDRESS:
Address- 50 Redfield Street, Suite 102
City - Boston State - MA Zip - 02122 Country - USA

7. APPLICANT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile
857-262-0757

10. AGENT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile
857-271-3019

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Ashley Bomely to act on my behalf as my agent in the processing of this general permit PCN application and to furnish, upon request, supplemental information in support of this general permit PCN application.

Courtney Walker — SIGNATURE OF APPLICANT
10/7/2024 — DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)
MassDOT Project #608460 - Hadley - Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)
Fort River

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
Bay Road (Route 47)
City: Hadley State: MA Zip: 01035

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)
Latitude: 42° 19' 57.63" °N Longitude: 72° 34' 43.27" °W

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: Municipality:

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

From West: Follow MA-9 East until the first traffic circle. Take 3rd exit toward Damon Road. At next traffic circle, take 2nd exit for MA-9E/Bridge St. After ~0.5mile, slight right at Old Bay Rd. After ~0.25 mile, right onto Bay Rd. After 1.5 mile, arrive at bridge.
From East: FOllow I-90 West to Northampton and take exit 45 toward I-91 North. Take exit 25 toward Route 9 Hadley/Amherst. At traffic circle, take 1st exit for MA-9E/Bridge St. After ~0.5mile, slight right at Old Bay Rd. After ~0.25 mile, right onto Bay Rd. After 1.5 mile, arrive at bridge.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

GP 23

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

The proposed work consists of replacing the existing bridge structure over the Fort River. The duration of the work-in-water is anticipated to be for two construction seasons.

For additional information, refer to Attachment A - Water Quality Narrative

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

Temporary sandbag cofferdams are to be installed during low flow river conditions to work in the dry during construction.

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

The purpose of this project is to replace the deteriorating bridge which spans over the Fort River.

22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by Proposed General Permit Activity (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration	Purpose
8,720 SF			Temp. (2 years)	Installation of sandbag cofferdams in order to perform bridge replacement within Waters of the US
1,500 SF			Permanent	Installation of riprap and proposed bridge piers within Waters of the US
		374 CY	Temp. (2 years)	Dredging for streambed restoration and riprap installation within Waters of the US
940 SF			Temp. (2 years)	Temporary impacts to Vegetated Wetland due to installation of sandbag cofferdams in order to perform bridge replacement
	210 linear feet		Permanent	Total length of bank impacts due to proposed work (150 linear feet along south bank, 60 linear feet along north bank)

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other GP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project on any related activity (*see instructions*)

N/A

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

N/A

25. Is Any Portion of the General Permit Activity Already Complete? [ ] Yes [X] No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

Northern Long-Eared Bats (NLEB) are listed as Endangered. There are no known presence of NLEB or roosts in the vicinity of the project, therefore no impacts are anticipated. Tricolored Bats are proposed to be endangered, as the USFWS has not made a determination on the uplisting and is currently under review. It is expected that they will make a determination this summer. If they determine the species warrants listing under the ESA we would then consult with the USFWS for Tricolor on any project in construction with potential stressors on the species in its range, as well the ad program going forward. But at this time, no official determination can be made for a species that's not listed.

27. List any historic properties that have the potential to be affected by the proposed GP activity or include a vicinity map indicating the location of the historic property or properties. Attach relevant project information, along with any responses received from project notifications to this submittal. (*see instructions*)

There are historic properties in the vicinity of the project, however there are no impacts to those properties associated with this project.

28. For a proposed GP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

N/A

29. If the proposed GP activity also requires permission from the USACE pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the USACE district having jurisdiction over that project? [ ] Yes [ ] No

If "yes", please provide the date your request was submitted to the USACE District:

30. Does the activity require a 401 Water Quality Certification (WQC)? If so, specify the type of 401 WQC that is required (general or individual). In cases where an individual 401 WQC is required, provide the date the 401 WQC certification request was submitted to the certifying authority and their contact information.

MassDEP 401 WQC (individual) - to be filed concurrently

31. If the terms of the GP(s) you want to use require additional information to be included in the PCN (i.e. sampling and analysis plan), please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

N/A

32. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Courtney Walker	10/7/2024	Ashley Bomely	10/07/2024
SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The Pre-Construction Notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

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An Official website of the Commonwealth of Massachusetts

EEA ePLACE Portal

Announcements | Logged in as: ASHLEY BOMELY | Collections (0) | Reports (4) | Account Management | Logout

Need Help? For technical assistance in using this web application, please call the ePLACE Help Desk Team at (844) 733-7522 or (844) 73-ePLAC between the hours of 7:30 AM-5:00 PM Monday-Friday, with the exception of all Commonwealth and Federally observed holidays. If you prefer, you can also e-mail us at ePLACE_helpdesk@mass.gov. For assistance with non-technical questions, please contact the issuing Agency directly using the links below.

Contact:
Energy and Environmental Affairs, MASSDEP
Energy and Environmental Affairs, MDAR
Energy and Environmental Affairs, DCR

Convenience Fee: Please note there will be a convenience fee for all online credit card transactions. There is also a nominal fee for online payment by check.

Home

DEP Applications

WW26 - Combined Licenses/Permits for Waterways and Water Quality Certification Application

1 Pre-Consultation Info	2 Location and Contact Info	3 Chapter 91 Information	4 401 Dredge Information	5 401 Fill Information	6	7	8

Step 1: Pre-Consultation Info > Page 1 of 2

Instructions

For instructions, please pay specific attention to the plan checklist about required information for application completeness.

* indicates a required field.

Pre-Consultation Information

If you have not consulted with the MassDEP-401 WQC Program regarding this application, please click on the "Instructions" button above for more information on whom to contact.

* Have you consulted with MassDEP about the combined application process?:
(●) Yes ( ) No

Date you consulted with MassDEP: *
05/14/2024

Continue Application »

Save and resume later

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Home

DEP Applications

WW26 - Combined Licenses/Permits for Waterways and Water Quality Certification Application

1 Pre-Consultation Info	2 Location and Contact Info	3 Chapter 91 Information	4 401 Dredge Information	5 401 Fill Information	6	7	8

Step 1: Pre-Consultation Info > Page 2 of 2

Instructions

* indicates a required field.

Application Information

Please select the Chapter 91 Water-Dependent Application (if applicable):

--Select--

Please select the 401 Water Quality Certification for Dredging Application (if applicable):

WW08 - 401 Minor Dredging - Minor < 5000 cubic yards

Please select the 401 Water Quality Certification for Fill/Excavation Application (if applicable):

WW10 - 401 Major Fill and Excavation - Major >= 5000 square fe

Continue Application »

Save and resume later

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Energy and Environmental Affairs, MDAR
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DEP Applications

WW26 - Combined Licenses/Permits for Waterways and Water Quality Certification Application

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* indicates a required field.

Primary Project Location

If the project site does not have a traditional physical address, please enter Street Number as "0" Street Name as "N/A", enter the latitude and longitude coordinates, and complete "Brief Description of Project Location" in the Project Information Section.

To find the latitude and longitude information, type in your address or locate the project site on Search Google Maps - Right click on your location pin. The format should be in decimal degrees (i.e., Latitude XX.XXXXXX Longitude -XX.XXXXXX).

"City" field must list the name of one of the 351 municipalities in the Commonwealth - please do not list a neighborhood or village name in this field or elsewhere in this application form.

*

Name of the Waterbody:
Fort River (ID Segment MA34-27)

*Street #: 0
*Street Name: Bay Road
Street Name 2:

*City: Hadley
*State: MA
*Zip: 01035-

Latitude*: 42.332675
Longitude*: 72.578686

Clear

Other Primary Location Info

*Parcel ID: N/A

*Municipality : HADLEY

Project Location Info

* Will the project occur in multiple municipalities?:
○ Yes ◉ No

Additional Project Sites

Additional Project Sites

In the 'Additional Project Location Description' field, please include the names of all waterbodies and add specific locations with latitude and longitude information.

Showing 0-0 of 0

	Municipality	Description	
No records found.			

Add a Row | Edit Selected | Delete Selected

Continue Application » Save and resume later

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Contact:
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* indicates a required field.

Permittee

"Permittee" is the individual, or individual authorized by a company/organization (previously referred to as "Applicant") submitting the application and the authorization will be issued in their name.

If you are a consultant, engineer, attorney, or other representative who is preparing the application on behalf of the Permittee you are an "Application Contact". Do not enter your name or contact information in the fields for the Permittee.

If you are the Permittee:
Click on "Add New" button and select the checkbox on the top "Use Login Information" and click "Continue". (Please note: if you are just filing this Application on your behalf, please disregard the language below!)

If you are a consultant or other representative submitting the application on behalf of a Permittee:
• If the Permittee has an EEA ePLACE account and they will be contributing to the Application process, click "Look Up" button, search and select the appropriate Permittee.
• If the Permittee does not have an EEA ePLACE account and will not be contributing to the Application process, click "Add New" button and enter the Permittee information on their behalf.
• If there are multiple Permittees, please enter information for one primary Permittee here and any additional Permittees in the "Application Contact" section.

An application will not be processed without valid contact information for the Permittee that includes their mailing address and phone number or email address.

Permittee:

MassDOT Highway Division
10 Park Plaza, Suite 7360
Boston, MA, 02116
Telephone #: 857-262-0757 Email: courtney.l.walker@dot.state.ma.us

Edit or View Remove

Application Contacts

The name and contact information for any additional Permittee and all Property Owners are required to be entered in this section. Every contact must be entered individually; do not enter 2 names in 1 contact field.

An "Application Contact" is an individual or organization who assisted with the application (in addition to the Permittee), or who is

contributing to the application. For example, a Property Owner, Additional Permittee, a consultant, an authorized representative etc.,

If the Permittee is the Property Owner, do not also list them as a Property Owner.

If there are any additional Permittees who should be listed on the authorization, each one is required to be listed.

If there are any Property Owners other than the Permittee, each one is required to be listed. Enter one as Property Owner and all others as Additional Property Owner (if you enter more than 1 contact type as Property Owner the system will send an error message).

• If the Contact has an EEA ePLACE account and they will be contributing to the Application process, click "Look Up" button, search and select the appropriate Contact.
• If the Contact does not have an EEA ePLACE account and/or will not be contributing to the Application process, click "Add New" button and enter their Contact information.

Note – If a Contact who will be submitting information in the online Application process has not yet created an account, click on "save and resume later" button, advise the Contact to create an account in the EEA ePLACE Portal, and then resume the application and "Look Up" that person.

Add New | Look Up

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Contact Type	Name	Organization Name	Contact Person	Action
Application Prepared By	ASHLEY BOMELY			Edit/View Delete

Continue Application » | Save and resume later

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EEA ePLACE Portal

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Step 4: 401 Dredge Information > Page 1 of 5

Please note: Now you are starting the 401 Water Quality Dredging application process. Please enter all the application information accordingly.

* indicates a required field.

Pre-Application Information

* Has the DEP Agency specified that you are exempt from this process?:
○ Yes ◉ No

Has the project's Sampling Analysis Plan been approved by the DEP Agency? If yes, please attach a document 'DEP Sampling Analysis Plan' in the document section.: *
◉ Yes ○ No

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Please continue with 401 Water Quality Dredging application process.

* indicates a required field.

Project Information

* Project Name:
MassDOT #608460 - Hadley - Bridge Replacement, H-01-005, Bay Road (F

* Have you completed the Public Notice as per 314 CMR 9.00? If yes, please attach a completed 'Proof of Public Notice' document in the document section.:
○ Yes ◉ No

* Will the proposed project occur in any wetlands or waters designated as 'Outstanding Resource Waters'?:
○ Yes ◉ No

* Identify the loss, or alteration, in square feet for Land under water:
10220

* Identify the loss, or alteration, in square feet for Other Resources:
940

Material to be Dredged

* Briefly describe in general the proposed project or activity, including the purpose and intended use of the project, and the duration of the work within any waterbody:
The proposed work consists of replacing the existing bridge structure at Bay Road (Route 47) over the Fort River. The duration of the work-in-water is anticipated to be for two construction seasons.

* Proposed Start Date:
05/01/2025

* What is the expected frequency of maintenance dredging of this project?:
N/A

* Length of the proposed project (If applicable, please include the maximum and minimum):

Approximately 200' total.

* Width of the proposed project (If applicable, please include the maximum and minimum):

Approximately 75' total.

* Depth of the proposed project (If applicable, please include the maximum and minimum):

Varies due to bridge substructure.

* Volume of the proposed project(Cubic yards):

374 CY of total dredge.

* Type of proposed project:

Improvement dredging

* Briefly describe the physical dredging operation (such as., dredging methods), the method of release of the dredged material into the disposal site, and the name of the contractor if other than the applicant. (Please attach a detailed document - "Dredging and Disposal Operation" in the document section of the application):

Dredging methods are determined by the Contractor as part of their means and methods. The Contractor will be determined following the bid process. Areas requiring dredging is for streambed restoration within the footprint of the existing bridge and where proposed riprap is being placed.

* Briefly describe all measures designed to avoid and minimize adverse impacts of the project on aquatic life and the aquatic ecosystem. Where impacts cannot be avoided or minimized, what mitigation measures are proposed? (If necessary, please attach a document - "Performance Standard to avoid and minimize and mitigate impact" in the document section of the application):

Temporary sandbag cofferdams are to be installed during low flow river conditions to work in the dry during construction.

* Does the proposed project have any past history of chemical or oil spills of discharge?:

○ Yes ◉ No

* Does the proposed project have any past history of Upstream or on-site industrial or municipal discharge within 1,000 feet of the proposed project?:

○ Yes ◉ No

* Does the proposed project have any past history of chronic pollutant loading from port or harbor use and/or other sources of pollutants? (eg. CSO or POTW discharges):

○ Yes ◉ No

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Please continue with 401 Water Quality Dredging application process.

* indicates a required field.

Proposed Ocean Site

Location of proposed disposal site and its physical boundaries:

N/A

Has the site been designated by the State or E.P.A. as a dredge disposal site?:

○ Yes ◉ No

If no, give a brief description of the characteristics of the proposed disposal site and an explanation as to why no currently designated site is feasible for this project. : *

N/A

Is the anticipated disposal site located within a designated ocean sanctuary as established by federal law or G.L.c. 132A, sec. 13?:

○ Yes ◉ No

Disposal/Dewatering Land Site

If necessary, please attach a document - "Plans for effluent control at the dewatering and disposal sites" in the document section of the application.

Location of proposed disposal and dewatering sites and physical boundaries:

Dewatering will be necessary for the replacement of the riprap at the abutments and the removal of the existing bridge substructure. The water pumped out of the confined areas will be transferred to a temporary sediment containment structure on site. The structure will filter out any sediments before the filtered water is discharged back into the environment. All sediment containing structures will be placed outside of any environmentally sensitive resource areas. Exact location of sediment containment structures will be determined by Contractor menas and methods with approval by the Engineer.

Indicate drainage characteristics of dewatering and disposal sites from the results of test pits, borings, and percolation tests as applicable:

How long are the dewatering and disposal sites estimated to be in use from this project?:

The total project duration will be for two construction seasons.

Proposed Barge Site

Are you proposing dewatering of dredged sediment on a barge? If yes, please attach a document 'Plans for adequate containment' in the document section.:

○ Yes ◉ No

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* indicates a required field.

Grain Size Analysis

Grain Size Analysis

Grain Size Analysis must be provided for particles passing the number 200 testing sieve.

Showing 1-1 of 1

	Number of Sieve	Percentage of total by weight passing	
☐	200	7.6	Actions

Add a Row | Edit Selected | Delete Selected

Chemical Analysis of Sediment

Chemical Analysis Of Sediment

Please provide a synopsis and chemical analysis results in a separate document in the Document Section (titled "Chemical Analysis of Sediment"). For the synopsis, it must be noted if any chemical analyte's concentration exceeding the Massachusetts Contingency Plan (MCP) RCS-1 threshold.

This section is not required if one of the following statements is true:

1) Chemical Analysis is not required if less than 10% of the sediment of particles (by weight) passing the No. 200 Testing Sieve AND the required "due diligence" review demonstrates that the area is unlikely to contain anthropogenic concentrations of oil or hazardous materials

2) Chemical Analysis is specifically exempted by MassDEP

Showing 0-0 of 0

	Chemical	Average Concentration (In ppm)	
No records found.			

Add a Row | Edit Selected | Delete Selected

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Please continue with 401 Water Quality Dredging application process.

* indicates a required field.

Additional Information

* Is your project subject to U.S. Army Corps of Engineers – Section 404 of Federal Clean Water Act? If yes, please attach a document 'USACE Authorization' in the document section.:
(●) Yes ( ) No

USACE File Number:
To be filed concurrently with this application.

* Is your project subject to Massachusetts Environmental Policy Act (MEPA)? If yes, application cannot be submitted until 1) the MEPA process is completed and 2) a Final certificate issued by MEPA is submitted to the "Document(s)" Tab. If no, please attach a document with justification that this project is not subject to MEPA review in the document section (including addressing the applicability of the MEPA review thresholds at 301 CMR 11.03):
( ) Yes (●) No

* Is your project subject to Massachusetts Wetlands Protection Act?: (?)
( ) Yes (●) No

* Is the project going to impact Eelgrass bed? If yes, please attach a document 'Eelgrass Management Plan' in the document section.: (?)
( ) Yes (●) No

* Does this project contain an attached written Alternatives Analysis? If yes, please attach a document 'Alternatives Analysis' in the document section.: (?)
( ) Yes (●) No

* Does this project require a license from the Federal Energy Regulatory Commission?: (?)
( ) Yes (●) No

* Is any of your proposed work exempt from the Massachusetts Wetlands Protection Act or taking place in a federal non-state wetland?:
(●) Yes ( ) No

If yes, please provide additional information: *
Bridge Exempt

Statement and Disclosures

Proposed dredging activity or dredged material management might occur within Rare Species Habitat as defined at 314 CMR 9.02. By checking this box, you agree that you have consulted with the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife. Please attach a 'NHESP Determination Letter or Conservation Management Permit' in the document section.:

☑

Date of NHESP Determination Letter:

MM/DD/YYYY

Any in-water activity may effect fish or shellfish, spawning and/or habitat. By checking this box, you agree that you have consulted with Massachusetts Division of Marine Fisheries (DMF) and/or Massachusetts Division of Fisheries and Wildlife (DFW) about Time of Year Restriction (TOY). Please attach Consultation Letter from DMF and/or DFW in the document section.:

☑

Date on Letter from DMF and/or DFW:

MM/DD/YYYY

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Step 5: 401 Fill Information > Page 1 of 3

Please note: Now you are starting the 401 Water Quality Fill/Excavation application process. Please enter all the application information accordingly.

* indicates a required field.

Project Information

Project Name:

MassDOT #608460 - Hadley - Bridge Replacement, H-01-005, Bay Road (F

* Proposed Activity:

The proposed work consists of replacing the existing bridge structure at Bay Road (Route 47) over the Fort River. The duration of the work-in-water is anticipated to be for two construction seasons.

Project Type

Industrial:
☐
Utility:
☐
Real Estate Subdivision:
☐
Institutional:
☐
Other:
☑

* Please provide additional information for the selection of your project major type:

Bridge Replacement

Proposed Areal Extent Info

Proposed Areal Extent of "Discharges of Dredged or Fill Material", including "redeposit of dredged or excavated material" to "Waters of the United States within the Commonwealth".

Report the areal extent, as expressed in square feet, of all proposed "discharges of dredged or fill material", including "redeposit of dredged or excavated material", both temporary and permanent, to each category of "Waters of the United States within the Commonwealth" below:

* Bordering Vegetated Wetland (sqft):
940

* Isolated Vegetated Wetland (sqft):
0

* Non-tidal Land Under Water (sqft):
10220

* Salt Marsh (sqft):
0

* Land Under the Ocean (sqft):
0

* Intertidal Zone (sqft):
0

Total cumulative loss (sqft):
11160

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Please continue with 401 Water Quality Fill/Excavation application process.

* indicates a required field.

Compliance with 314 CMR 9.00

* Does the proposed project meet the definition of a Single and Complete Project at 314 CMR 9.02?:
(●) Yes ( ) No

* Does the proposed project include "multi-phased activities"?:
( ) Yes (●) No

* Does the proposed project meet the definition of an Ecological Restoration Project?:
( ) Yes (●) No

* Have you completed the Public Notice as per 314 CMR 9.05(3)? If yes, please attach a completed 'Proof of Public Notice' document in the document section.:
(●) Yes ( ) No

Date of Public Notice per 314 CMR 9.05(3): *
09/27/2024

Does the required Alternatives Analysis screen all practicable alternatives to the proposed discharge that would have less adverse impact on the aquatic ecosystem?:
(●) Yes ( ) No

* Does this proposed project meet the definition of Water-Dependent at 314 CMR 9.02?:
(●) Yes ( ) No

* Is the proposed project restricted to access to one dwelling unit?:
( ) Yes (●) No

* Will the cumulative discharges of dredged or fill material to Waters of the United States within the Commonwealth exceed 1 acre in areal extent?:
( ) Yes (●) No

* Report the areal extent, as expressed in square feet, of all proposed restoration or replication of Bordering Vegetated Wetlands and/or Isolated Vegetated Wetlands:
940 SF restoration

* Will any proposed discharges of dredged or fill material or any proposed restoration or replication occur within Rare Species Habitat as defined at 314 CMR 9.02?:
(●) Yes ( ) No

* If yes, does the Permittee presently hold a "no adverse effect determination" and/or a "no take determination", or a

Conservation and Management Permit from the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife? Also, please attach a document 'NHESP Determination Letter or Conservation Management Permit' in the document section.:

(●) Yes ( ) No

NHESP File Number (if available):

Date of NHESP Determination Letter:

03/15/2024

* Will the proposed project include or consist of the construction of a new non-tidal crossing of any Land Under Water? :

( ) Yes (●) No

* Will the proposed project include or consist of the construction of a new tidal crossing of any Land Under Water?:

( ) Yes (●) No

* Will the proposed project include or consist of the repair, replacement, and/or expansion of an existing non-tidal crossing of any Land Under Water? :

(●) Yes ( ) No

If yes, will such repair, replacement, and/or expansion of an existing crossing comply with the Massachusetts River and Stream Crossing Standards (March 8, 2012) to the maximum extent practicable (see Practicable at 314 CMR 9.02)?: *

(●) Yes ( ) No

* Will the proposed project include or consist of the repair, replacement, and/or expansion of an existing tidal crossing of any Land Under Water?:

( ) Yes (●) No

* Does the proposed project include any amount of discharges of dredged or fill material to any Outstanding Resource Water?:

( ) Yes (●) No

* Will any proposed "discharge of dredged or fill materials" occur within any certified Vernal Pool (as defined at 314 CMR 9.02)? :

( ) Yes (●) No

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* indicates a required field.

Additional Information

* Is your project subject to Massachusetts Environmental Policy Act (MEPA)?:
○ Yes ◉ No

* Is your project subject to Massachusetts Wetlands Protection Act?:
○ Yes ◉ No

* Is your project subject to Massachusetts Public Waterfront Act?:
○ Yes ◉ No

* Is your project subject to Massachusetts Historical Commission?:
○ Yes ◉ No

* Is your project subject to Massachusetts Bureau of Underwater Archeological Resources?:
○ Yes ◉ No

* Is your project subject to U.S. Army Corps of Engineers – Section 404 of Federal Clean Water Act?:
◉ Yes ○ No

USACE File Number (if available):

Date of USACE PCN Authorization (if available):
MM/DD/YYYY

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Instructions

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List of Documents

The List of Environmental Regulatory Programs can be accessed at https://www.mass.gov/how-to/ww-01-03-14-15-16-17-chapter-91-waterways-license , please have this form completed and upload here.

Documents:

Please upload 12 Required Document(s) which are mandatory to Submit this Application:

1. Alternatives Analysis
2. Characteristics of the proposed ocean disposal site
3. Consultation Letter from DMF and/or DFW
4. DEP Sampling Analysis Approval
5. Dredging and Disposal Operation
6. Grain Size Analysis
7. NHESP Determination Letter or Conservation Management Permit
8. Plans for adequate containment during dewatering on a barge
9. Project Narrative
10. Project Plan Set
11. Site Plans
12. USGS Quadrangle Map

Attachment

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WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT A

Water Quality Narrative

ATTACHMENT A – WATER QUALITY NARRATIVE

INTRODUCTION

The proposed project is to replace the deteriorating Bay Road Bridge (H-01-005) which spans over the Fort River in Hadley, MA. The existing bridge substructure consists of seven (7) timber pile bents with reinforced concrete pile caps and two (2) reinforced concrete abutments. The proposed bridge will consist of two (2) pipe pile bents with reinforced concrete pile caps and two (2) integral reinforced concrete abutments. This project meets the Bridge Exemption under the 2014 Transportation Bond Bill as the proposed bridge will remain functionally equivalent to the existing bridge.

The project will require work within Waters of the United States and includes 8,720 SF of temporary waterway impacts, 1,500 SF of permanent waterway impacts, 940 SF of temporary Bordering Vegetated Wetlands/Vegetated Wetland impacts, 940 SF of Bordering Vegetated Wetlands/Vegetated Wetland restoration, 374 CY of dredging and 210 total linear feet of bank impacts. Overall, there will be no negative net loss of existing Bordering Vegetated Wetlands/Vegetated Wetland as part of this project.

The project will require a Pre-Construction Notification (PCN) from the USACE under the MA General Permit 23. Aside from the 401 MassDEP WQC and 404 USACE PCN, there are no additional regulatory permits as part of this project.

1.0 EXISTING CONDITIONS

1.1 Description of Existing Bridge Structure

The Bay Road Bridge (Bridge No. H-01-005) carries Bay Road (Route 47) over the Fort River in Hadley, MA. The bridge structure, completed in 1936, consists of a 14” thick reinforced concrete slab supported by seven (7) timber pile bents with reinforced concrete pile caps and two (2) reinforced concrete abutments. The existing out-to-out width of the bridge is 39’-0” wide and is 124’-0” long from centerline-to-centerline of the abutments.

There have been numerous repairs to the existing timber piles consisting of encasing the deteriorating portions in concrete. The most recent Routine Bridge Inspection was performed on 10/05/2023 and rated the deck, superstructure and substructure in fair condition. Due to the age of the structure (89 years), the need for numerous pile repairs and inspection evaluation, rehabilitation of the structure is not viable and therefore eligible for replacement.

1.2 Description of Existing Roadway, Pedestrian, and Bicycle Facilities

Bay Road (State Route 47) is classified as a National Highway System (NHS) Principal Arterial roadway. The estimated Average Daily Traffic (ADT), measured June 2017, is 11,732 vehicles with 4.1% truck/bus traffic. The posted speed limit in the vicinity of the bridge is 30 mph. There is an unsignalized intersection with East Road approximately 800 feet north of the bridge, and an unsignalized intersection with Lawrence Plain Road approximately 400 feet south of the

bridge. The project area is zoned as a mix of Local Business and Agricultural-Residential zoning. The immediate abutters to the project are private residences, with one parcel being the Hadley Water Treatment Plant.

Investigation with the Pioneer Valley Planning Commission (PVPC) indicates that this corridor is not within a defined bicycle route. Investigation with the Pioneer Valley Transit Authority (PVTA) indicates that this corridor is on a bus route which runs approximately every half hour during the week (less frequent on the weekends) in the vicinity of the bridge.

Bay Road (Route 47) in the vicinity of the bridge is on a straight tangent segment between two horizontal curves as the roadway transitions from an east-west alignment to a north-west alignment. The approach roadways near and on the bridge are in superelevation with a cross slope of ½"/Ft. The roadway on either side of the bridge consists of two lanes (one lane traveling in each direction). To the north of the bridge, Bay Road (Route 47) is approximately 26 feet wide. To the south of the bridge, Bay Road (Route 47) widens through the curve to approximately 30 feet width. The shoulders throughout the project limits are approximately 3 feet wide. Existing pedestrian facilities within the project include a concrete sidewalk on the bridge structure only. There are no approach sidewalks within the project limits.

The approach roadways both slope down towards a low point located approximately 200 feet north of the bridge. The existing roadway drainage consists of "country drainage" with sheet flow from the roadway directly onto grass/plant growth adjacent to the roadway. Near and on the bridge the roadway superelevation directs all the drainage to the west side of the roadway.

1.3 Description of Waterbody Under the Bridge Structure

The Fort River is a river that flows in a westerly direction in the vicinity of the bridge and is a tributary of the Connecticut River. The Fort River is designated as a coldwater fishery. In the vicinity of the bridge, the Fort River is not regulated as a FEMA floodway. The channel width (bankfull width) at the bridge varies approximately from 58 feet to 76 feet and is located primarily under existing spans 3 through 6. The river depth at ordinary high water is about 5' deep at the bridge location. During a field visit in September 2017, the river was noted as deep as 2.5' at the bridge. Per research performed by Benesch using the USGS StreamStats Application, the bankfull width of the Fort River in the vicinity of the bridge is 74.6' which corroborates the wetland delineation completed June 20, 2024. The wetlands delineation report can be found in Attachment D.

Per research performed by Benesch using MassMapper, the Fort River in the vicinity of the project is not considered an Outstanding Resource Water and is not within an Area of Critical Environmental Concern (ACEC).

1.4 Description of Existing Hydraulics at the Bridge Site

According to the FEMA Flood Insurance Rate Map (Community-Panel Number 250163 0002 B), the 100-year flood is at elevation 124' in NGVD 1929 datum (123.3' in NAVD 1988). This elevation is the 100-year flood water at approximately the top of the pile caps along the west fascia of the bridge.

The latest routine bridge inspection report dated October 5, 2023, rated channel scour a 6, satisfactory condition. The timber piles which support the bridge were encased in concrete at the mudline as part of a repair contract which was completed in 2018.

See Attachment E for the FEMA Flood Insurance Rate Map and Attachment F for the full Hydraulic Study Report, dated February 27, 2018.

1.5 Description of All Utilities Within the Bridge Site

There is an 8" diameter water main currently supported below the bridge sidewalk. The town of Hadley has confirmed the desire to increase the water main to a 12" diameter pipe at the bridge site. There are no other utilities attached to the bridge structure.

Overhead wires run along the east fascia, immediately upstream of the bridge with a utility pole at either end of the sidewalk that crosses the bridge.

Approximately 40' south of the bridge, along the west edge of roadway, is an abandoned Verizon pole with evidence of a buried conduit which runs below the river parallel to the roadway.

1.6 Description of Environmentally Sensitive or Cultural Resource Areas Affecting the Bridge Site

According to MassMapper, the Fort River is within NHESP Estimated Priority Habitats for Rare Species (PH 2084) and has wetlands present at the project site. There are no potential or certified vernal pools within the vicinity of the bridge structure. The Fort River is designated as a coldwater fishery. For locus map and environmental constraints maps, see Attachment B. The wetlands delineation was completed June 20, 2024 and can be found in Attachment D.

All four quadrants of the bridge site consist of heavily vegetated steep banks sloping down to the river. According to MassMapper, wooded swamp deciduous wetlands are present within the southeast quadrant at the bridge site and continue upstream.

Upstream approximately 75 feet are stone foundations from the old Bay Road river crossing. These foundations are listed on the Massachusetts Cultural Resource Information System (MACRIS) and are not anticipated to be impacted as part of this project.

1.7 Hazardous Materials

The existing timber piles supporting the bridge are creosote treated. It is assumed for this project that the piles will require handling and disposal of treated wood products. A search of the MassDEP Oil & Hazardous Material (OHM) database was completed. There is a one release site (Site # 1-0010026) located within project limits on the property at the northwest quadrant of the bridge site. The release was due to a fuel tank, and the site has since been closed.

2.0 PROPOSED CONDITIONS

2.1 Proposed Substructure

The proposed bridge substructure consists of two (2) integral abutments and two (2) pipe pile bents with reinforced concrete pile caps. The existing pile bents will be removed to a depth of 5'-0" below grade. New riprap will be installed at the base of the south and north abutment walls. The construction of the proposed bridge substructure will occur in the dry, behind temporary sandbag cofferdams.

Also associated with the proposed substructure, are the proposed embankments between the Fort River and the proposed abutments. Consistent with the current MassDOT Bridge Manual, the embankments above the River Bankline are proposed to be composed of riprap meeting MassDOT Specifications M2.02.0. Above the River Bankline, natural streambed cobble and gravel will be placed to fill the voids between riprap stones. Below the River Bankline, the areas of proposed riprap will have 12" of natural streambed material placed over the riprap. This will provide a consistent material that matches the existing material of the channel. The areas of proposed riprap/streambed material will require a dredging volume of 222 CY. No new streambed material is anticipated to be imported onto the site, as the material dredged will be reused as much as possible. Since the bank line is coincident with the flagged Ordinary High Water, this work will result in a total of 210 linear feet of bank impacts.

2.2 Proposed Superstructure

The entire bridge superstructure will be replaced and widened using a combination of S36-18 and S48-18 precast concrete deck beams. The superstructure will support an 8" cast-in-place reinforced concrete slab with 3" HMA overlay and one sidewalk along the east side of the bridge. The total bridge will be 126' long, with spans of 42', 42' and 42' from centerline of bearings. The total out-to-out width is 42'-6", all within current right-of-way limits. This superstructure replacement requires a 15" rise in profile in order to maintain the existing low chord elevation and accommodate current bridge structure standards.

2.3 Proposed Streambed Restoration

Due to prior bridge repairs which occurred within the Fort River, the existing streambed was left uneven and irregular. As part of the bridge work, the Contractor will be required to perform streambed restoration below the footprint of the bridge structure. The restoration will include dredging the top 12" of the Fort River and replacing the material in place and regrading to

provide a smooth streambed. The exact methods of the restoration will be determined by Contractor means and methods, however no new streambed material is anticipated to be imported onto the site. All streambed material dredged as part of the restoration will be regraded on site. The area of proposed streambed restoration will require a dredging volume of 152 CY.

2.4 Proposed Roadway

The proposed roadway section on the bridge will provide two 12-foot wide lanes (one in each direction) of vehicular traffic with 5-foot wide outside shoulders, as well as a sidewalk on the east side of the bridge. As a result of the project, there will be a 1,960 SF increase to impervious material within the project limits.

As part of the proposed work, no trees are proposed to be removed, however some areas of clearing and grubbing are identified within the limits of disturbance of the project in the immediate vicinity of the bridge. For exact locations, see the full set of plans in Attachment M.

2.5 MA Stream-Crossing Standards

The proposed crossing will follow the Massachusetts Stream Crossing Standards including:

- Type of Crossing: Proposed crossing is a bridge **(Meets criteria)**
- Crossing Span: The proposed bridge span is 126’-0” and the existing bankfull width of the Fort River is approximately 75’-0” in the vicinity of the bridge crossing. This provides at least 1.2 times the bankfull width and provides sufficient headroom for wildlife via a 5’ wide terrestrial wildlife passage at an elevation higher than ordinary high water. The material of the wildlife passage will be natural streambed material to match the existing substrates within the project limits. **(Meets criteria)**
- Openness: Proposed openness ratio is at least 1.64 feet and provides more than 6’ height for wildlife passage. **(Meets criteria)**
- Substrate: Riverbed restoration will be performed below the bridge crossing. Natural streambed material will be used to match the upstream and downstream substrates. **(Meets criteria)**
- Water Depth & Velocity: Once construction is complete, the proposed bridge will not increase the water depth and velocity at the crossing. The bridge will not raise design storm flood elevations. **(Meets criteria)**

3.0 CONSTRUCTION SEQUENCE

3.1 Construction Sequence

The bridge work will be performed in two stages, with traffic being maintained with a one-way alternating pattern for both stages. Temporary work in water will occur during both construction stages.

Exact construction equipment will be determined by the Contractor as part of their means and methods, however heavy equipment present on site is anticipated to include pavement milling/reclamation machines, excavator, skid steer, dump trucks, snooper truck and a small crane. Staging, laydown and stockpile areas will be determined by the Contractor. The exact location for a sedimentation basin as part of dewatering will be determined by the Contractor.

The sequence of demolition and construction is determined by the Contractor as part of their means and methods, however is anticipated to be as follows:

Construction Stage 1:

1. Install temporary TL-3 limited deflection barriers along the construction baseline and east half of the bridge.
2. Install temporary traffic signals at both bridge approaches.
3. Place sedimentation fences and compost filter tubes around the work area for erosion control at the bottom of slope.
4. Demolish the west half of the existing bridge superstructure, the west half of the north and south abutments, and the west half of the existing bridge substructure where the work in water provides access.
5. Install proposed utility poles, guy wires, and overhead wires along the west fascia.
6. Construct the proposed substructure and superstructure on the west half of the bridge.
7. Install railing and wearing surface on west half of the bridge.
8. Permanently relocate the water main to the west fascia.
9. Install temporary pedestrian walkway on the west fascia.
10. Remove temporary barriers from east half of the bridge.

Construction Stage 2:

1. Install temporary TL-3 limited deflection barriers along the construction baseline and west half of the bridge.
2. Demolish the east half of the existing bridge superstructure, the east half of the north and south abutments, and the east half of the existing bridge substructure where the work in water provides access.
3. Construct the proposed substructure and superstructure on the east half of the bridge.
4. Install sidewalk, railing, and wearing surface on east half of the bridge.
5. Remove temporary barriers from the west half of the bridge.
6. Remove temporary traffic signals at both bridge approaches.
7. Remove erosion controls once all other work has been completed.

The sequence of Temporary Work in Water (TWIW) is determined by the Contractor as part of their means and methods, however is anticipated to be as listed below. See Attachment C for work-in-water exhibits.

TWIW Stage 1:

1. TWIW Stage 1 corresponds with Construction Stages 1 and 2.

2. Place sandbag cofferdams between existing piers 2 to 3 and 4 to 5. Dewater the confined areas. The water will be directed towards the south edge of the river. A location for any temporary sedimentation basins for the dewatered areas will be determined by the Contractor.
3. After the west half of the superstructure has been removed in Construction Stage 1, demolish the existing west half of the substructure in the dewatered areas. The exact method of removing the existing substructure will be determined by the Contractor, however the existing piles are anticipated to be cut at an elevation 5' below the existing river bed.
4. After the east half of the superstructure has been removed in Construction Stage 2, demolish the existing east half of the substructure in the dewatered areas. The exact method of removing the existing substructure will be determined by the Contractor, however the existing piles are anticipated to be cut at an elevation 5' below the existing river bed.
5. Install the riprap at the north and south abutments including the shelf for terrestrial wildlife passage.
6. Perform riverbed restoration. Dredged streambed material for restoration shall be stockpiled for regrading as required and shall be used in material replacement at the existing pier removal locations.
7. Remove cofferdam between existing piers 2 to 3 and sedimentation basin on the north side of the river.

TWIW Stage 2:

1. TWIW Stage 2 is to occur after the completion of Construction Stage 2.
2. Relocate sandbags between existing piers 4 to 5 to close off the south half of the river. Dewater the confined areas. The water will be directed towards the north edge of the river.
3. Demolish the remaining existing substructure that was not removed in TWIW Stage 1. A location for any temporary sedimentation basins for the dewatered areas will be determined by the Contractor.
4. Perform riverbed restoration not performed in TWIW Stage 1. Dredged streambed material for restoration shall be stockpiled for regrading as required and shall be used in material replacement at the existing pier removal locations.
5. Remove the sandbag cofferdams and sedimentation basin.

4.0 WETLAND IMPACTS

Table 1: Summary of Impacts (SF)		
	Temporary Impacts	**Permanent Impacts**
Land Under Water/Waters of the US	8,720 SF	1,500 SF
Bordering Vegetated Wetlands/Vegetated Wetland	940 SF	0 SF

In addition to the permanent and temporary impacts described below, numerous upland plantings are proposed as part of this project to further improve the site surrounding the bridge. The plantings are shown in Exhibits 14-17 of 17 in Attachment C.

Due to the number and size of existing timber piles in the riverbed (45 piles at approximately 0.85 SF each) compared to the proposed pipe piles (12 piles at approximately 3.1 SF each), the gain to Land Under Water/Waters of the U.S. and the permanent impacts are approximately equivalent to each other and not included in the temporary and permanent impacts described below.

4.1 Permanent Impacts to Land Under Water/Waters of the U.S.

The proposed work will require the removal and placement of riprap, removal of the existing substructure, installation of the proposed substructure. A total of 1,500 square feet of LUW/Waters of the U.S will be permanently impacted by the proposed riprap to ensure adequate scour protection of the abutments; 344 square feet at the south abutment and 1,156 square feet at the north abutment.

All of the permanent LUW/Waters of the U.S. impacts will occur adjacent to the south and north abutment as shown on Exhibit 7 of 17 – Temporary & Permanent Impacts in Attachment C.

4.2 Temporary Impacts to Land Under Water/Waters of the U.S.

The proposed work under the bridge will require the placement of temporary sandbag cofferdams in order to remove the existing substructure, install the proposed substructure, place the proposed riprap in the dry, and perform the riverbed restoration. A total of 8,720 square feet of LUW/Waters of the U.S. will be temporarily impacted by the cofferdams and construction access.

The riverbed restoration will include dredging the top 12” of the Fort River and replacing the material in place and regrading to provide a smooth streambed. The exact methods of the restoration will be determined by Contractor means and methods.

All of the temporary impacts are shown on Exhibit 7 of 17 – Temporary & Permanent Impacts in Attachment C.

4.3 Temporary Impacts to Bordering Vegetated Wetlands/Vegetated Wetland

The proposed work will require the placement of temporary sandbag cofferdams in order to remove the existing substructure, install the proposed substructure, place the proposed riprap in the dry and perform the riverbed restoration. Due to a rise in the roadway profile, the slopes adjacent to the roadway will be regraded. A total of 940 square feet of BVW/Vegetated Wetland will be temporarily impacted due to the placement of sandbag cofferdams and construction access. The sandbag cofferdams and construction access will result in compaction of the soils due to the weight of the sandbags. No removal of Bordering Vegetated Wetlands/Vegetated Wetland soil as a result of the cofferdams is anticipated.

There are no permanent impacts to Bordering Vegetated Wetlands/Vegetated Wetland as part of the proposed work.

All of the temporary impacts are shown on Exhibit 7 of 17 – Temporary & Permanent Impacts, as well as Exhibit 11 of 17 – Wetland Mitigation Plan in Attachment C.

4.4 Dredging Within Land Under Water/Waters of the U.S.

The proposed work will require dredging within the existing Land Under Water/Waters of the U.S. in order to place the proposed riprap and perform the riverbed restoration. The dredging volume due to the streambed restoration is a total of 152 CY and the dredging volume due to the proposed riprap is a total of 222 CY. The exact method of dredging will be determined by the Contractor, however will be required in locations where proposed riprap is being placed and where streambed restoration is proposed. In areas with proposed riprap, the riverbed will be removed to a depth of 4' and will be replaced with a 3' layer of riprap over a 12" layer of crushed stone over geotextile fabric for permanent erosion control. In areas with proposed streambed restoration, the existing streambed material will be dredged to a depth of 12" deep and regraded to a smooth streambed surface within the footprint of the bridge structure. Since the bank line is coincident with the flagged Ordinary High Water, this work will result in a total of 210 linear feet of bank impacts.

The limits of dredging are shown on Exhibit 10 of 17 – Dredging Location Plan in Attachment C.

5.0 WETLAND MITIGATION

5.1 Bordering Vegetated Wetlands/Vegetated Wetland Mitigation

In addition to the temporary impacts to BVW/Vegetated Wetland, as described above, a mitigation plan has been developed to ensure no negative net loss of existing BVW occurs as part of this project. The 940 square feet to be temporarily impacted, as described in Section 4.3, will be restored to match the existing condition of the BVW/Vegetated Wetland.

Due to right-of-way constraints, no additional Bordering Vegetated Wetlands/Vegetated Wetland mitigation alternatives have been considered.

All impacts to the existing BVW on site are shown on Exhibit 11 of 17 – Wetland Mitigation Plan in Attachment C.

6.0 SEDIMENTATION CONTROL

6.1 Sedimentation Control

The appropriate erosion and sedimentation controls, such as compost filter tubes or equivalent, will be utilized throughout construction to minimize any impacts to adjacent areas.

To control turbidity, the removal and placement of riprap, demolition of existing substructure, and riverbed restoration will be confined within the sandbag cofferdams. Use of the cofferdams will minimize sedimentation within the surrounding areas and will allow the riprap to be placed in the dry. The water contained in the confined areas will be pumped to sedimentation basins outside of any environmentally sensitive areas.

Additionally, silt sacks are required to be used by the Contractor at all existing and proposed drainage structures within the project limits. The Contractor shall routinely inspect, repair and/or clean the silt sacks throughout construction and after major rain events.

For additional information on sedimentation control, refer to the project special provisions in Attachment L.

7.0 DEWATERING

7.1 Dewatering

Dewatering will be necessary for the replacement of the riprap at the abutments and the removal of the existing substructure. The water pumped out of the confined areas will be transferred to a temporary sediment containment structure. The structure will filter out any sediments before the filtered water is discharged back into the environment. All sediment containment structures will be placed outside of any environmentally sensitive resource areas. Exact location of sediment containment structures will be determined by Contractor means and methods with approval by the Engineer.

8.0 STORMWATER MANAGEMENT

8.1 Best Management Practices (BMP) Stormwater Management

This project will meet the Stormwater Standards to the maximum extent practicable. The Stormwater Management Memo is provided in Attachment I.

The majority of the existing roadway relies on country drainage (sheet runoff) directed towards the west side of the road via superelevation. Prior to the bridge, in the southwest quadrant, there is an existing corrugated pipe that conveys captured stormwater from the existing edge of roadway to an outlet at the bottom of slope near the edge of river. The project proposes to remove this existing pipe as the stormwater pipes will be graded to convey stormwater to the proposed drainage channel in the southeast quadrant of the bridge.

The proposed project will install a deep sump catch basin structure to capture stormwater which will outlet at a concrete headwall at the bottom of slope onto a stone pipe end energy dissipater. A proposed streambed material drainage channel from the stone pipe end to the bank edge will be installed, which will also aid in temperature reduction before discharge into

the river. The location of the drainage channel is shown on Exhibit 1 of 17 – Plan View in Attachment C.

BMP Stormwater Management Alternatives

Many Stormwater Control Measures (SCMs) were considered, however were not considered feasible for this project. The project will improve the existing conditions by providing pre-treatment of roadway runoff prior to being outlet to the river and maintaining existing drainage patterns with existing conditions. The following were considered:

- Deep-Sump Catch Basins – the catch basin proposed as part of this project will have a deep-sump. The deep-sump catch basin will be used to replace the existing corrugated pipe (without sump or structure) that conveys water to an existing outlet and provide 25% pre-treatment TSS removal.
- Sediment Forebay/Infiltration Basin – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, forebays and infiltration basins with check dams were not considered feasible or effective. A stone apron, however, is provided at the proposed outlet location to prevent erosion and reduce water velocities. The stone apron transitions to a streambed material drainage channel to aid in temperature reduction of runoff before discharge into the river.
- Open-Graded Friction Course – the design coordinated with and approved by the MassDOT Pavement Management Section does not include open-graded friction course pavement.
- Pavement Disconnection – The existing site relies primarily on “country drainage” or sheet flow to convey water away from the roadway. Some widening of the roadway is proposed (described in Section 2.3 above), however the existing pavement disconnection was maintained to the maximum extent practicable for the site. Bridge scuppers are not proposed on this bridge, therefore all roadway drainage within the project site will either exit the roadway to natural vegetated areas or be pre-treated within a deep-sump catch basin prior to being outlet to the river.
- Leaching Basins – due to the existing site topography and proximity of the toe of slope with the river bank, a leaching basin was not considered for the project site.
- Subsurface Infiltration System – due to the existing site topography, proximity of the toe of slope with the river bank and existing right-of-way, a subsurface infiltration system was not considered feasible for the project.
- Porous Pavement – the design coordinated with and approved by the MassDOT Pavement Section does not include porous pavement. Since this project is primarily a roadway project, porous pavement was not considered. Also, the proposed pedestrian sidewalk is limited to the length of the bridge and will be made of cement concrete.
- Stormwater Wetland Stormwater Control Measures (SCM) – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, stormwater wetland SCMs were not considered feasible for this project. Although not a constructed stormwater wetland, numerous upland plantings are being proposed as part of the project in order to improve the banks compared to the existing condition. There is also a streambed material drainage channel proposed

between the drainage outfall location and the river bank. Details regarding the proposed plantings are provided in the exhibits in Attachment C.

8.2 Impacts to the 100 Year Floodplain

Due to the existing bridge's proximity to Fort River's confluence with the Connecticut River, this crossing site is subject to the former's backwater flooding influence and has been incorporated within the Connecticut River's local base (100-year) Special Flood Hazard Area (SFHA) Zone A delineation in the 1977 Town of Hadley Flood Insurance Study (FIS). Since the bridge does not fall under the NFIP regulatory floodway delineation, No-Rise analysis was not required. Detailed hydraulic analysis performed is shown in the Hydraulic Report by MassDOT, which indicates that the project activities will have no adverse impact on any Fort River's or Connecticut River's regulatory flood delineation width, or at any location within the Town of Hadley.

During construction, the Contractor shall be required to install the temporary sandbag cofferdams and shall ensure that the sandbags are secured in place in case of an unexpected storm event. During construction, the River will be temporarily diverted to accommodate the sandbag cofferdams. Following construction, the permanent river channel will have fewer obstructions (due to fewer pile bents) and the existing bridge low chord is being maintained which will not permanently negatively affect the river flow and have no impact to the base flood profile.

The replacement structure will have minimal impact to the site hydraulics as the proposed structure has been analyzed, as presented in the Hydraulic Study Report.

See Attachment F for the full Hydraulic Study Report, dated February 27, 2018.

9.0 FISHERIES AND WILDLIFE/NATURAL HERITAGE ENDANGERED SPECIES/VERNAL POOLS

9.1 Fisheries and Wildlife/Natural Heritage Endangered Species/Vernal Pools

As part of this project, a 5'-0" minimum wide terrestrial wildlife passage will be provided on either side of the Fort River. This passage will be composed of natural streambed material and will have a level cross slope in order to provide an even surface for wildlife to maneuver. The wildlife passage is proposed above the ordinary high water elevation of the Fort River.

NHESP – (Natural Heritage and Endangered Species Program) – NHESP indicates that as of 2017 the bridge is located in a priority habitat of rare species and also an estimated habitat of rare wildlife area, located within the 100-year floodplain, the River is designated a coldwater fishery and within Atlantic Salmon habitat. NOAA has confirmed that consultation for this project is not required due to Atlantic Salmon habitat. See Attachment Q for NOAA coordination.

MassDOT is currently coordinating with NHESP.

US Fish & Wildlife Service IPaC – Per research performed by Benesch using USFWS IPaC website, there are no critical habitats at the project location. The Northern Long-Eared Bat (NLEB) is listed for the area as "wherever found" per the USFWS IPaC website. Standard MassDOT language regarding the NLEB is included in the up-front portion of the project special provisions. This language includes ensuring the Contractor is aware of NLEB, restrictions regarding roost locations and provides a time of year restriction on tree cutting. There are no known presence of NLEB or roosts in the vicinity of the project. Tricolored Bats are proposed to be endangered, as the USFWS has not made a determination on the uplisting and is currently under review. If USFWS determines the species warrants listing, additional consultation with USFWS will occur at that time.

Vernal Pools – Per research performed by Benesch using MassMapper, no certified vernal pools exist in the vicinity of the project.

10.0 ALTERNATIVE ANALYSIS

Three alternatives were considered for this project.

10.1 Alternative 1 – No Build

The most recent Routine Inspection was performed on October 5, 2023 and rated the superstructure, substructure and deck in fair condition. There have been numerous repairs to the existing timber piles consisting of encasing the deteriorating portions in concrete. Prior to the recent repairs, the timber piles were in serious condition. In the future, the piles will require replacement or else risk closing the bridge.

This alternative was not considered feasible since repairs will be required to keep the bridge open. If the bridge was closed, it would require a detour of approximately seven (7) miles.

This alternative poses no immediate impacts to resource areas, however would be subject to impacts based on the nature of repairs performed in the future.

10.2 Alternative 2

Alternative 2 represents the design alternative for which an additional sidewalk would be provided and the desirable shoulder widths would be provided. As part of this alternative, per Engineering Directive E-14-006, two (2) sidewalks would be provided on and off the bridge (note that there are currently no sidewalks on either side of the roadway approaches), 12' wide travel lanes, 8' wide right shoulders (off bridge) and 10' wide right shoulders (on bridge) would be provided.

This alternative was not considered feasible due to increased cost and the adverse effects the project would have on the natural environment and to abutting properties. This alternative would require significant acquisitions to increase the Right-Of-Way (ROW) from 66' to

approximately 90'+/- and Alteration of the Highway Layout. The number of utility pole relocations would increase from 2 to 7 relocations. Implementing the desirable cross-section would also have major impacts to the existing landscape, vegetation and character of the roadway and the local historic district with the removal of numerous mature trees and vegetation to provide slope stabilization due to the steep abutting terrain and account for the required widening of the project cross-section. The alternative cross-section would increase impermeable surfaces and associated drainage catchment area requiring drainage system upgrades and increase of outfall flow amounts to the Fort River. This alternative would delay the project schedule by one year to account for the ROW acquisitions, have a substantial increase in construction costs and adversely impact the community and natural environment. This alternative would also significantly increase the temporary and permanent impact areas to both Land Under Water/Waters of the U.S. as well as existing Bordering Vegetated Wetlands/Vegetated Wetland.

10.3 Alternative 3 - Proposed

Alternative 3 will provide one (1) sidewalk on the east side of the bridge, 12' wide travel lanes, up to 5' wide right shoulders off the bridge and 5' wide right shoulders on the bridge. This proposed cross-section within the existing ROW with limited impact on private and public utilities with only 2 utility pole relocations being required. Minor slope stabilization is required as well as permanent easements for the relocated utility poles and proposed riprap. This proposed recommended alternative cross-section was agreed upon by the Town and representatives from MassDOT at a field site meeting on February 8, 2017 (see attached correspondence). This alternative is shown on the attached design exhibits and balances impacts to Land Under Water/Waters of the U.S., Bordering Vegetated Wetlands/Vegetated Wetland, ROW acquisitions and meeting design criteria to the maximum extent practicable.

11.0 CONCLUSION

The purpose of this project is to replace the Bay Road Bridge over the Fort River. Work to be included in the project relative to the work in water includes removal of existing timber piles, abutments and riprap; along with installing proposed piles, abutments, riprap, and riverbed restoration.

Riprap will be installed in front of both abutments permanently impacting a total of approximately 1,500 square feet of LUW/Waters of the U.S. In order to perform the required work, including installing riprap, sandbag cofferdams will be installed in the river during construction. These cofferdams will temporarily impact the LUW/Waters of the U.S. a total of approximately 8,720 square feet.

The applicant respectfully requests that MassDEP and the USACE find these measures adequately protective of the interests identified in the 401 Water Quality Regulations and 404 Massachusetts General Permits and issue a Water Quality Certificate and 404 Authorization approving the work shown on the accompanying plan set.

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

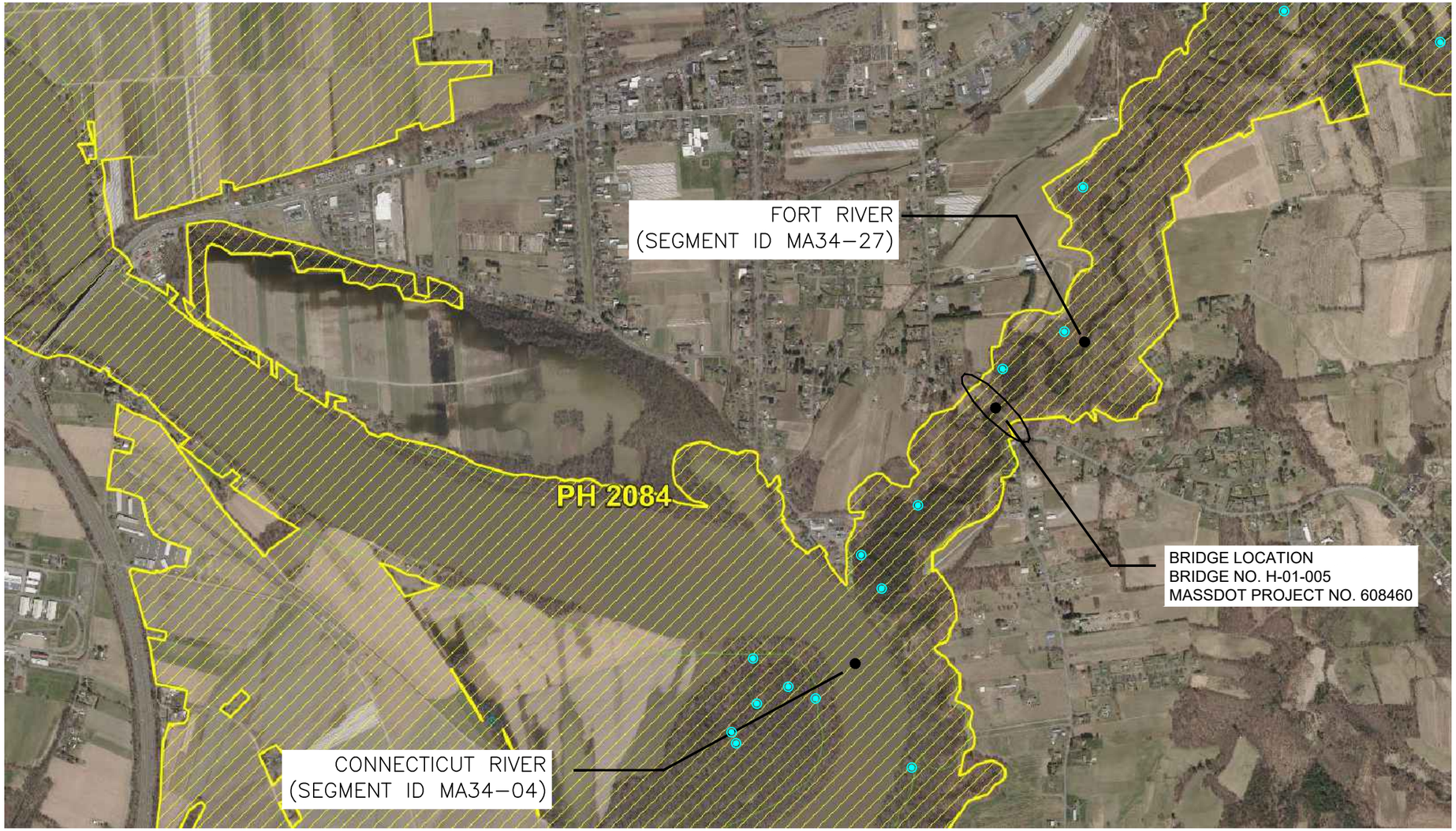
ATTACHMENT B

Wetland Exhibits



LOCUS MAP

benesch	**BAY ROAD (ROUTE 47) OVER FORT RIVER HADLEY, MA**	SCALE: N.T.S. EXHIBIT NO. 1 OF 3



LEGEND:

- NHESP ESTIMATED HABITATS OF RARE WILDLIFE
- NHESP PRIORITY HABITATS OF RARE SPECIES (PH 2064)
- AREAS OF CRITICAL ENVIRONMENTAL CONCERN ACEC'S (NONE)
- OUTSTANDING WATER RESOURCES (NONE)
- NHESP CERTIFIED VERNAL POOLS (NONE)
- POTENTIAL VERNAL POOLS

NOTE: LINEWORK IS NOT SHOWN, HOWEVER THE FORT RIVER IS A COLDWATER **FISHERY.**

0 1000 2000 4000

SCALE: 1" = 1000'

ENVIRONMENTAL CONSTRAINTS MAP

benesch

BAY ROAD (ROUTE 47 OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 1000'

EXHIBIT NO. 2 OF 3



LEGEND:

WOODED SWAMP DECIDUOUS

SHRUB SWAMP

OPEN WATER

WETLANDS RESOURCE MAP

benesch

BAY ROAD (ROUTE 47 OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

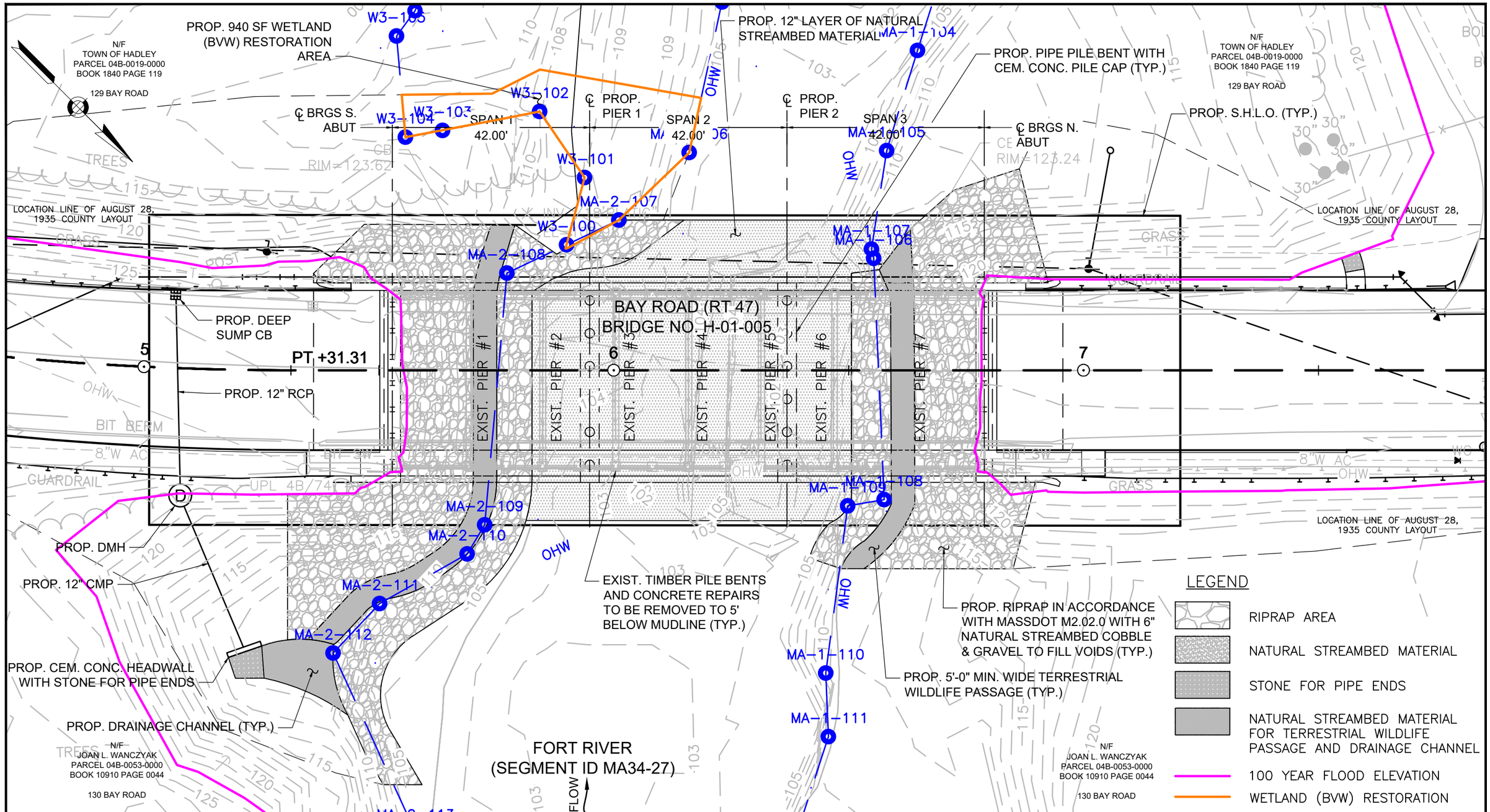
SCALE: 1" = 100'

EXHIBIT NO. 3 OF 3

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT C

Proposed & Existing Design Exhibits



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 5 AND 11 RESPECTIVELY.

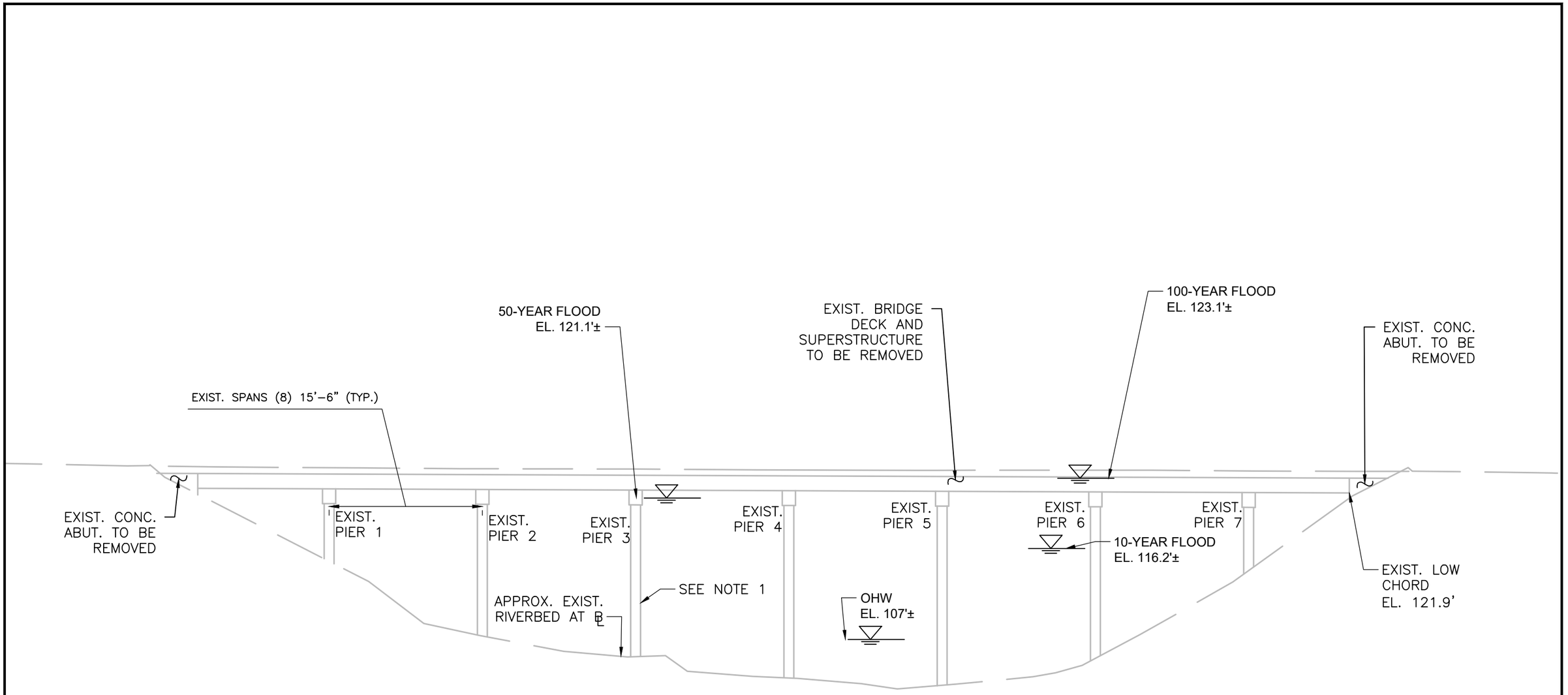
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 1 OF 17



EXISTING EAST ELEVATION

0 10 20 40

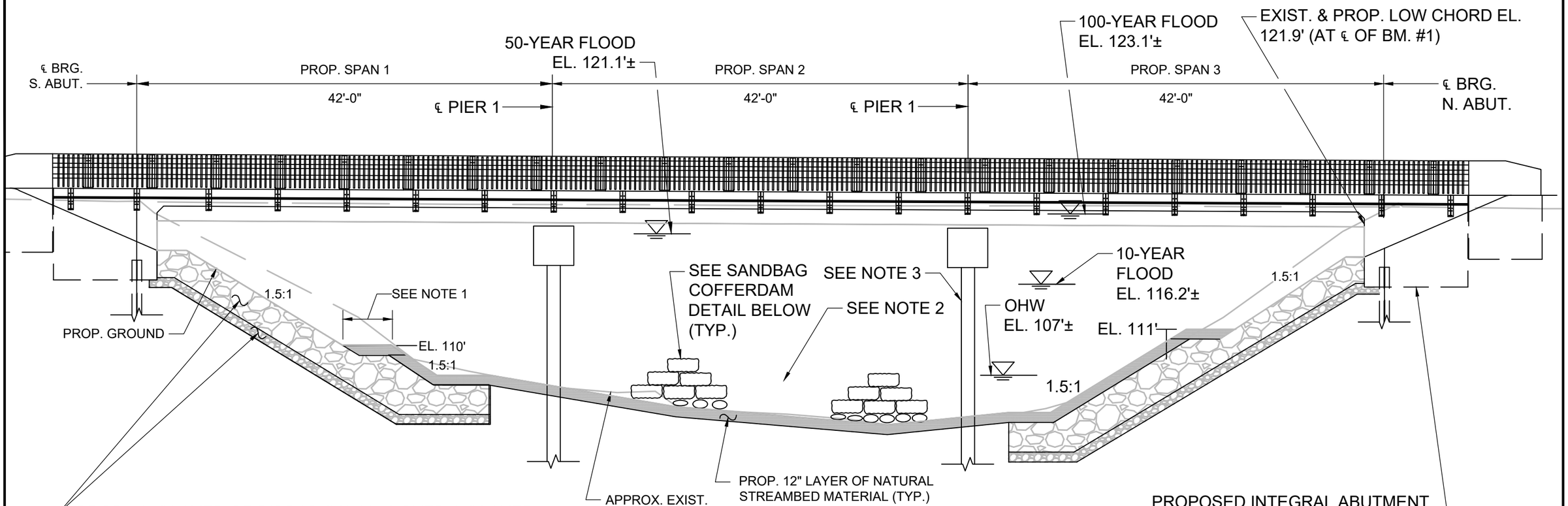
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 2 OF 17

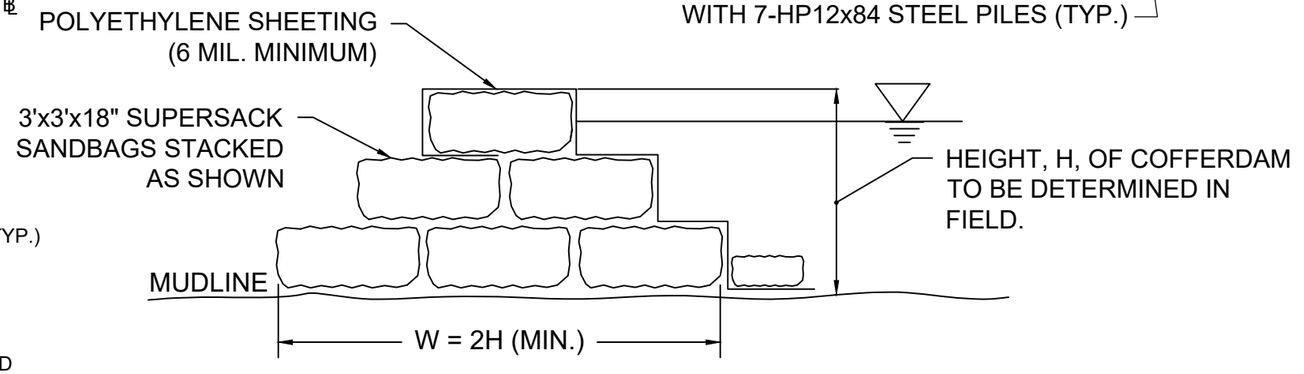


NOTES:

1. 5'-0" MIN. WIDE NATURAL STREAMBED MATERIAL FOR TERRESTRIAL WILDLIFE PASSAGE (TYP.)
2. EXIST. TIMBER PILE BENTS AND CONCRETE REPAIRS TO BE REMOVED TO 5' BELOW MUDLINE (TYP.)
3. PROP. PILE BENT WITH 16" Ø PIPE PILES WITH CONCRETE PILE CAP (TYP.)

SANDBAG NOTES:

1. SANDBAG COFFERDAM IS TO BE CONSTRUCTED IN A PYRAMID SHAPE BASED ON THE REQUIRED HEIGHT AND NUMBER OF BAGS REQUIRED.
2. THE SANDBAGS ARE TO BE PLACED OVERLAPPING ALONG THE LENGTH OF THE COFFERDAM.



SANDBAG COFFERDAM DETAIL
NOT TO SCALE

PROPOSED EAST ELEVATION

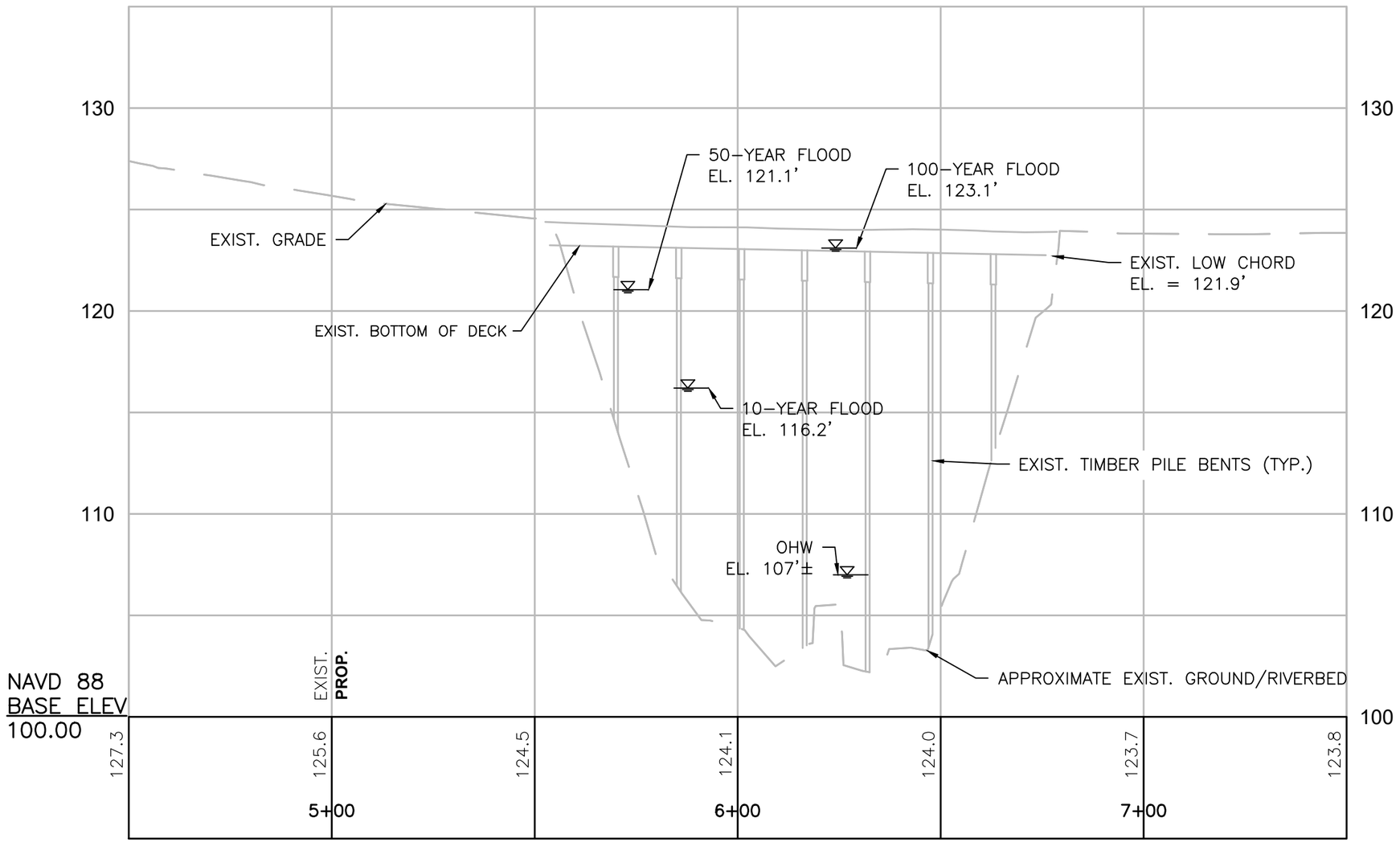
0 10 20 40
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 3 OF 17



HOR. SCALE IN FEET
30 0 30 60
6 0 6 12
VER. SCALE IN FEET

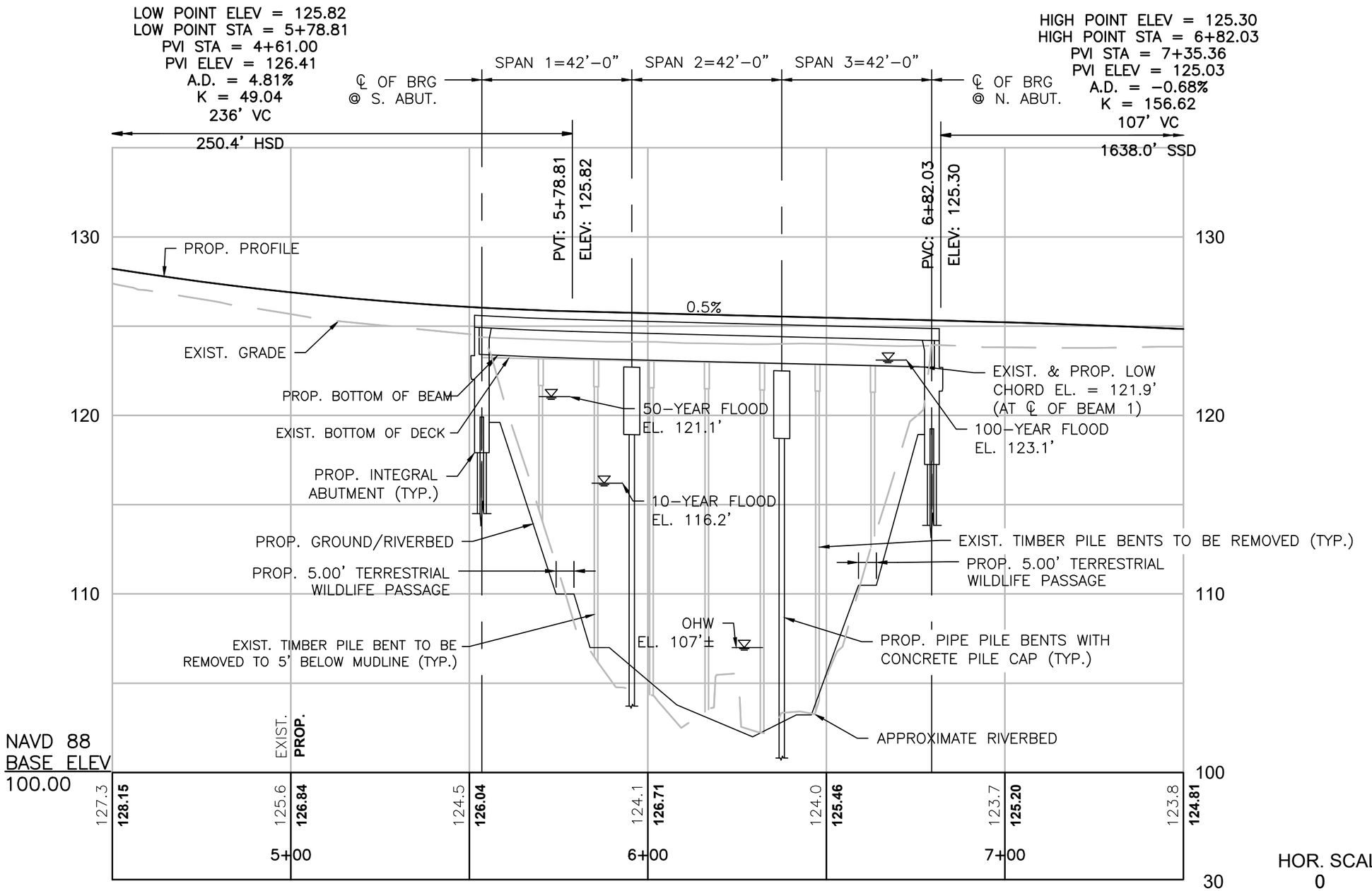
EXISTING CRITICAL PROFILE

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 30'

EXHIBIT NO. 4 OF 17



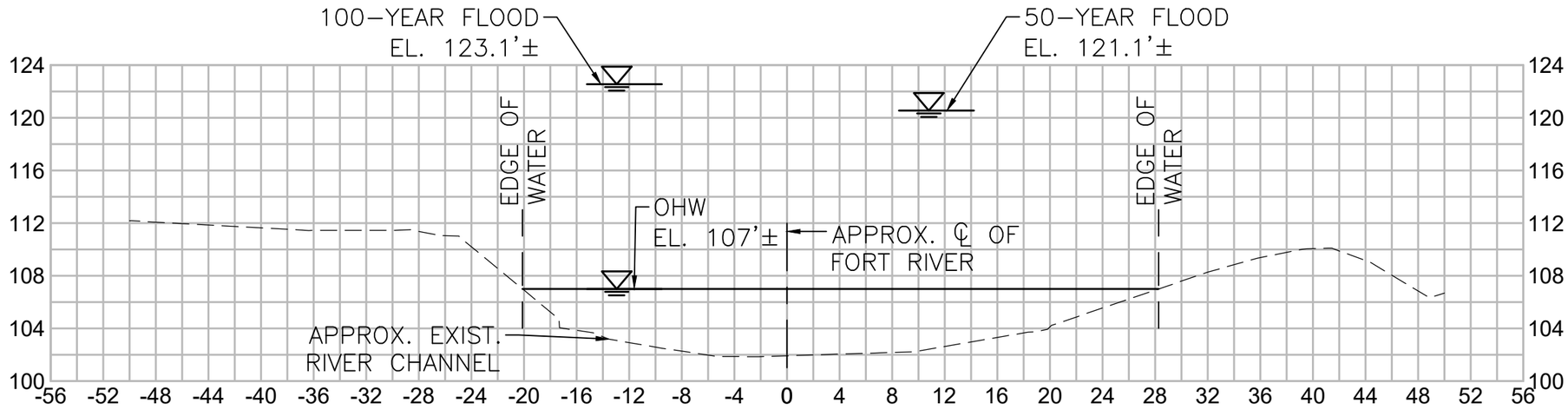
PROPOSED CRITICAL PROFILE

benesch

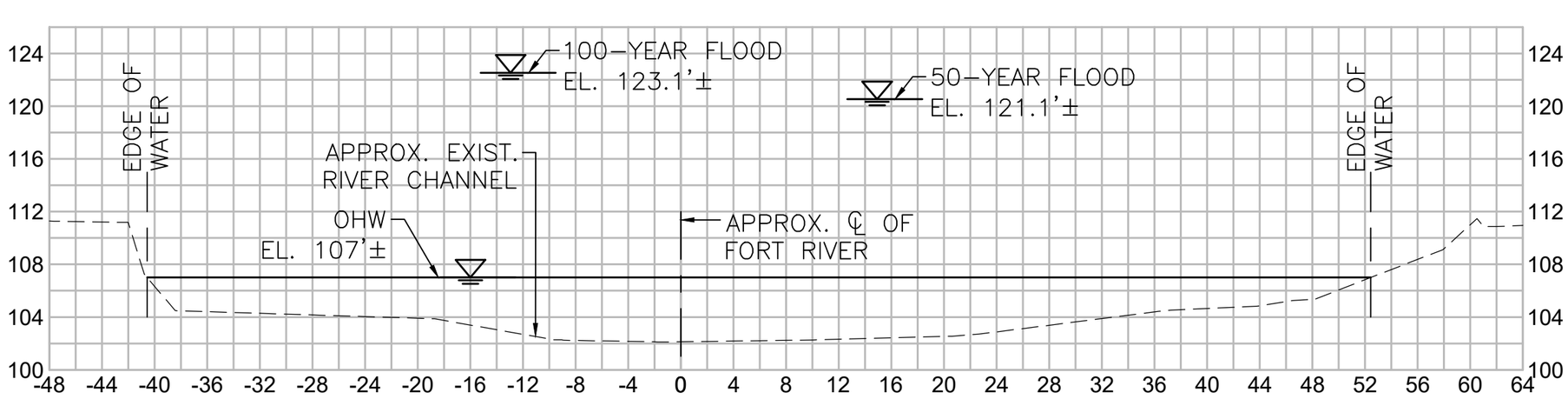
BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 30'

EXHIBIT NO. 5 OF 17



50 FT DOWNSTREAM OF WEST FASCIA
(LOOKING UPSTREAM)



50 FT UPSTREAM OF EAST FASCIA
(LOOKING UPSTREAM)

HOR. SCALE IN FEET
10 0 10 20
10 0 10 20
VER. SCALE IN FEET

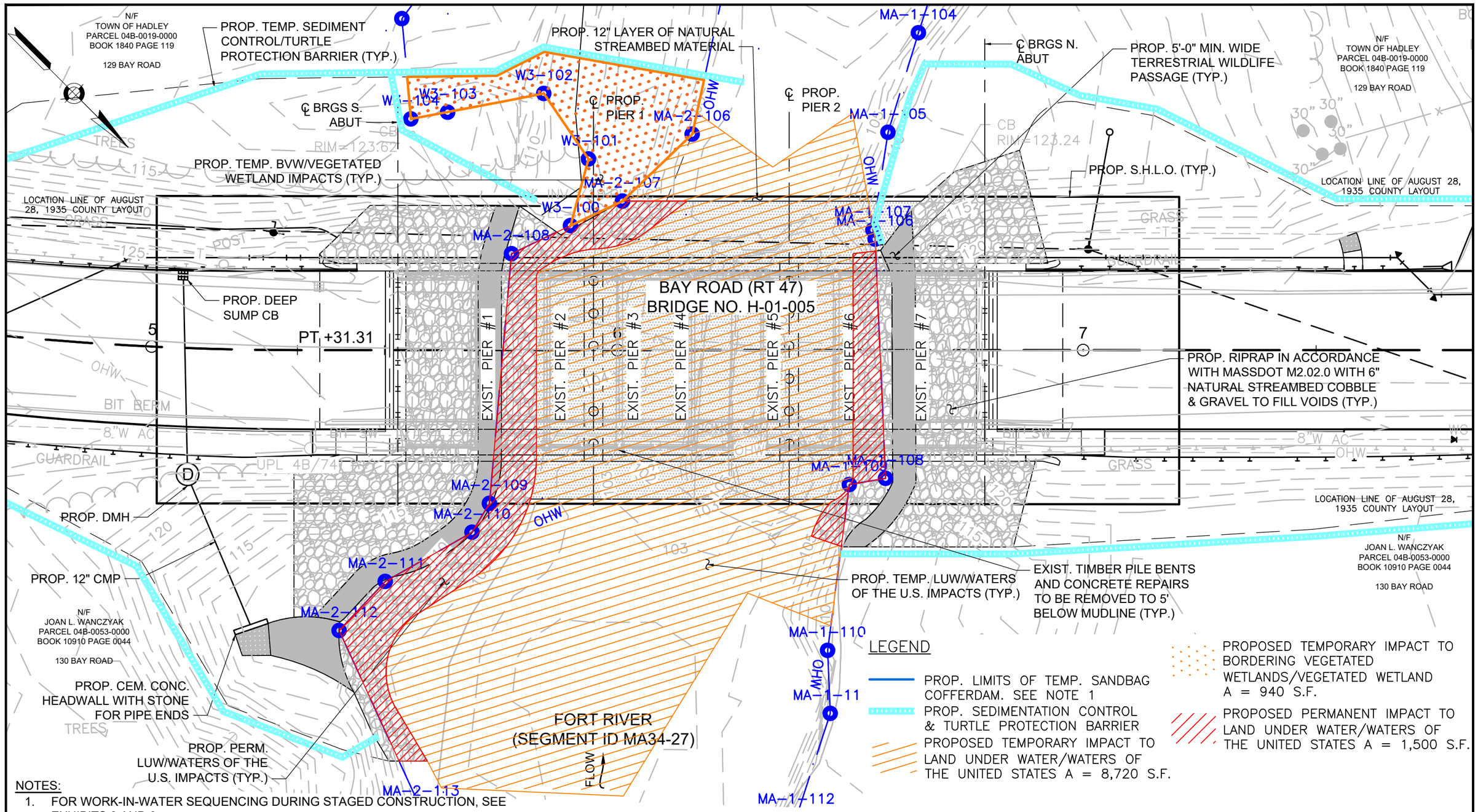
CHANNEL SECTIONS

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 6 OF 17



NOTES:

1. FOR WORK-IN-WATER SEQUENCING DURING STAGED CONSTRUCTION, SEE EXHIBITS 8 AND 9.
2. THE BANK IS COINCIDENT WITH THE OHW LINE, THEREFORE THERE ARE 150 LINEAR FEET OF BANK IMPACTS ALONG THE SOUTH BANK AND 60 LINEAR FEET OF BANK IMPACTS ALONG THE NORTH BANK.

TEMPORARY & PERMANENT IMPACTS

0 20 40 80

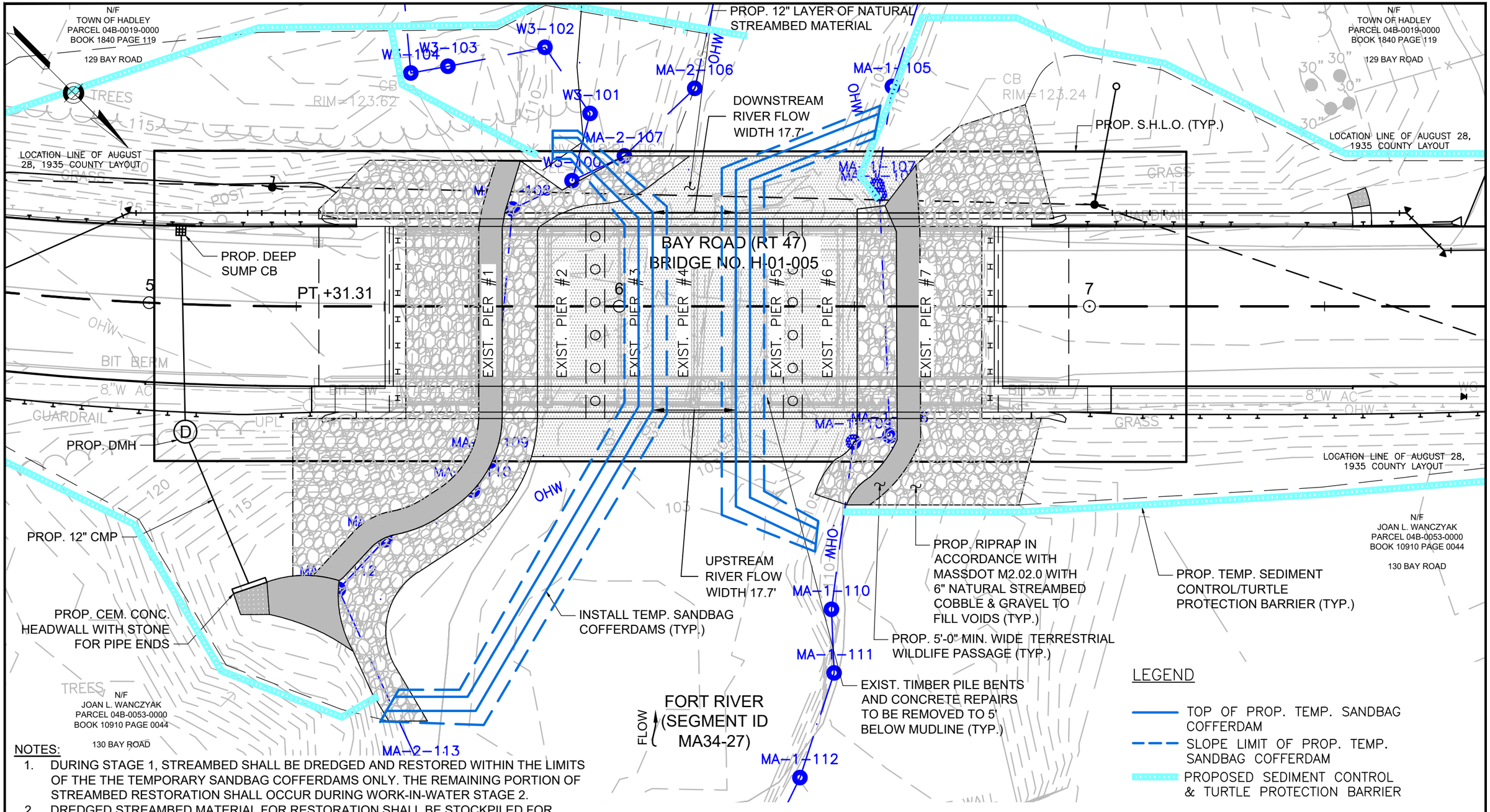
SCALE: 1" = 20'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 7 OF 17



NOTES:

1. DURING STAGE 1, STREAMBED SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY. THE REMAINING PORTION OF STREAMBED RESTORATION SHALL OCCUR DURING WORK-IN-WATER STAGE 2.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

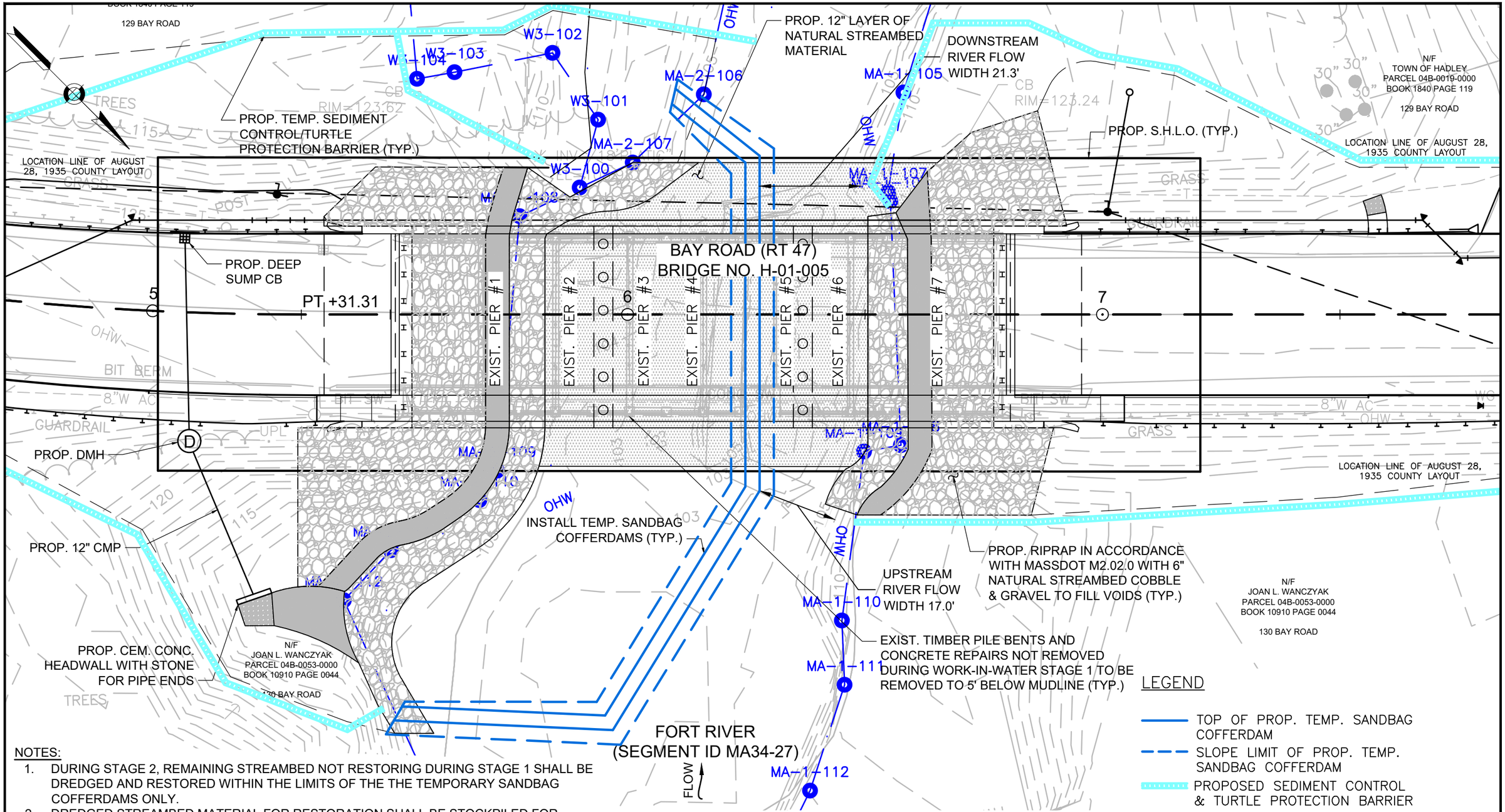
WORK-IN-WATER STAGE 1

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 8 OF 17



NOTES:

1. DURING STAGE 2, REMAINING STREAMBED NOT RESTORING DURING STAGE 1 SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

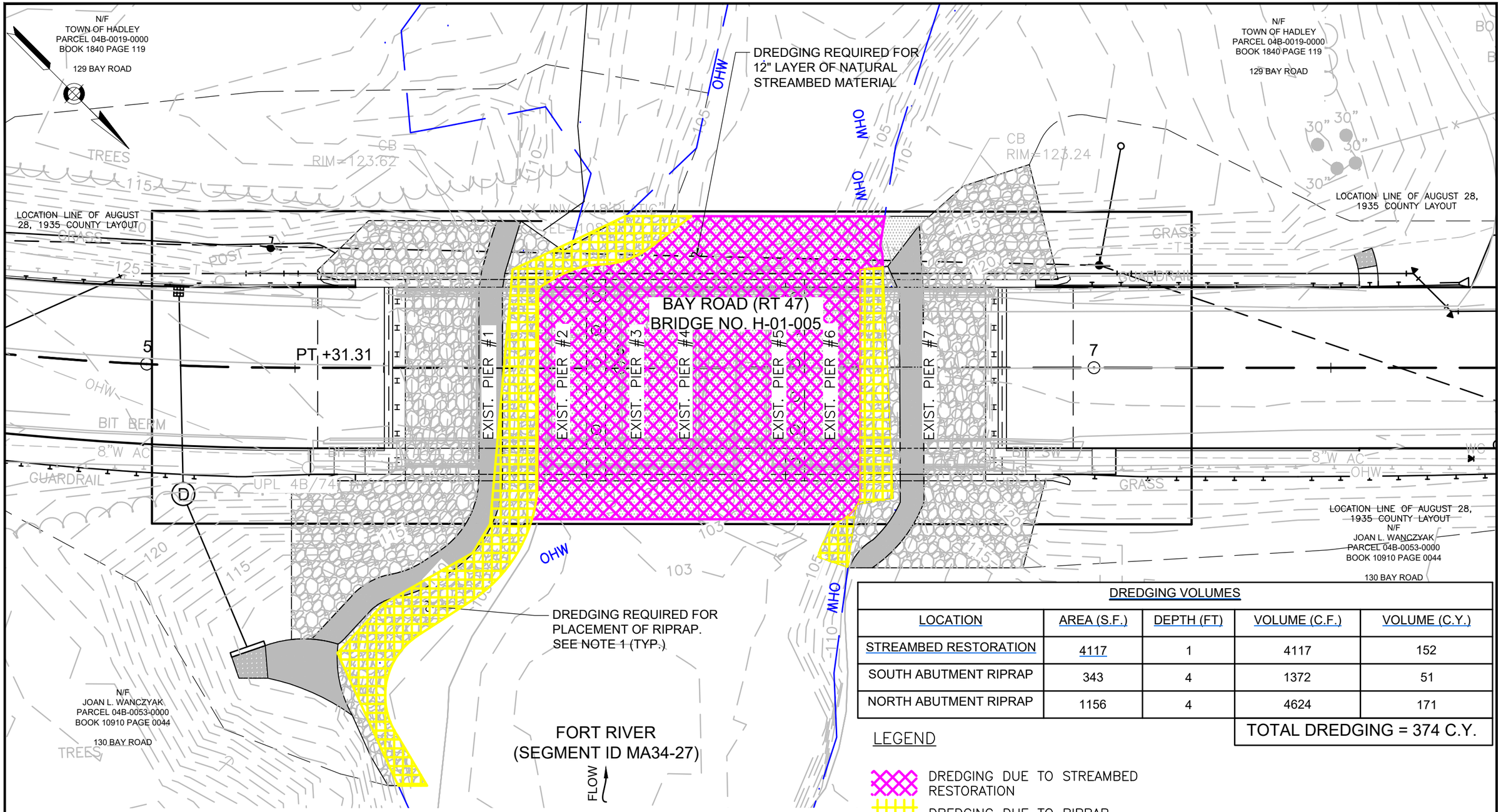
WORK-IN-WATER STAGE 2

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 9 OF 17



DREDGING VOLUMES				
LOCATION	AREA (S.F.)	DEPTH (FT)	VOLUME (C.F.)	VOLUME (C.Y.)
STREAMBED RESTORATION	4117	1	4117	152
SOUTH ABUTMENT RIPRAP	343	4	1372	51
NORTH ABUTMENT RIPRAP	1156	4	4624	171
			TOTAL DREDGING = 374 C.Y.	

LEGEND

- DREDGING DUE TO STREAMBED RESTORATION
- DREDGING DUE TO RIPRAP

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH 6" NATURAL STREAMBED COBBLE & GRAVEL TO FILL VOIDS (TYP.)

0 20 40 80

SCALE: 1" = 20'

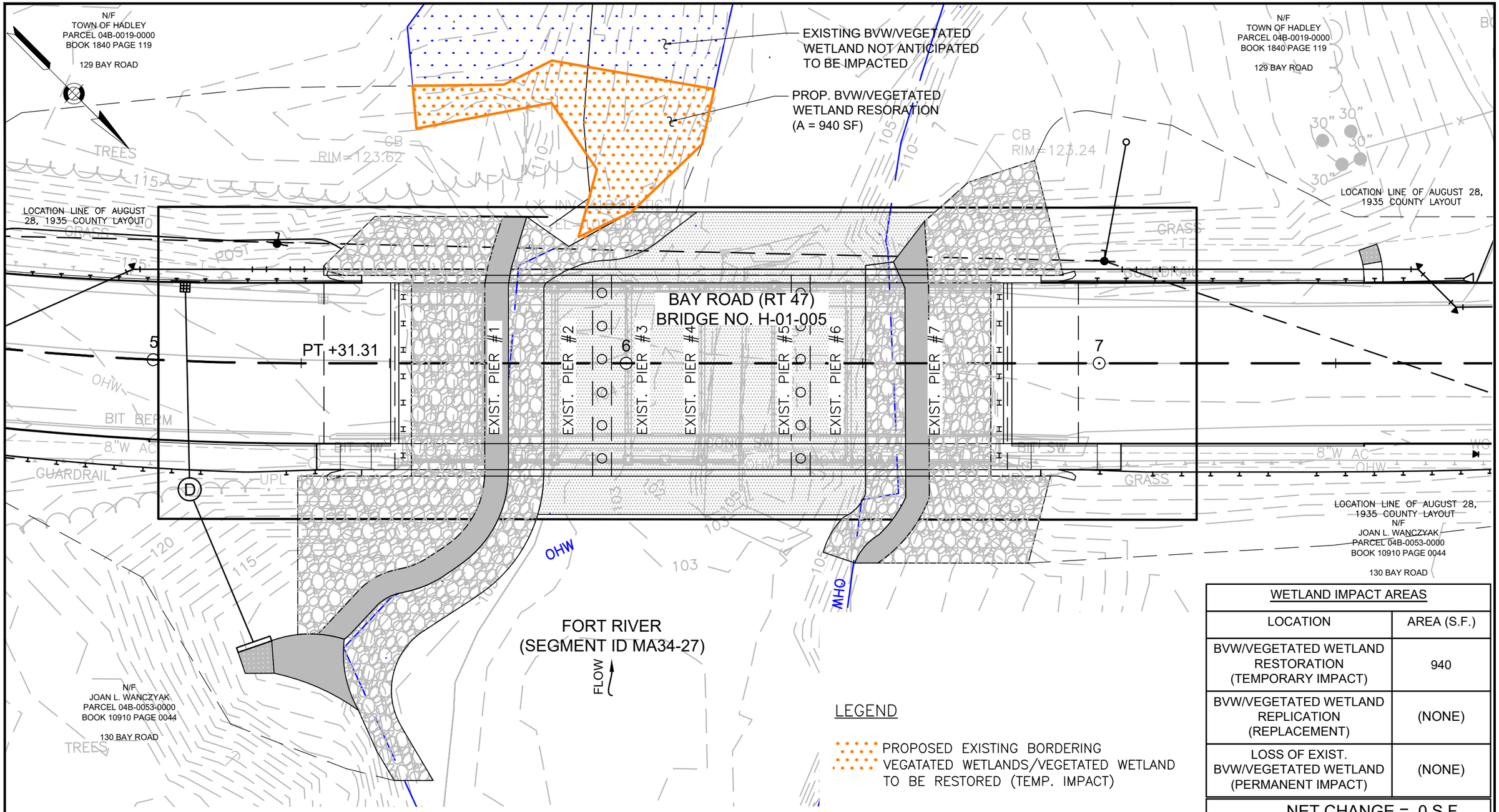
DREDGING LOCATION PLAN

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 10 OF 17



LEGEND

PROPOSED EXISTING BORDERING VEGATATED WETLANDS/VEGETATED WETLAND TO BE RESTORED (TEMP. IMPACT)

WETLAND IMPACT AREAS	
LOCATION	AREA (S.F.)
BVW/VEGETATED WETLAND RESTORATION (TEMPORARY IMPACT)	940
BVW/VEGETATED WETLAND REPLICATION (REPLACEMENT)	(NONE)
LOSS OF EXIST. BVW/VEGETATED WETLAND (PERMANENT IMPACT)	(NONE)
NET CHANGE = 0 S.F.	

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH 6" NATURAL STREAMBED COBBLE & GRAVEL TO FILL VOIDS (TYP.)

0 20 40 80

SCALE: 1" = 20'

WETLAND MITIGATION PLAN

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 11 OF 17

340 SF WETLAND
REPLICATION AREA

W3–102

W3–103

W3–104

W3–101

MA–2–106

MA–2–107

W3–100

MA–2–108

940 SF WETLAND
RESTORATION AREA

OHW

TO BE UPDATED

LEGEND

PROP. NATIVE TALL UPLAND MIX

WILDLIFE PASSAGE AREA
(NATURAL STREAMBED MATERIAL)

PART SHADE ROADSIDE MIX

LEGEND

EXISTING
WETLANDS
TO BE
RESTORED

SEDIMENT CONTROL
BARRIER WITHOUT
SILT FENCE

SEDIMENT CONTROL
BARRIER WITH SILT
FENCE

WETLAND RESTORATION AREA
PLAN VIEW

0 8 16 24 32

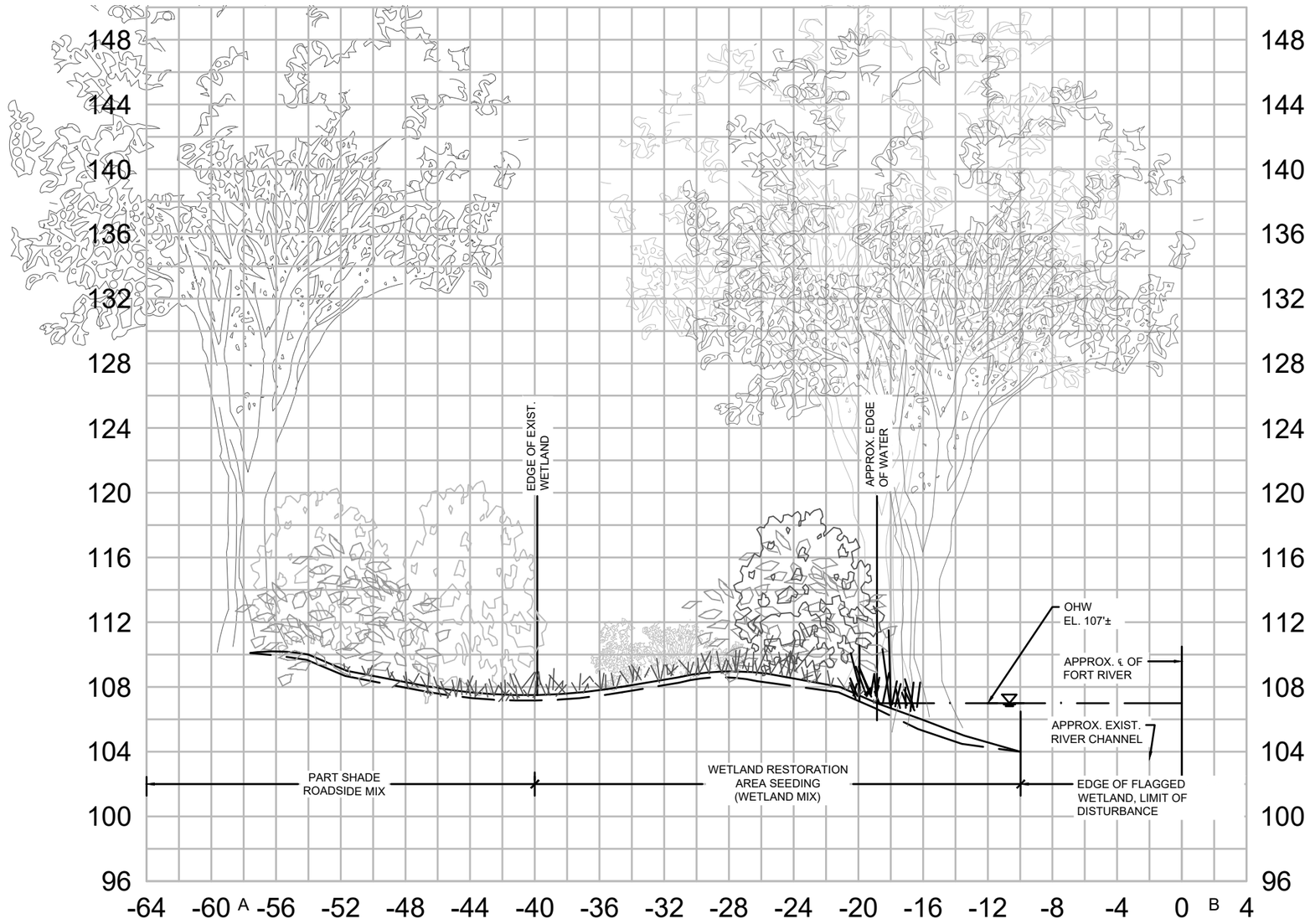
SCALE: 1" = 8'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 8'

EXHIBIT NO. 12 OF 17



WETLAND RESTORATION SECTION A-B
(LOOKING WEST)

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: NTS

EXHIBIT NO. 13 OF 17

NOTES:
1. SEE EXHIBIT 16 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 17 FOR PLANTING NOTES.

BOS (TYP.)

940 SF WETLAND RESTORATION AREA

OHW

TO BE UPDATED

TEMP. SEDIMENT CONTROL

PROP. FACE OF BRIDGE

ORDINARY HIGH WATER (OHW) EL. = 107'

5' (TYP.) PROPOSED TERRESTRIAL WILDLIFE PASSAGE

PROP. LEVEL SHELF

RE-USED LOG (TYP.)

SEDIMENT CONTROL BARRIER SHALL BE PLACED AFTER GRADING AND PRIOR TO SEED IF REQUIRED FOR SEDIMENT CONTROL DURING PLANT ESTABLISHMENT. LOCATIONS SHOWN ARE DIAGRAMATIC ONLY. ACTUAL LOCATION SHALL BE AS REQUIRED BY THE ENGINEER.

LEGEND

- EXISTING WETLANDS TO BE RESTORED
- WILDLIFE PASSAGE AREA (NATURAL STREAMBED MATERIAL)
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER WITHOUT SILT FENCE
- SEDIMENT CONTROL BARRIER WITH SILT FENCE

WETLAND RESTORATION AND PROPOSED WETLAND AND UPLAND PLANTINGS (WEST OF BRIDGE)

0 10 20 30 40

SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 14 OF 17

NOTES:

1. SEE EXHIBIT 16 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 17 FOR PLANTING NOTES.

PROP. DMH

PROP. FACE OF BRIDGE

5' (TYP.) PROPOSED TERRESTRIAL WILDLIFE PASSAGE

ORDINARY HIGH WATER (OHW) EL. = 107'

TO BE UPDATED

MP. SEDIMENT CONTROL

CONTRACTOR TO REMOVE EXISTING BITTERSWEET VINE (TYP.)

CEM. CONC. HEADWALL WITH CHECK VALVE

1 NS

6 CA

5 CS

1 AS

5 IV

1 BN

7 SC

1 AS

GUARDRAIL

TREES

LEGEND

- RIPRAP AREA
- WILDLIFE PASSAGE AREA & DRAINAGE CHANNEL AREA (NATURAL STREAMBED MATERIAL)
- STONE FOR PIPE ENDS
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER WITHOUT SILT FENCE
- SEDIMENT CONTROL BARRIER WITH SILT FENCE

PROPOSED WETLAND AND UPLAND PLANTINGS (EAST OF BRIDGE)

0 10 20 30 40

SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 15 OF 17

PLANT LIST (WEST OF BRIDGE)

PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	13 + 8*	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	6 + 8*	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	17 + 27*	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	11 + 11*	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
	HV	3	HAMAMELIS VIRGINIANA	WITCH HAZEL	2'-2.5'	5' TYP.
	VD	3		ARROWWOOD	2'-2.5'	5' TYP.
TREES						
	BN	6*		R BIRCH	5'-6'	

TO BE UPDATED

PLANT LIST (EAST OF BRIDGE)

PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	10	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	9	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	8	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	7	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
TREES						
	AS	2	ACER SACCHARINUM	SILVER MAPLE	5'-6'	
	BN	1	BETULA NIGRA	RIVER BIRCH	5'-6'	
	NS	1	NYSSA SYLVATICA	BLACK GUM	5'-6'	

* THE QUANTITIES MARKED WITH AN ASTERISK ARE LOCATED WITHIN THE AREAS OF WETLAND RESTORATION. ALL OTHER QUANTITIES ARE LOCATED WITHIN UPLAND AREAS.

PROPOSED WETLAND AND UPLAND PLANTING SCHEDULE

GENERAL NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER. REFER TO THE APPLICABLE SPECIAL PROVISION.
2. ORDINARY HIGH WATER IS AT EL. 107'.
3. ALL BITTERSWEET SHOULD BE TREATED PRIOR TO START OF ANY WORK PER THE INVASIVE PLANT MANAGEMENT STRATEGY.

PLANTING NOTES FOR WEST OF BRIDGE:

1. FOR WETLAND RESTORATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.45.
2. RESTORATION WORK SHALL NOT COMMENCE UNTIL ALL WORK IN WATER AND SLOPE RECONSTRUCTION HAS BEEN COMPLETED TO AVOID DAMAGE TO MITIGATED AREA.
3. REFER TO CONSTRUCTION PLANS FOR LIMIT OF CLEARING AND GRUBBING. RETAIN TREES TO RESTORE WOODY DEBRIS (SEE SPECIFICATION). LOGS CAN BE CUT AND LEFT ON-SITE OR ADJACENT TO THE SITE. THE WETLAND SPECIALIST WILL SELECT A MINIMUM OF 3 LARGE TREES TO BE RE-USED ON-SITE TO CREATE HABITAT LOGS PER THE WETLAND SPECIAL PROVISIONS. PLACEMENT OF LOGS AT TIME OF WETLAND CONSTRUCTION SHALL BE PER THE WETLAND SPECIALIST (PLAN LOCATIONS ARE SYMBOLIC ONLY.)
4. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER, UNLESS OTHERWISE NOTED ON THE PLAN. REFER TO THE APPLICABLE SPECIAL PROVISION.
5. ORDINARY HIGH WATER IS AT EL. 107'.
6. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
7. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
8. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
9. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
10. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
11. ALL SHRUB AND PERENNIAL BEDS WILL BE WEEDED AND OTHERWISE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.
12. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

PLANTING NOTES FOR EAST OF BRIDGE

1. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
2. PLANT LOCATIONS ARE SCHEMATIC ONLY. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
3. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
4. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
5. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
6. ALL SHRUB AND PERENNIAL BEDS WILL BE WEEDED AND OTHERWISE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.
7. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

TO BE UPDATED

PROPOSED WETLAND AND UPLAND PLANTING NOTES

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT D

Wetland Resource Area Delineation

WETLAND DELINEATION SUMMARY REPORT

Date: June 24, 2024

To: Massachusetts Department of Transportation, Highway Division

From: Robert Brewer, Staff Scientist, Epsilon Associates, Inc.

Subject: Wetland Delineation Summary Memo – Bay Road (Route 47) Bridge over the Fort River, Hadley, Massachusetts

INTRODUCTION

Epsilon Associates, Inc. ("Epsilon") was retained by Massachusetts Department of Transportation ("MassDOT") to delineate wetland resource areas in the vicinity of Bay Road (Route 47) over the Fort River in Hadley, Massachusetts (the "Study Area"). This report describes general environmental conditions and delineated wetland resource areas within the Study Area, including a discussion of potential jurisdiction under local, state, and federal wetlands regulatory programs. The wetland resource areas described in further detail below were field delineated by Epsilon on June 20, 2024. Included with this Freshwater Wetland Delineation Summary Report are the following attachments:

- Attachment A – Figures (USGS Locus Map, MassGIS Wetlands & Hydrologic Connections, NHESP Priority/Estimated Habitat & potential and certified vernal pools, NRCS Soils Map, and FEMA-FIRM).
- Attachment B – Representative photographs of Study Area and delineated wetland resource areas.
- Attachment C – MassDEP Bordering Vegetated Wetland Determination Forms.
- Attachment D – Wetland Delineation Map.

STUDY AREA DESCRIPTION

The Study Area includes approximately 400 linear feet of the Fort River on the north and south of the Bay Road Bridge (Route 47), and the immediate surrounding area out to a distance of approximately 200 feet. (see Attachment D). The Fort River flows in a southeasterly direction beneath the bridge, before joining the Connecticut River, approximately 3,000 feet southwest of the bridge. Two drainage culverts were observed within the Study Area, one which outlets into a large drainage swale in the northwest portion of the Study Area (wetland flag series W1-100), and a second which outlets from the bridge deck, south of

the river crossing into a drainage channel that is parallel to the Fort River between wetland flag series W3 and Mean Annual High Water ("MAHW") series MA2-100, (see Attachment D).

The Study Area is bordered to the north, south, and east by residential properties, and to the west by land owned by the Town of Hadley (water treatment plant).

The upland portions of the Study Area generally consist of undeveloped forested areas. Plant species observed include: red oak (*Quercus rubra*), catalpa (*Catalpa speciosa*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), white ash (*Fraxinus americana*) trees and/or saplings; poison ivy (*Toxicodendron radicans*), asiatic bittersweet (*Celastrus orbiculatus*), virginia creeper (*Parthenocissus quinquefolia*), climbing woody vines; highbush blueberry (*Vaccinium corymbosum*), honeysuckle (*Lonicera spp.*), multiflora rose (*Rosa multiflora*), and mapleleaf viburnum (*Viburnum acerifolium*) shrubs; and poison ivy, new york fern (*Thelypteris noveboracensis*), bracken fern (*Pteridium aquilinum*), hayscented fern (*Dennstaedtia punctilobula*), teaberry (*Gaultheria procumbens*), partridge-berry (*Mitchella repens*), and wild-lily-of-the-valley (*Maianthemum canadense*), ground cover. The wetland resources observed on the site are described further in this memo.

According to U.S. Department of Agriculture ("USDA") Natural Resources Conservation Service ("NRCS") mapping information, soils in the Study Area include Pootatuck, Rippowam, and Limerick.

Soil Name	Proportion of Hydric Soils	Drainage Classification
Pootatuck fine sandy loam, (2A)	15%	Moderately well drained
Rippowam fine sandy loam, (4A)	95%	Poorly drained
Limerick silt loam, (8A)	95%	Poorly drained

See Attachment A, Figure 4 for additional detail.

The Study Area is mapped as Priority Habitat (PH 2084) of Rare Species and Estimated Habitat of Rare Wildlife by the Natural Heritage and Endangered Species Program (NHESP). There are no mapped Certified Vernal Pools; however, there is a mapped Potential Vernal Pool in the northwest corner of the Study Area, within the W2 Series BVW. (see Attachment A, Figure 3)[1].

The Study Area does not contain any mapped Certified Vernal Pools ("CVP's") or Potential Vernal Pools ("PVP's).

WETLAND DELINEATION METHODOLOGY & REGULATORY FRAMEWORK

Wetlands within the Study Area were delineated in accordance with the following guidance manuals and regulatory processes:

- U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987);

[1] Priority Habitat is based on the known geographical extent of habitat for all state-listed rare species, both plants and animals, and is codified under the Massachusetts Endangered Species Act ("MESA"). Estimated Habitats are a sub-set of the Priority Habitats and are based on the geographical extent of habitat of state-listed rare wetlands wildlife and is codified under the Wetlands Protection Act, which does not protect plants. State-listed wetland wildlife species are protected under MESA as well as the Wetlands Protection Act.

- Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Environmental Laboratory, Version 2.0, January 2012);

- Massachusetts Wetlands Protection Act ("WPA") and implementing regulations (310 CMR 10.00);

- Massachusetts Department of Environmental Protection ("MassDEP"), Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (MassDEP, 2nd Edition, September 2022); and

The wetland delineation methodologies referenced above generally prescribe a multi-parameter approach, where hydrophytic vegetation and hydrology (including hydric soils) are reviewed in conjunction with one another when delineating a wetland boundary.

The boundaries of the wetland resource areas were delineated in the field by tying brightly colored survey flagging to woody vegetation or other relatively permanent vegetation/structures. The flags were placed sufficiently close together to clearly identify wetland/resource area edges and to allow survey crews to see adjacent flags from one another. Flags were labeled successively using unique numeric identifiers for each wetland series.

RESULTS

The wetland resource areas delineated or otherwise identified by Epsilon are described below.

Bordering Vegetated Wetlands

According to the WPA Regulations, BVW's are "freshwater wetlands that border on creeks, rivers, streams, ponds and lakes and include wet meadows, marshes, swamps and bogs. Generally, the soils are saturated and/or inundated conditions exist such that these areas support a predominance of wetland indicator plants." Under the Act, BVW has a 100-foot Buffer Zone extending from its edge.

BVW Flag Series W1 (flags 100 through 112)

BVW Series W1 is located in the western portion of the Study Area on the wastewater treatment plant land and borders on the Fort River. This wetland system is a relatively wide drainage swale, ultimately ending in the Fort River. Vegetation species observed include: American elm (*Ulmus Americana*), red maple, catalpa, jump-seed (*Persicaria virginiana*), New York fern, sensitive fern (*Onoclea sensibilis*), poison ivy, Virginia creeper, Asiatic bittersweet, creeping charlie (*Glechoma hederacea*), jewelweed (*Impatiens capensis*), and jack-in-the-pulpit (*Arisaema triphyllum*).

BVW Flag Series W2 (flags 100 through 105)

BVW Series W2 is located adjacent to MAHW series MA1 in the northwest portion of the Study Area. The W2 series borders on the Fort River Vegetation species observed include; red maple, American elm, silver maple , white ash, silky dogwood (*Cornus amomum*), spicebush (*Lindera benzoin*), hop sedge (*Carex lupulina*), stinging nettle (*Urtica dioica*), New York fern, jewelweed, poison ivy, catalpa, and sensitive fern.

BVW Flag Series W3 (flags 100 through 108)

Wetland series W3 is located in the southeast portion of the Study Area and borders on the Fort River. A drainage channel was observed that runs parallel to the Fort River that carries stormwater from a culvert. It appears to also carry the Fort River during flooding events. Vegetation species observed include: red maple, silver maple, American elm, ash, spice bush, silky dogwood, poison ivy, Virginia creeper, jumpseed, reed canary grass (*Phalaris arundinacea*), beggarticks (*Bidens aristosa*) New York fern, sensitive fern, and jewelweed.

Bordering Land Subject to Flooding

According to the WPA regulations, Bordering Land Subject to Flooding ("BLSF") is "an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland. The boundary of BLSF is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm. Said boundary shall be that determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed under the National Flood Insurance Program (NFIP, currently administered by the Federal Emergency Management Agency, successor to the U.S. Department of Housing and Urban Development). Said boundary, so determined, shall be presumed accurate."[2]

BLSF does not have a 100-foot Buffer Zone extending from its boundary.

According to the current Federal Emergency Management Agency Flood Insurance Rate Map ("FEMA-FIRM") Community Panel Number 2501630002Bfor the Town of Hadley, Hampshire County, dated June 1, 1978, the Study Area is located within the mapped 100-year floodplain (see Attachment A, Figure 5).

Inland Bank and Land Under Water Bodies and Waterways

According to the WPA regulations, an Inland Bank is "the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a bordering vegetated wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and upland. The upper boundary of Bank is the first observable break in slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level."

[2] As explained in the WPA regulations, this presumption is rebuttable and may be overcome only by credible evidence from a registered professional engineer or other professional competent in such matters. Where NFIP Profile data is unavailable, the boundary of BLSF shall be the maximum lateral extent of flood water which has been observed or recorded. In the event of a conflict, the issuing authority may require the applicant to determine the boundary of BLSF by engineering calculations. Please see 310 CMR 10.57 for additional information.

According to the WPA regulations, Land Under Water Bodies and Waterways ("LUW") is "the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock; the boundary of LUW is the mean annual low water level."

Bank and LUW are associated with the Fort River identified with the Study Area. LUW was not specifically field delineated as it is contained within the MA1 & MA2 MAHW/Bank flag series described below.

Riverfront Area

According to the WPA regulations, a river is any natural flowing body of water that empties to any ocean, lake, pond, or other river and which flows throughout the year. Rivers include streams (see 310 CMR 10.04: Stream) that are perennial because surface water flows within them throughout the year. Intermittent streams are not rivers as defined herein because surface water does not flow within them throughout the year.

A Riverfront Area ("RFA") is the area of land between a river's mean annual high-water ("MAHW") line and a parallel line measured horizontally. The RFA may include or overlap with other resource areas or their Buffer Zones. The RFA is the area of land between a river's MAHW line measured horizontally outward from the river and a parallel line located 200-feet away[3]. The RFA does not have a Buffer Zone under the WPA.

According to the WPA regulations, a perennial stream (aka "river") is defined (in part), as follows:

- A river or stream shown as perennial on the current USGS map or more recent map provided by MassDEP is perennial.

- A river or stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size greater than or equal to one square mile, is perennial.

- A stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size less than one square mile, is intermittent unless the stream has a watershed size of at least ½ (0.50) square mile and has a predicted flow rate greater than or equal to 0.01 cubic feet per second at the 99% flow duration using the USGS Stream Stats method; or it meets certain criteria specified in the WPA regulations.[4]

[3] Except that the parallel line is located: a. 25 feet away in Boston, Brockton, Cambridge, Chelsea, Everett, Fall River, Lawrence, Lowell, Malden, New Bedford, Somerville, Springfield, Winthrop, and Worcester; b. 25 feet away in densely developed areas, as designated by the Secretary of the Executive Office of Energy and Environmental Affairs pursuant to 301 CMR 10.00: Densely Developed Areas; and c. 100 feet away for new agricultural and aquacultural activities. Measured horizontally means that the riverfront area extends at a right angle to the MAHW line rather than along the surface of the land.

[4] See 310 CMR 10.58.2(a) for additional detail.

The Study Area contains one perennial stream reach, the Fort River, having an associated 200-foot RFA. The reach of the Fort River flowing through the Study Area is shown as perennial on the current USGS Map. This resource area is described in further detail below.

MAHW Flag Series MA1 (flags 100 through 117)

The MA1 series delineates the MAHW associated with the northern Bank of the Fort River. In this reach the MAHW is coincident with the Bank. Bankfull field indicators such as vertical banks, changes in vegetation, stain lines, changes in bank materials, and in some locations, bank undercuts, were used to establish the MAHW. Vegetation observed on the Bank include silky dogwood, catalpa, spicebush, silver maple, poison ivy, beggarticks, American elm, and jewelweed.

MAHW Flag Series MA2 (flags 100 through 117)

The MA2 series delineates the MAHW associated with the southern Bank of the Fort River. South of the bridge, the Bank gradually sloped down toward the river, while north of the bridge the Bank was vertical in many locations, much like the bank associated with the MA1 series described above. Vegetation observed on the Bank include American elm, silver maple, catalpa, poison ivy, silky dogwood, spicebush, jewelweed, and beggarticks.

DISCUSSION

Depending on the location and extent of potential future work, Epsilon recommends filing an Abbreviated Notice of Resource Area Delineation ("ANRAD") at the appropriate time with the Conservation Commission seeking formal approval of the proposed wetland resource area boundaries described herein. The ANRAD provides a procedure for an applicant to obtain official confirmation from the Conservation Commission regarding the extent and types of local and state jurisdictional wetland resource areas on the site. The Commission's approval of the wetland resource area boundaries is valid for 3 years, notwithstanding any extension permits issued thereto. Having an approved wetland boundary will allow Project Engineers to advance the design work in accordance with applicable regulatory performance standards and with confidence knowing that the wetland boundaries are "locked in" and not subject to change leading up to the eventual filing of a Notice of Intent ("NOI") with the Conservation Commission describing proposed work.

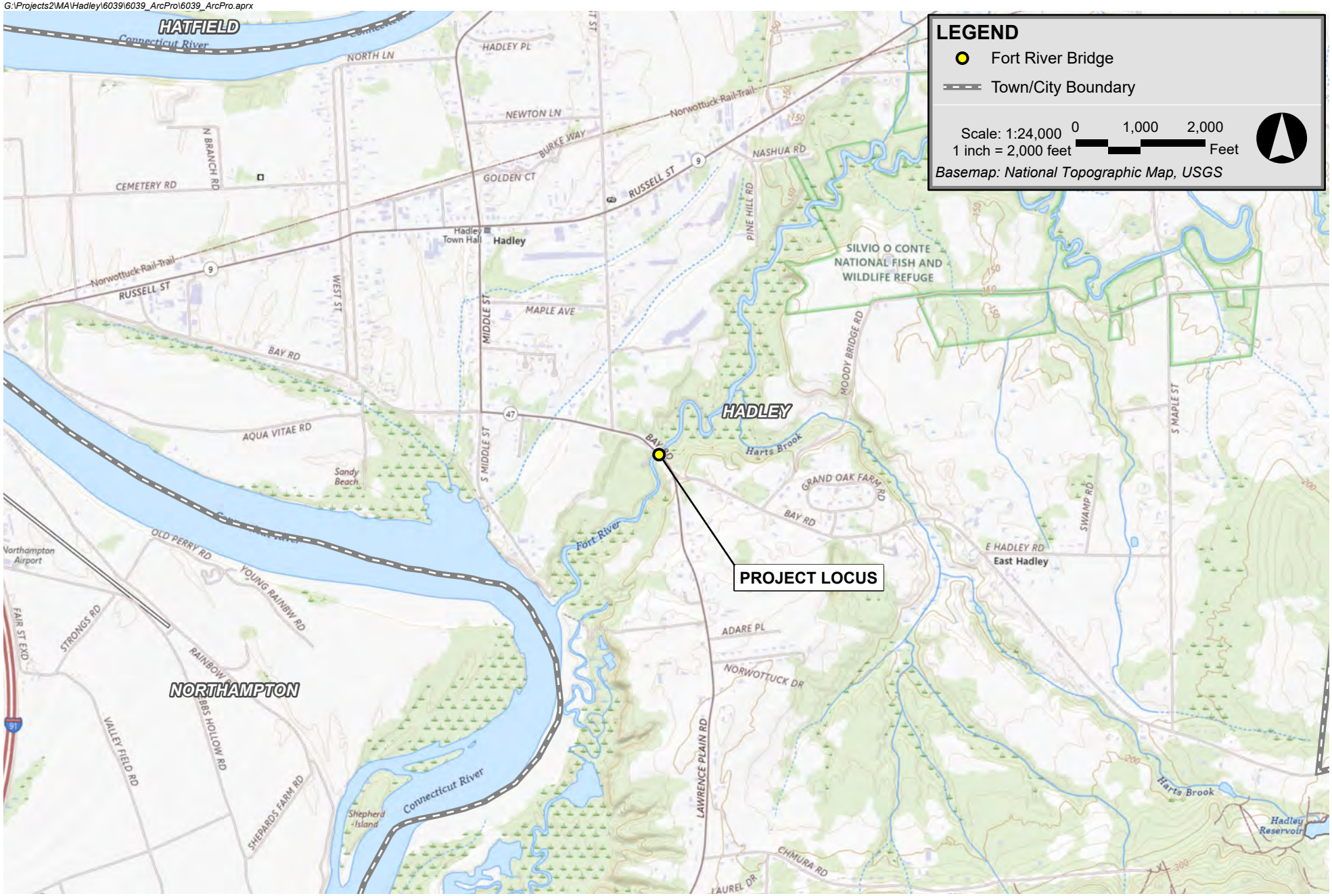
For purposes of this report, it is assumed that all the delineated vegetated wetlands are waters of the U.S. subject to regulation under Section 401 and 404 of the U.S. Clean Water Act.[5]

[5] "Waters of the United States" is broadly defined in the federal regulations that implement the Clean Water Act. It includes tidal waters, rivers, streams, lakes, ponds and wetlands. Wetlands are further defined MassDEP's 401 Water Quality Certification regulations as follows: "Bordering Vegetated Wetlands ("BVW") - Any land or surface area so defined by the Massachusetts Wetlands Protection Act, M.G.L. c. 131, § 40 and 310 CMR 10.55(2). [According to 310 CMR 10.55, BVW means (in part), "… freshwater wetlands which border on creeks, rivers, streams, ponds and lakes …"]; and Isolated Vegetated Wetlands ("IVW") - Areas subject to jurisdiction under 33 U.S.C. 1251, et seq. that are not Bordering Vegetated Wetlands subject to jurisdiction under M.G.L. c. 131, § 40 and 310 CMR 10.55(2).

Attachment A

Figures

G:\Projects2\MA\Hadley\6039\6039_ArcPro\6039_ArcPro.aprx

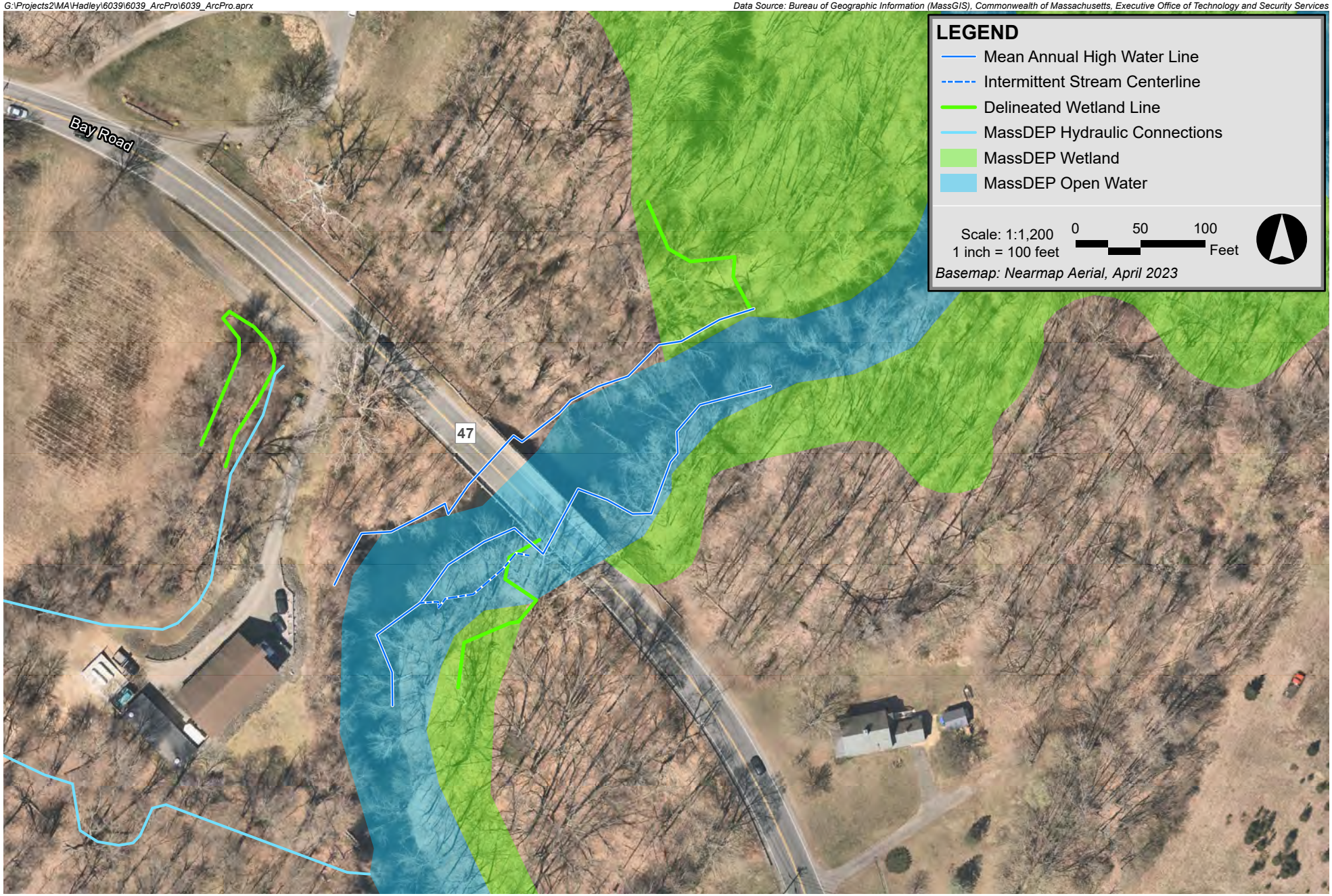


Fort River Bridge Hadley, Massachusetts

Figure 1
USGS Locus Map

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

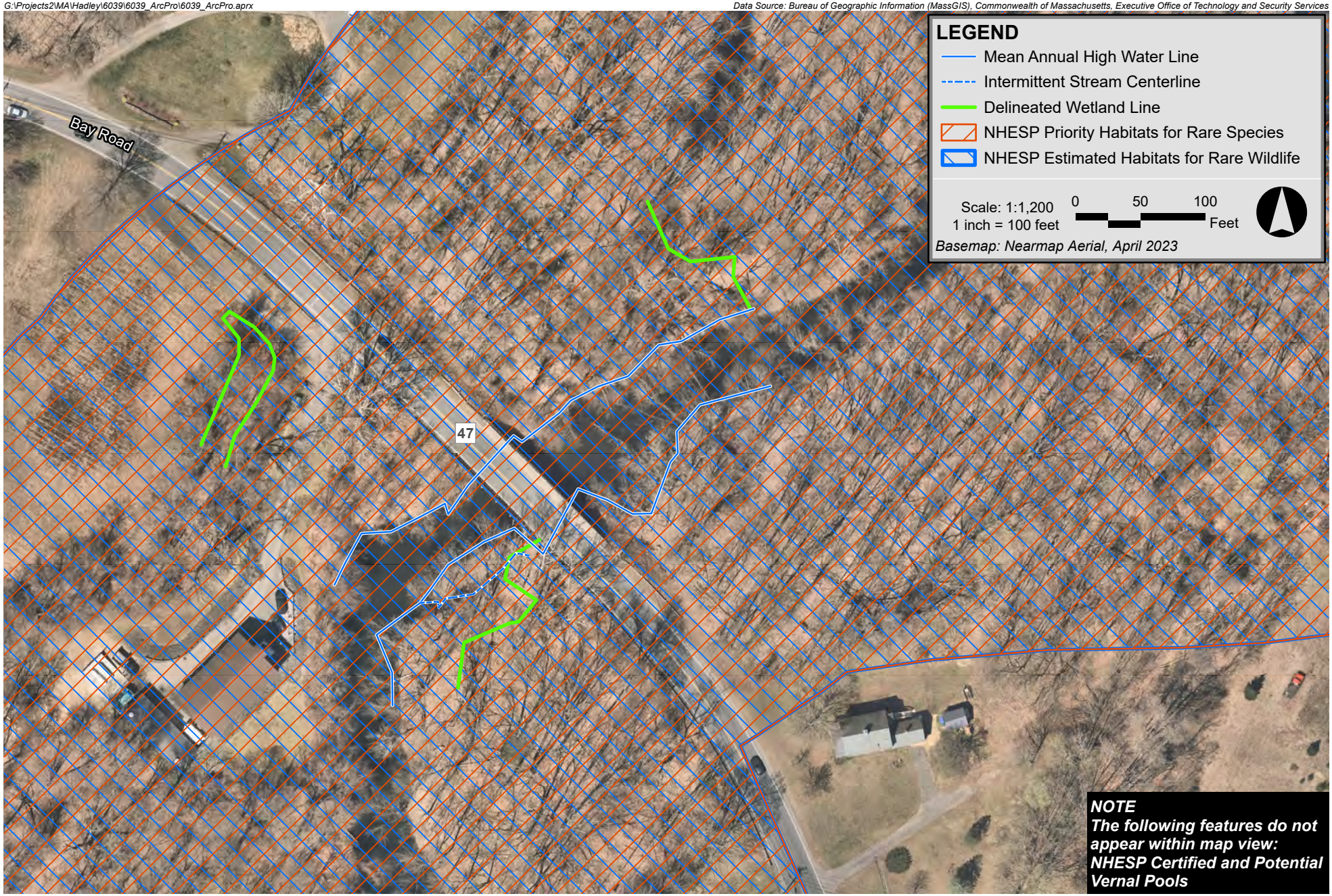


Fort River Bridge Hadley, Massachusetts

Figure 2
MassDEP Wetlands and Hydraulic Connections

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



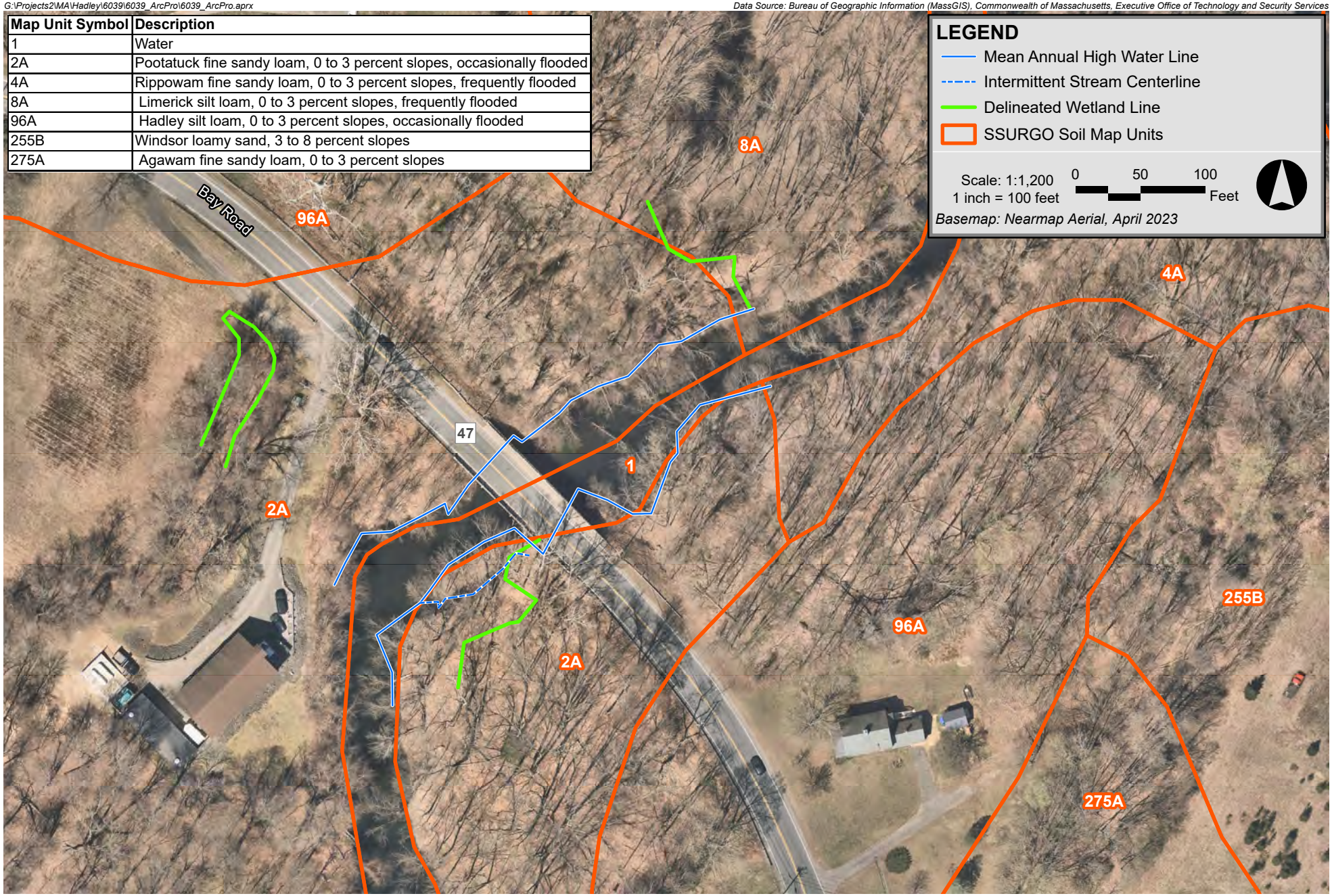
Fort River Bridge Hadley, Massachusetts

Figure 3
NHESP Habitats and Vernal Pools

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

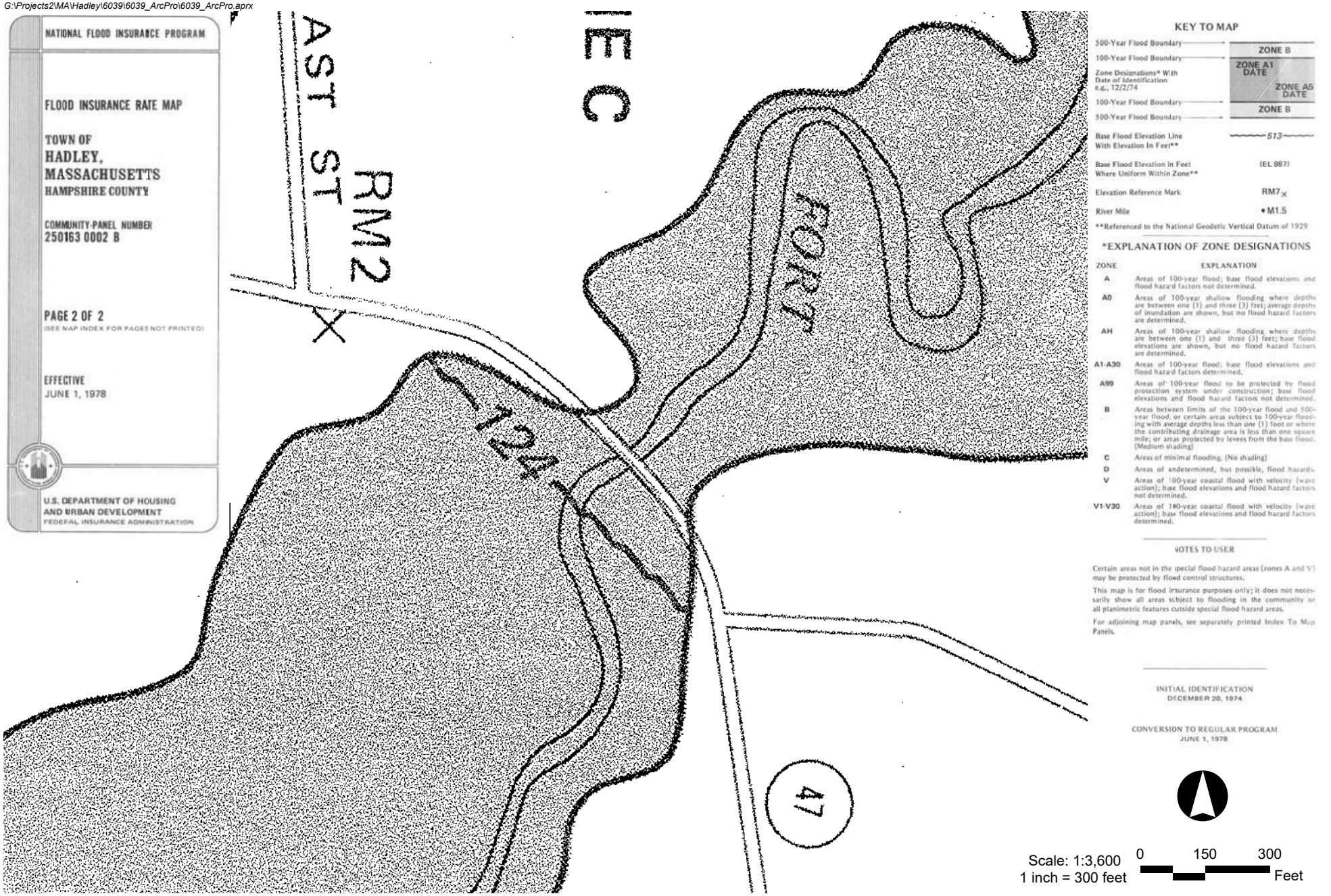
Map Unit Symbol	Description
1	Water
2A	Pootatuck fine sandy loam, 0 to 3 percent slopes, occasionally flooded
4A	Rippowam fine sandy loam, 0 to 3 percent slopes, frequently flooded
8A	Limerick silt loam, 0 to 3 percent slopes, frequently flooded
96A	Hadley silt loam, 0 to 3 percent slopes, occasionally flooded
255B	Windsor loamy sand, 3 to 8 percent slopes
275A	Agawam fine sandy loam, 0 to 3 percent slopes



Fort River Bridge Hadley, Massachusetts

Figure 4
NRCS SSURGO Soils

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Fort River Bridge Hadley, Massachusetts

Figure 5
FEMA FIRM

Attachment B

Photos



Photo 1: Overview of wetland flag series W1 looking north toward Bay Road



Photo 2: Overview of wetland flag series W1 looking south toward Hadley Water Department facility



Photo 3: View from north side underneath Fort River Bridge



Photo 4: View of the Fort River as seen from the top of the bridge on Bay Road



Photo 5: View of gravel drive near wetland series W1, with the entrance to the Hadley water department to the right, and a view of Bay Road and the Fort River Bridge in the background to the left.



Photo 6: View of the culvert found just south of the bridge on the southern bank.



Photo 7: View of drainage ditch carrying water from the culvert found south of the bridge



Photo 8: View of Fort River from the southern bank, north of the Fort River Bridge

Attachment C

Wetland Determination Forms

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Town of Hadley Sampling Point or Zone: W1 - Upland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.333096, -72.579467

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: NA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ☐	No ✔	**Is the Sampled Area within a Wetland?**	**Yes** ☐ **No** ✔
Hydric Soils criterion met?	Yes ☐	No ✔		
Wetlands hydrology present?	Yes ☐	No ✔		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)_____
Water Table Present?	Yes ☐	No ✔	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes ☐	No ✔	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	☐ Drainage patterns
☐ Iron deposits	☐ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	☐ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W1 - Upland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. catalpa	Catalpa speciosa	FACU	38.0	Yes	No
3. red oak	Quercus rubra	FACU	38.0	Yes	No
4.					
5.					
6.					
7.					
8.					
9.					

114.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. multiflora rose	Rosa multiflora	FACU	38.0	Yes	No
2. green ash	Fraxinus pennsylvanica	FACW	10.5	No	
3. honeysuckle	Lonicera japonica	FACU	20.5	Yes	No
4. Norway maple	Acer platanoides	UPL	20.5	Yes	No
5.					
6.					
7.					
8.					
9.					

89.5 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. jewelweed	Impatiens capensis	FACW	20.5	Yes	Yes
2. christmas fern	Polystichum acrostichoides	FACU	10.5	Yes	Yes
3. poision ivy	Toxicodendron radicans	FAC	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

51.5 = Total Cover

Sampling Point W1 - Upland

VEGETATION – continued.

Woody Vine Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	10.0	Yes	No
2. Virginia creeper	Parthenocissus quinquefolia	FACU	30.0	Yes	No
3.					
4.					
			40.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes _ _ No ✔

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	11	3	Yes _ _ No _ ✔

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	31	X 2	= 62.00
	FAC species	59	X 3	= 177.00
	FACU species	107	X 4	= 428.00
	UPL species	31	X 5	= 155.00
	Column Totals	(A) 228		(B) 822
	Prevalence Index	B/A = 3.61		Is the Prevalence Index ≤ 3.0? Yes _ _ No _ ✔

Wetland vegetation criterion met? Yes _ _ No ✔

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W1 - Upland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-8	10YR 3/2	100.00					FSL	
8-16+	7.5YR 5/6	100.00					FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: no redox

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Town of Hadley Sampling Point or Zone: W1 - Wetland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.333003, -72.579486

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: NA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ✔	No ☐	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ☐
Hydric Soils criterion met?	Yes ✔	No ☐		
Wetlands hydrology present?	Yes ✔	No ☐		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)
Water Table Present?	Yes ✔	No ☐	Depth (inches) 10.00
Saturation Present (including capillary fringe)?	Yes ✔	No ☐	Depth (inches) 10.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	✔ Drainage patterns
☐ Iron deposits	✔ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	✔ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W1 - Wetland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	63.0	Yes	Yes
2. catalpa	Catalpa speciosa	FACU	20.5	Yes	No
3. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

104.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
2. red maple	Acer rubrum	FAC	20.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

41.0 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. sensitive fern	Onoclea sensibilis	FACW	38.0	Yes	Yes
2. jewelweed	Impatiens capensis	FACW	20.5	No	
3. creeping charlie	Glechoma hederacea	FACU	10.5	No	
4. poison ivy	Toxicodendron radicans	FAC	38.0	Yes	Yes
5. New York fern	Thelypteris noveboracensis	FAC	20.5	No	
6.					
7.					
8.					
9.					
10.					
11.					
12.					

127.5 = Total Cover

Sampling Point W1 - Wetland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	20.5	Yes	No
2.					
3.					
4.					
			20.5 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	8	6		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	100	X 2	= 200.00
	FAC species	142	X 3	= 426.00
	FACU species	31	X 4	= 124.00
	UPL species	21	X 5	= 105.00
	Column Totals	(A) 294		(B) 855
Prevalence Index		B/A = 2.91		Is the Prevalence Index ≤ 3.0? Yes ☑ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W1 - Wetland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-6								fill
6-10	10YR 3/2	100.00					fine sandy loam	
10-20	2.5Y 4/2	85.00	5YR 5/8	15.00	C	M	loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Wanczyk Lee Ann Trustee Sampling Point or Zone: W2 - Upland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.332411, -72.578770

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: R2USC

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ☐	No ✔	**Is the Sampled Area within a Wetland?**	**Yes** ☐ **No** ✔
Hydric Soils criterion met?	Yes ☐	No ✔		
Wetlands hydrology present?	Yes ☐	No ✔		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)_____
Water Table Present?	Yes ☐	No ✔	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes ☐	No ✔	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	☐ Drainage patterns
☐ Iron deposits	☐ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	☐ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W2 - Upland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. silver maple	Acer saccharinum	FACW	38.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

76.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. multiflora rose	Rosa multiflora	FACU	38.0	Yes	No
2. honeysuckle	Lonicera japonica	FACU	20.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					

58.5 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. poison ivy	Toxicodendron radicans	FAC	20.5	Yes	Yes
2. creeping charlie	Glechoma hederacea	FACU	10.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

31.0 = Total Cover

Sampling Point W2 - Upland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	10.5	Yes	No
2. Virginia creeper	Parthenocissus quinquefolia	FACU	10.5	Yes	No
3.					
4.					
			21.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes _ _ No ✔
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	8	3		Yes _ _ No _ ✔ _
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	38	X 2	= 76.00
	FAC species	59	X 3	= 175.50
	FACU species	80	X 4	= 318.00
	UPL species	11	X 5	= 52.50
	Column Totals	(A) 186.5		(B) 622
Prevalence Index		B/A = 3.34		Is the Prevalence Index ≤ 3.0? Yes _ _ No _ ✔ _
Wetland vegetation criterion met?		**Yes** _ _	**No** ✔	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2 - Upland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)								
Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]	Texture	Remarks
0-10	10YR 3/2	100.00					FSL	
10-16	7.5YR 5/6	100.00					FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: no redox

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Wanczyk Lee Ann Trustee Sampling Point or Zone: W2 - Wetland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.332495, -72.578757

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: R2USC

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ✔	No ☐	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ☐
Hydric Soils criterion met?	Yes ✔	No ☐		
Wetlands hydrology present?	Yes ✔	No ☐		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)
Water Table Present?	Yes ✔	No ☐	Depth (inches) 10.00
Saturation Present (including capillary fringe)?	Yes ✔	No ☐	Depth (inches) 10.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	✔ Drainage patterns
☐ Iron deposits	✔ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	✔ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W2 - Wetland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
3. silver maple	Acer saccharinum	FACW	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

79.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. silky dogwood	Swida amomum	FACW	20.5	Yes	Yes
2. green ash	Fraxinus pennsylvanica	FACW	3.0	No	
3. spice bush	Lindera benzoin	FACW	10.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

34.0 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. poison ivy	Toxicodendron radicans	FAC	10.5	Yes	Yes
2. sensitive fern	Onoclea sensibilis	FACW	10.5	Yes	Yes
3. jewelweed	Impatiens capensis	FACW	10.5	Yes	Yes
4. New York fern	Thelypteris noveboracensis	FAC	38.0	Yes	Yes
5. hop sedge	Carex lupulina	OBL	3.0	No	
6. stinging nettle	Urtica dioica	FAC	10.5	Yes	Yes
7.					
8.					
9.					
10.					
11.					
12.					

83.0 = Total Cover

Sampling Point W2 - Wetland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test:	Do all dominant species have an indicator status of OBL or FACW?			Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	10	10		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	3	X 1	= 3.00
	FACW species	96	X 2	= 192.00
	FAC species	97	X 3	= 291.00
	FACU species	0	X 4	= 0.00
	UPL species	0	X 5	= 0.00
	Column Totals	(A) 196		(B) 486
	Prevalence Index	B/A = 2.48		Is the Prevalence Index ≤ 3.0? Yes ☑ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2 - Wetland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-10	10YR 3/2	100.00					SIL	
10-18	5Y 5/2	85.00	10YR 5/8	15.00	C	M	FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

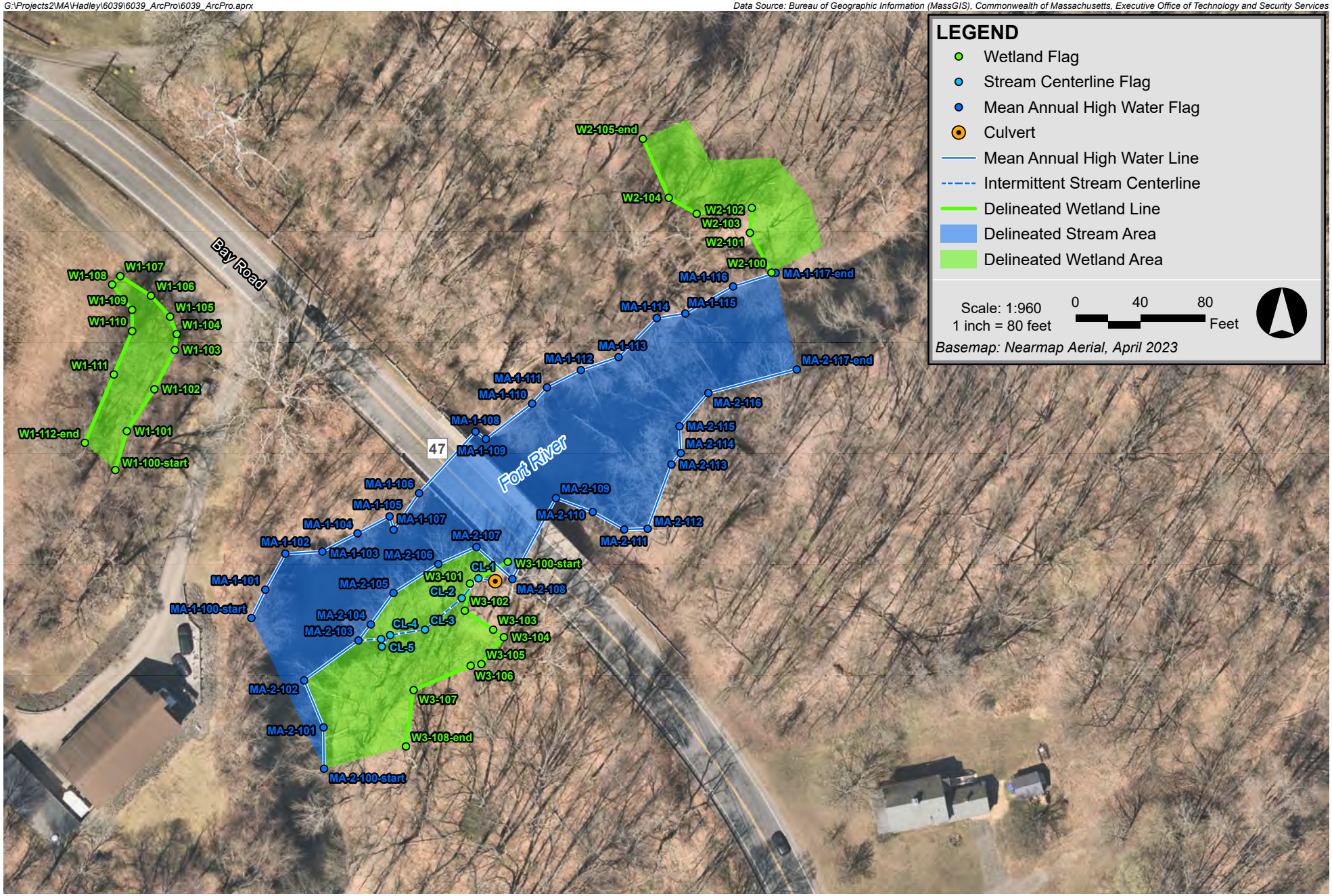
Hydric Soils criterion met? **Yes** ☑ **No** ☐

Attachment D

Wetland Delineation Map

G:\Projects2\MA\Hadley\6039\6039_ArcPro\6039_ArcPro.aprx

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



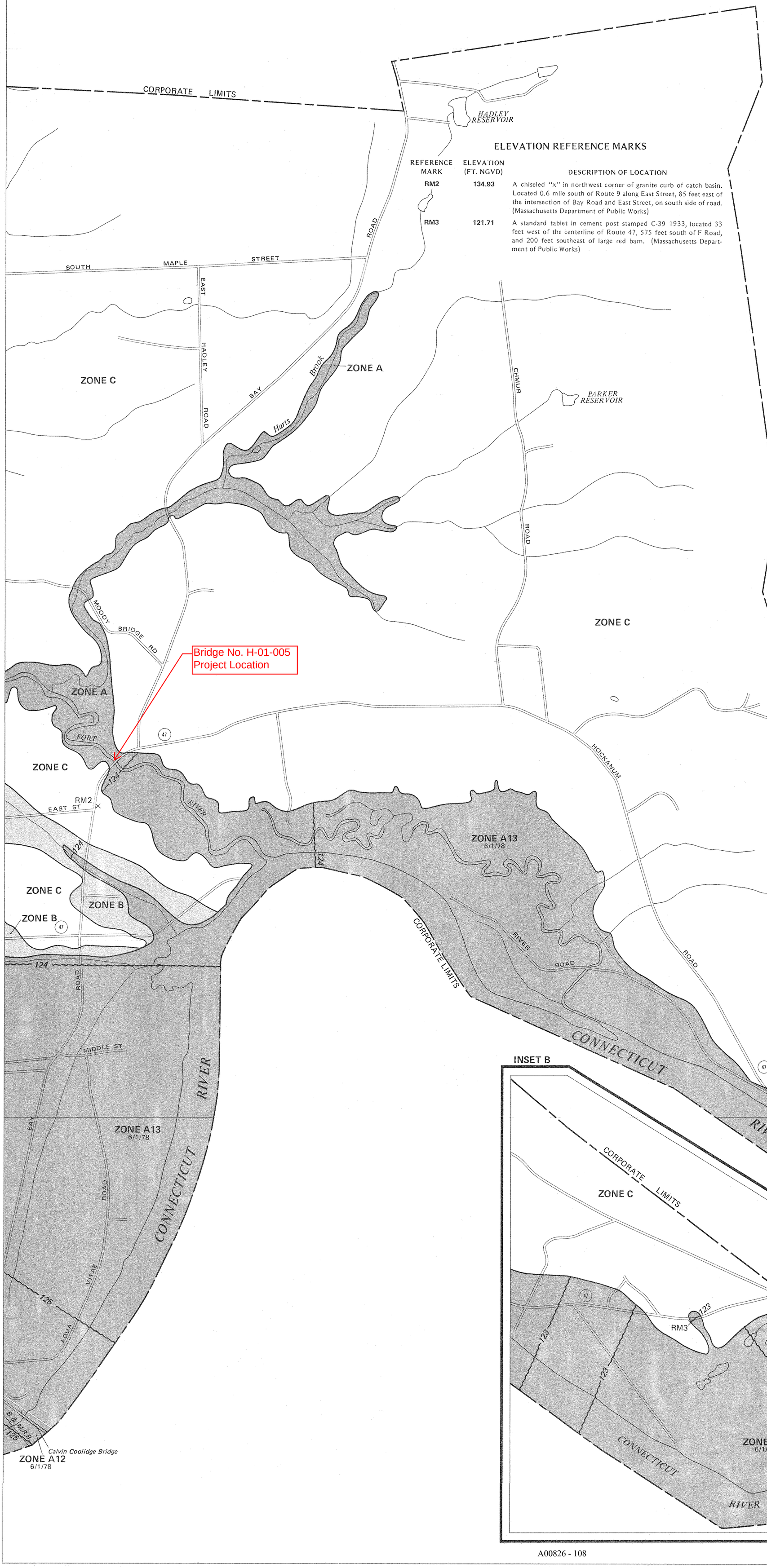
Fort River Bridge Hadley, Massachusetts

Attachment D
Delineated Wetland Resource Areas

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT E

Flood Insurance Rate Map



KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary

ZONE B
ZONE A1 DATE / ZONE A5 DATE
ZONE B

Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7 ×

River Mile — • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION
DECEMBER 20, 1974

CONVERSION TO REGULAR PROGRAM
JUNE 1, 1978

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE
1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

TOWN OF
HADLEY, MASSACHUSETTS
HAMPSHIRE COUNTY

COMMUNITY-PANEL NUMBER
250163 0002 B

PAGE 2 OF 2
(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE
JUNE 1, 1978

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT F

Hydraulic Study Report

HYDRAULIC STUDY REPORT

BAY ROAD (ST 47) ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS
HAMPSHIRE COUNTY- DISTRICT 1
BRIDGE NO. H-01-005 (12J)
PROJECT FILE No. 608460



February 27, 2018

Prepared by

Hydraulics Unit
Bridge Section
10 Park Plaza, Suite 6430
Boston, MA 02116

The Commonwealth Of Massachusetts
Massachusetts Department of Transportation
Highway Division
Interoffice Memorandum

To: **Thomas P. Donald, P.E., Director of Bridge Project Management**

From: **Hanan Fouad, P.E., Hydraulic Engineer**

Date: **February 27, 2018**

Subject: **Hadley: Br. No. H-01-005, Bay Road (ST 47) Over Fort River**
Project Hydraulic Study Report, Project File No. 608460

Transmitted herewith is the Hydraulic Study Report prepared for the subject bridge. If you have questions regarding the content of this document, please contact Bindu Thomas at 857.368.9386 or at Bindu.Thomas@dot.state.ma.us

HF
cc: James M. Dalton, Project Manager

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1.0 Executive Summary

The purpose of this report is to present the results of a study conducted at the subject bridge site to evaluate the hydraulic performance of the replacement alternative for the Bay Road (ST 47) Bridge in the Town of Hadley considered in the Bridge Type Study. This investigation was conducted in a manner consistent with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA), and Massachusetts Department of Transportation (MassDOT) guidelines for preparation of hydraulic studies at bridge sites.

The scope of this investigation consisted of review of pertinent hydrologic analysis data for the Fort River at the project site and a detailed hydraulic analysis. Data collected, hydraulic model input/output and scour calculations are presented in the appendices of this report. A narrative discussion of the problem statement, engineering methods, as well as results and conclusions of the hydraulic study follows.

2.0 Project Description

The bridge is located on Bay Road (ST Route 47) over Fort River in the Town of Hadley, Hampshire County, Massachusetts **(Figure 2-1).**

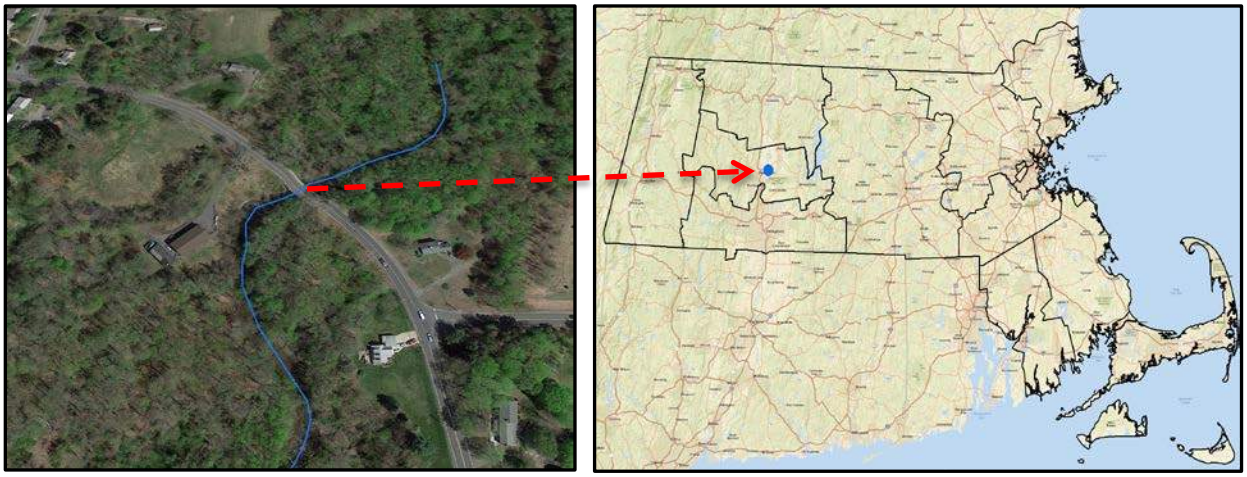


Figure 2-1: Bridge Location

2.1 Existing Structure

The subject bridge is located in the Town of Hadley in Hampshire County, Massachusetts. It is designated as Bridge No. H-01-005 (12J) in the NBIS inventory. The existing bridge was built in 1935. The structure has a National Bridge Inspection Standard (NBIS) Item 113 (Scour Critical Bridges) of 4, *Bridge foundations determined to be stable for calculated scour conditions; field review indicates action is required to protect exposed foundations from effects of additional erosion and corrosion* (**Reference-1**).

The existing bridge superstructure consists of eight span continuous reinforced concrete slabs and is supported by two reinforced concrete abutments on timber piles and seven open bent piers with reinforced concrete pier caps on timber piles. The bridge has a total span of approximately 126 feet. The bridge supports a deck out to out width of 37.7 feet and has a skew of 0 degree. (**Figure 2-2**)



Figure 2-2: Existing Bridge

2.1.1 Crossed Waterway at the Bridge Location

The Fort River is one of the major and longest free flowing tributary of the Connecticut River. The River originates from the Atkins reservoir and flows through the heavily forested uplands in the south westerly direction. The river flows through the towns of Shutesbury, Pelham, Amherst, and Hadley. The river crosses the subject bridge in the southwest direction in the Town of Hadley and finally discharges 0.7 miles downstream of the bridge into Connecticut River. The Fort River's drainage area at the crossing site is estimated to be 54.6 square miles (**Figure 2-3**).

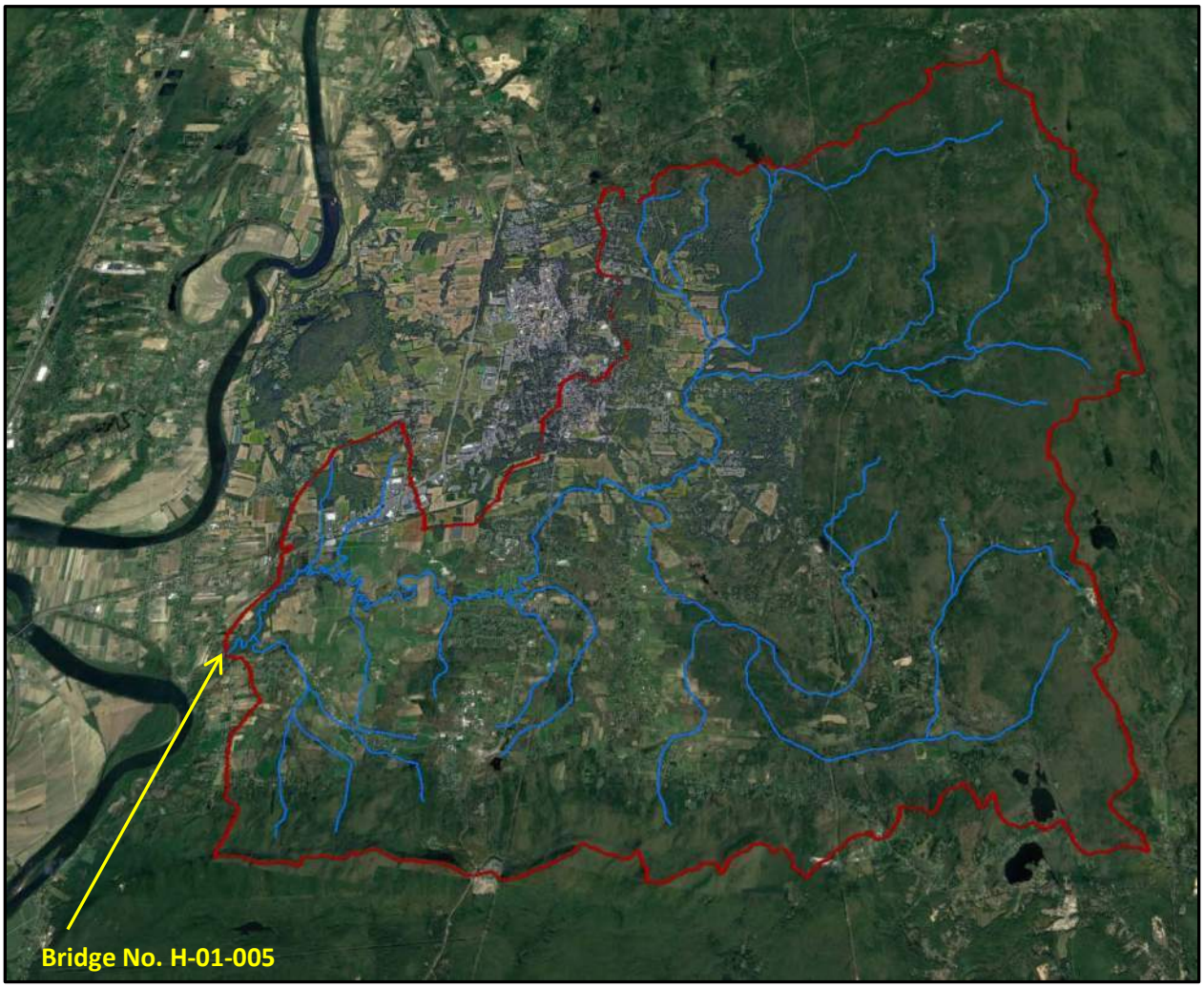


Figure 2-3: Drainage Area at Bridge Crossing

2.1.2 Highway Conveyed

The Bay Road (ST 47) is classified as an Urban Arterial Road. It conveys an average daily traffic (ADT) load of about 6983 vehicles per day, with 9% of which may be trucks (**Reference-1**).

2.1.3 Land Use in the vicinity of the bridge

Land use near the bridge is a mix of forest, forested wetland and low density residential (**Figure 2-4**).



Figure 2-4: Land Use at the Bridge Location

2.1.4 Special Site Considerations

No detailed hydrologic/hydraulic study of Fort River in Hadley is known to exist. Nonetheless, due to the existing bridge's proximity to Fort River's confluence with the Connecticut River, this crossing site is subject to the former's backwater flooding influence and has been incorporated within the Connecticut River's local base (100-year) Special Flood Hazard Area (SFHA) Zone A delineation in the 1977 Town of Hadley Flood Insurance Study (FIS) (**References-2**). As the river is not studied in the NFIP in detail, **NO-RISE** analysis is **NOT** performed in this study. Detailed hydraulic analysis performed within this present hydraulic study indicates that project activities will have no adverse impact on any Fort River's or Connecticut River's regulatory flood delineation width, or at any location within the Town of Hadley (**Figure 2-5**).

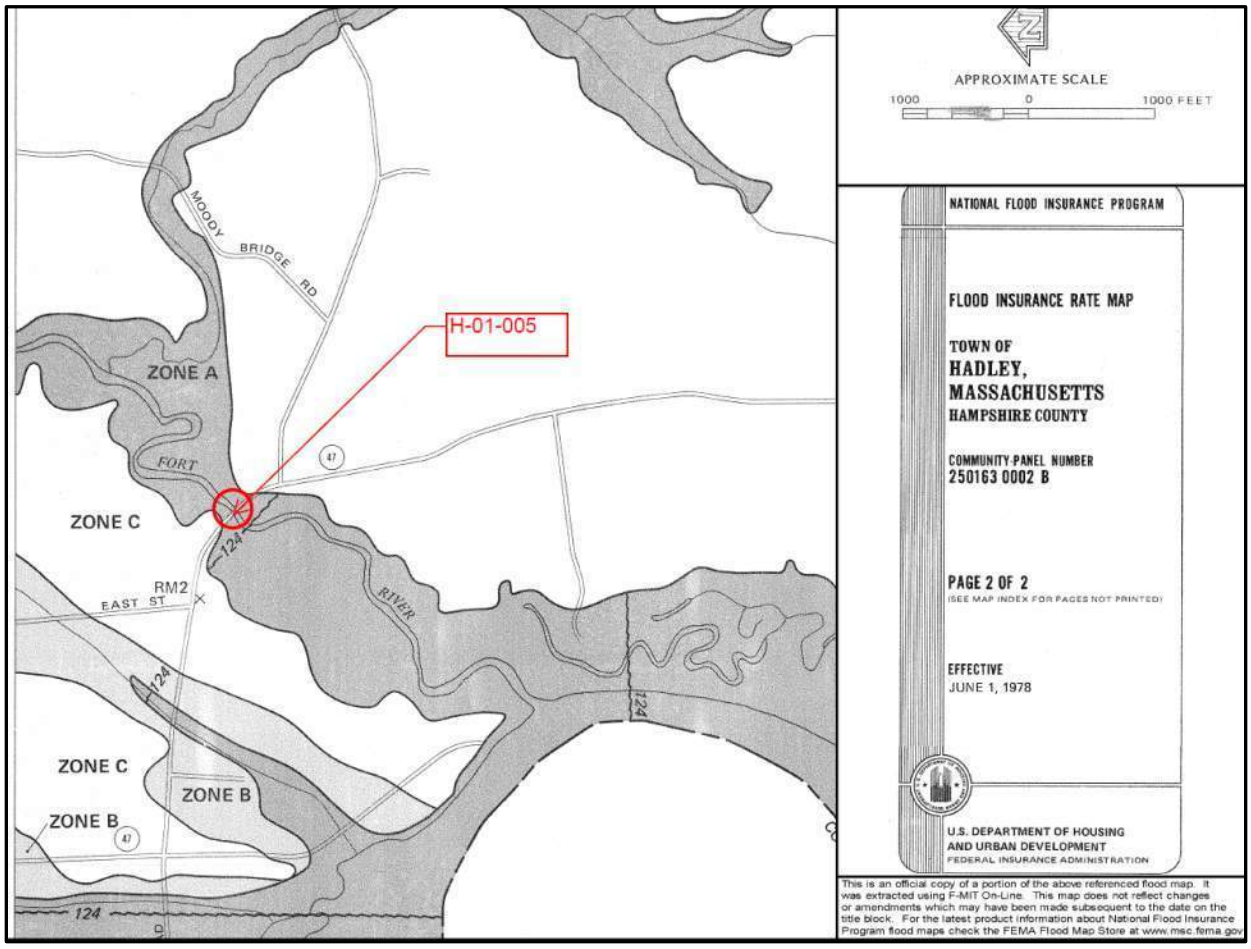


Figure 2-5: Floodway Map

2.2 Proposed Action

The principle project objectives are to upgrade the existing load and service capacity to current highway standards along Bay Road (ST 47). The proposed action is a full replacement of the existing superstructure and abutments for the widening of the bridge. Four alternatives considered in this study are the following.

(a) Alternative-1 - Three Span Continuous Steel Beam with an out to out width of 42.5 ’;

(b) Alternative-2 - Two Span Continuous Steel Beam with an out to out width of 42.5’and;

(c) Alternative-3 - Three Span Precast Deck Beam with an out to out width of 43’.

(d) Alternative-4 - Three Span Separated Precast Deck Beam with an out to out width of 42.5’.

The proposed bridge alternatives are shown in **Figure 2-6 through 8**.

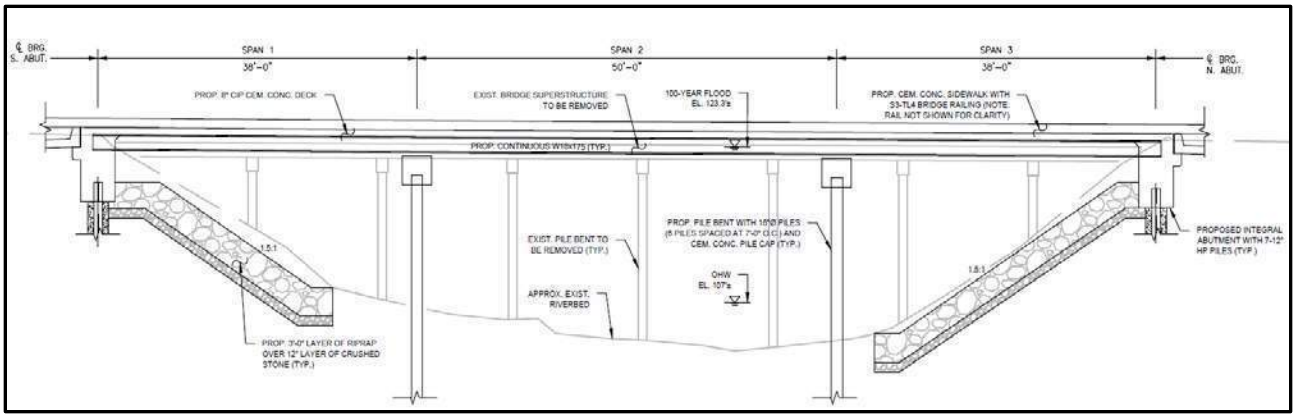


Figure 2-6: Alternative-1 -Three Span Continuous Steel Beam

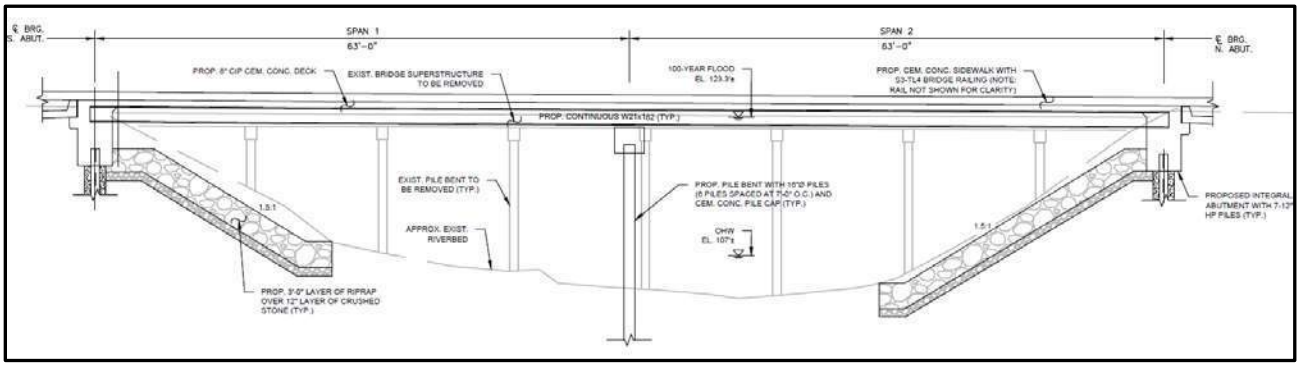


Figure 2-7: Alternative-2 -Two Span Continuous Steel Beam

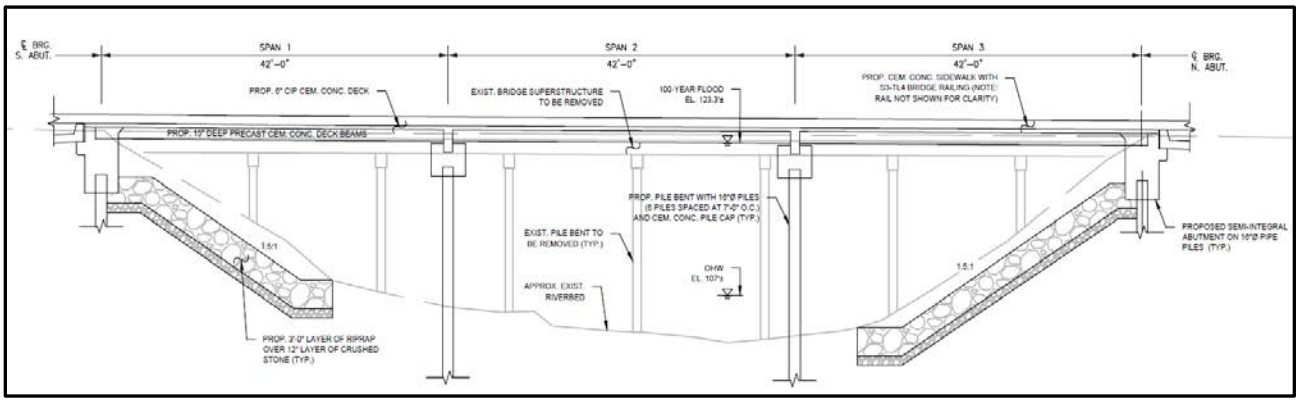


Figure 2-8: Alternative-3 - Three Span Precast Deck Beam

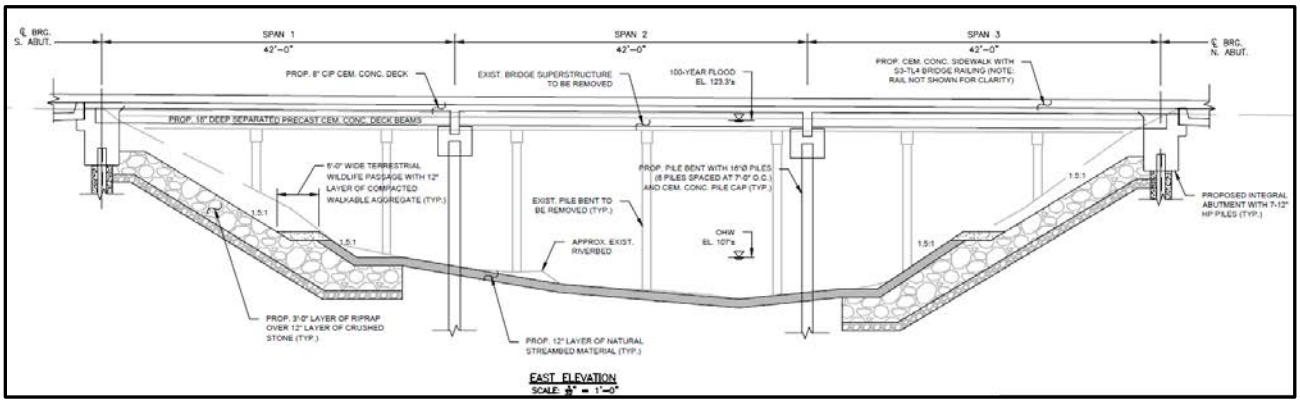


Figure 2-9: Alternative-4 - Three Span Separated Precast Deck Beam

3.0 Data Collection

The following reference and report on the study area were available and were used as guidance during the hydraulic and hydrologic model development and Analysis:

- Town of Hadley, Hampshire County Flood Insurance Study (FIS), December, 1977 (**Reference-2**);
- River Sediment Sampling Results by GZA GeoEnvironmental Inc., January 11 2018 (**Appendix 7-3**);
- Base plans for Fort River;

4.0 Engineering Methods

Hydrologic and hydraulic analyses were conducted to estimate the peak discharge and water surface elevation respectively, at the bridge location. The following sections briefly describe the methodology.

4.1 Hydrologic Analysis

The Peak 10% (10-yr), 4% (25-yr), 2% (50-yr), 1% (100-yr), 0.5% (200-yr) and 0.2% (500-yr) annual chance peak flood discharges for Fort River were adopted from the hydrologic model developed in this study. The design annual chance event for an Urban Principal Arterial Road is 2% (50-yr).

The river's drainage area at the subject bridge was delineated using USGS StreamStat Web Application (**Reference-4**). See section 2.1.1 for delineated drainage area at the bridge. The peak flows were estimated using USGS regression equation based on the 2017 report on magnitude of flood flows for streams in Massachusetts (**Reference-6)**. The computed peak flows are presented in **Table 4-1**. See **Appendix 7-1** for hydrologic computations.

Table 4-1: Summary of Peak Flood Discharges

Fort River	Drainage Area (Square Miles)	10% Annual Chance [10-yr] (CFS)	4% Annual Chance [25-yr] (CFS)	2% Annual Chance [50-yr] (CFS)	1% Annual Chance [100-yr] (CFS)	0.5% Annual Chance [200-yr] (CFS)	0.2% Annual Chance [500-yr] (CFS)
@ Bay Road	54.6	2,160	2,870	3,460	4,080	4,760	5,720

4.2 Hydraulic Analyses

Water surface profiles for 10%, 4%, 2%, 1%, 0.5% and 0.2% annual chance peak discharge events were developed in a manner consistent with the standards used to develop water surface profiles under the National Flood Insurance Program (NFIP). USACOE HEC-RAS Version 5.0.3 application was used to develop flood elevation profile for various return events at the project site (**References-12**). The datum used in all hydraulic models is NAVD 1988.

Since the bridge does not fall under the NFIP regulatory floodway delineation, **NO-RISE** analysis is **not** required in this study.

4.2.1 Existing Condition Analysis

The Existing Condition HEC-RAS Model was developed by incorporating relevant cross section data upstream and downstream of the subject bridge. The cross section data for the existing condition upstream and downstream of the bridge were extracted using ArcGIS HEC-GeoRAS modeling tool and using recent survey and LiDAR data (**Reference-5, 11, 13**). The model parameters such as channel and overbank roughness coefficients (Manning's 'n') were determined from the aerial maps and from the site visit notes. The HEC-RAS model cross section locations are shown in **Figure 4-1**.

All flood simulations performed using HEC-RAS model were done in a subcritical flow mode with FEMA WSEL at the confluence of Fort River with Connecticut River as downstream boundary condition and employed Peak discharges from Table 4-1 for the flow data.

The existing condition analysis yielded a design and Base Flood Elevation (BFE) of 121.15’ and 123.16’ respectively at the upstream cross section of subject Bridge.



Figure 4-1: HEC-RAS Cross Section Layout Plan

4.2.2 Proposed Condition Analysis

The proposed condition analyses were performed for all four alternatives described under Section 2.2: (a) Alternative-1 - Three Span Continuous Steel Beam with an out to out width of 42.5 ’; (b) Alternative-2 - Two Span Continuous Steel Beam with an out to out width of 42.5’; (c) Alternative-3 - Three Span Precast Deck Beam with an out to out width of 43’ and (d) Alternative-4 - Three Span Separated Precast Deck Beam with an out to out width of 42.5’.

Table 4-2: Summary of Hydraulic Performance

Project Alternative	Annual Chance Event (%)	Discharge (CFS)	WSEL (Feet, NAVD)	Velocity (Ft/s)
Existing Condition	10%	2,160	116.25	1.83
	4%	2,870	119.07	1.84
	2%	3,460	121.15	1.88
	1%	4,080	123.16	1.92
	0.5%	4,760	125.57	1.70
	0.2%	5,720	128.41	1.57
Proposed Alternative-1	10%	2,160	116.23	2.12
	4%	2,870	119.04	2.18
	2%	3,460	121.12	2.23
	1%	4,080	123.12	2.27
	0.5%	4,760	125.58	1.99
	0.2%	5,720	128.42	1.73
Proposed Alternative-2	10%	2,160	116.22	2.14
	4%	2,870	119.04	2.20
	2%	3,460	121.11	2.25
	1%	4,080	123.12	2.27
	0.5%	4,760	125.57	1.98
	0.2%	5,720	128.42	1.71
Proposed Alternative-3	10%	2,160	116.23	2.01
	4%	2,870	119.04	2.08
	2%	3,460	121.12	2.12
	1%	4,080	123.13	2.16
	0.5%	4,760	125.57	1.91
	0.2%	5,720	128.42	1.67
Proposed Alternative-4	10%	2,160	116.20	2.21
	4%	2,870	119.03	2.24
	2%	3,460	121.11	2.27
	1%	4,080	123.10	2.29
	0.5%	4,760	125.53	2.26
	0.2%	5,720	128.42	1.71

The proposed condition analysis was performed after revising the existing condition model by changing the existing bridge width to accommodate the proposed road and changing the ineffective areas locations and elevations. The peak discharges, boundary conditions and cross sections locations from the existing model were not changed. The summary of existing and

proposed condition alternatives HEC-RAS analysis at the upstream cross-section of the bridge is presented in **Table 4-2.**

The model results for all four alternatives showed that there is less than 0.1' reduction in water surface elevation upstream of the bridge. The reduction is very less because of the flood plain extent. Hence, there will not be any adverse project impact due to increased hydraulic opening at the bridge for all proposed openings. However, it is observed that there is slight increase in velocity due to this reduction in WSEL.

Appendix 7.2 shows the results of HEC-RAS modeling at the bridge and WSEL profiles of Fort River.

4.3 Scour Safety and Stability Analysis

Scour potential at the crossing site under existing and proposed conditions was analyzed using the guidelines set forth by the FHWA Hydraulic Engineering Circular No.18 (HEC-18) "*Evaluating scour at bridges"* (**Reference-8**) and AASHTO LRFD Bridge Design Specifications, Sections 2.6.4.4.2 and 3.7.5. In accordance with Section 1.3.4 of LRFD Bridge Manual (**Reference-3**), for *Urban Principal Arterial* Highway Functional Classification, the river's 1% (100-year) and 0.5% (200-year) chance flood events were respectively used in this analysis as the scour design and scour check events.

In this study the abutment scour is calculated using National Cooperative Highway Research Program (NCHRP 24-20) method described in HEC-18. Total scour at the pier is computed using guidelines provided in HEC-18. Prediction of pressure flow scour under the deck is calculated using HEC-18 guidelines. Calculations showed no pressure flow scour under the deck for both design and check flood events. Since the hydraulic results for all four proposed alternatives showed only minor differences, abutment, contraction and pressure scour calculations are performed only for the worst case scenario. A summary of computed 1% and 0.5% chance flood scour depths under existing and proposed site conditions is presented in **Table 4-3.** See **Appendix 7-3** for the detailed scour calculations.

Table 4-3: Summary of Calculated Scour

Alternative	Annual Chance Flood (%)	Contraction Scour Depth (Feet)	Maximum Pier Scour Depth (Feet)	Design Abutment Scour (Feet)
Existing Condition	1%	0.0	2.4	13.4
	0.5%	0.0	2.3	10.3
Proposed Alternative-1	1%	0.0	2.6	11.9
	0.5%	0.0	2.5	13.2
Proposed Alternative-2	1%	0.0	2.6	11.9
	0.5%	0.0	2.5	13.2
Proposed Alternative-3	1%	0.0	2.5	11.9
	0.5%	0.0	2.5	13.2
Proposed Alternative-34	1%	0.0	2.6	11.9
	0.5%	0.0	2.6	13.2

5.0 Conclusions & Recommendations

5.1 Conclusions

1. The project hydraulic model predicts that both the existing bridge and the preferred replacement bridge type will safely convey the 50-year hydraulic design flood event.
2. Analysis performed within this hydraulic study indicates that project activities will not result in any increase in flood elevations within the community during the occurrence of Fort River's base flood discharge.

5.2 Recommendations

1. The information in **Table 5-2, 3, 4 or 5** for the recommended alternative should be presented within the Hydraulic Data Tables in the General Notes of the Bridge Sketch and Construction Plan sets.
2. The grades that will exist at the proposed abutments should be stabilized with flexible revetments consisting of MassDOT Standard Specification M2.02.2 Dumped Riprap over a composite filter medium consisting of a layer of MassDOT Standard Specification M2.02.01, Crushed Stone placed over an appropriate MassDOT Standard Specification 9.50.0 Geotextile Fabric membrane.
3. The calculated 1% (100-year) chance flood event total scour depth presented in **Table 5-2, 3, 4 or 5** for the recommended alternative should be considered for use as a bridge foundation condition in LRFD strength and service limit state foundation stability determination. Similarly, the calculated 0.5% (200-year) scour depth should be considered for use as a bridge foundation condition in the LRFD extreme event limit state foundation stability determination. Also, the design engineer should be cognizant that the proposed bridge substructure will meet the foundation scour stability requirements set forth in MassDOT Bridge LRFD Manual (**Reference-3**), Section 3.2.9.4, and presented below.

For new bridges or full bridge replacements, the substructures shall be designed to meet the requirements of Paragraphs 3.2.9.2 and 3.9.2.3 for the calculated design and check scour without using scour countermeasures.

Table 5-1: Hydraulic Design Data (Existing Condition)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	1.88 Feet Per Second
Design Flood Elevation:	121.15 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.16 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	13.4 Feet
Design Flood Pier Scour Depth	2.4 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	10.3 Feet
Check Flood Pier Scour Depth	2.3 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-2: Hydraulic Design Data (Proposed Alternative - 01)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.23 Feet Per Second
Design Flood Elevation:	121.12 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.12 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.6 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.5 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-3: Hydraulic Design Data (Proposed Alternative - 02)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.25 Feet Per Second
Design Flood Elevation:	121.11 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.12 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.6 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.5 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-4: Hydraulic Design Data (Proposed Alternative - 03)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.12 Feet Per Second
Design Flood Elevation:	121.12 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.13 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.5 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.5 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

Table 5-5: Hydraulic Design Data (Proposed Alternative - 04)

Hydraulic Design Data	
Drainage Area:	54.6 Square miles
Design Flood Discharge:	3,460 Cubic Feet Per Second
Design Flood Frequency:	50 Years
Design Flood Velocity:	2.27 Feet Per Second
Design Flood Elevation:	121.11 Feet, NAVD
Base (100- YEAR) Flood Data	
Base Flood Discharge:	4,080 Cubic Feet per Second
Base Flood Elevation:	123.10 Feet, NAVD
Design and Check Scour Data	
Design Flood Scour Frequency:	100 Years
Design Flood Abutment Scour Depth:	11.9 Feet
Design Flood Pier Scour Depth	2.6 Feet
Check Flood Scour Frequency:	200 Years
Check Flood Abutment Scour Depth:	13.2 Feet
Check Flood Pier Scour Depth	2.6 Feet
Flood of Record	
Discharge:	Not Available
Frequency (If Known):	Not Available
Maximum Elevation:	Not Available
Date:	March 1936
History of Ice Floes:	None Documented in NBIS Database
Evidence of Scour and Erosion:	At the upstream ends of Bents 3, 4, & 5 shown in underwater inspection report, minor scour has exposed the timber piles below the steel jacket.

6.0 References

6.1 Data Sources

1. MassDOT NBIS Bridge Inspection File, Br. No. H-01-005
2. Town of Hadley Flood Insurance Study (FIS), December 1977
3. MassDOT Bridge Load and Resistance Factor Design (LRFD) Manual, June 2013
4. United States Geological Survey (USGS), USGS Streamstat in Massachusetts website http://water.usgs.gov/osw/streamstats/massachusetts.html
5. Mass GIS Datalayers - http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/layerlist.html
6. Zarriello, P.J., 2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 54 p., https://doi.org/10.3133/sir20165156
7. United States Geological Survey (USGS) Water-Supply Paper 2214, “Estimating Peak Discharges of Small, Rural Streams in Massachusetts”, by S. William Wandle Jr., 1983
8. Federal Highway Administration (FHWA), Hydraulic Engineering Circular, HEC-18 “Evaluating Scour at Bridges”, May 2012
9. Federal Highway Administration (FHWA), Hydraulic Design Series, HDS-7 “Hydraulic Design of Safe Bridges”, April 2012
10. Federal Highway Administration (FHWA), Hydraulic Engineering Circular, HEC-23 “Bridge Scour and Stream Instability Countermeasures”, September 2009

6.2 Data Applications

11. ESRI ArcGIS version 10.4.1 mapping software
12. US Army Corps of Engineer (USACOE), Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 5.0.3
13. US Army Corps of Engineer (USACOE), Hydrologic Engineering Center, HEC-GeoRAS, Version 10 for ArcGIS 10

7.0 Appendix

7.1 Hydrologic Analyses

7.1.1 Drainage Area Delineation
7.1.2 Peak Flow Estimation

7.2 Hydraulic Analyses

7.2.1 Existing Condition Bridge Cross Section
7.2.2 Existing Condition Channel Profile
7.2.3 Existing Condition WSEL Upstream of the Bridge
7.2.4 Existing Condition Analysis Summary Table
7.2.5 Proposed Condition Bridge Cross Sections
7.2.6 Proposed Condition Channel Profiles
7.2.7 Proposed Condition WSEL's Upstream of the Bridge
7.2.8 Proposed Condition Analysis Summary Tables

7.3 Scour and Countermeasures Calculations

7.3.1 Scour Sediment Sampling Results
7.3.2 Scour Calculations

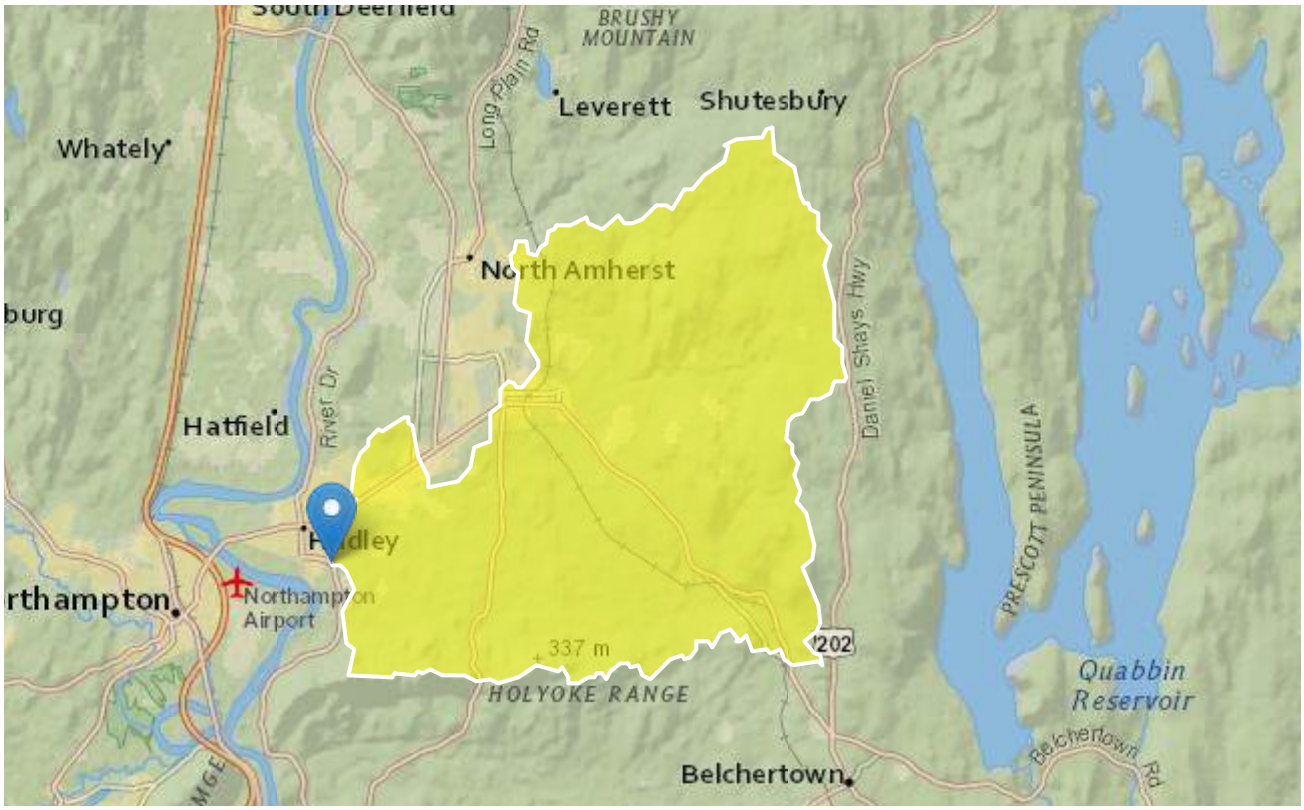
7.1 Hydrologic Analyses

7.1.1 Drainage Area Delineation

7.1.2 Peak Flow Estimation

H-01-005 StreamStats Report

Region ID: MA
Workspace ID: MA20171129201209044000
Clicked Point (Latitude, Longitude): 42.33273, -72.57871
Time: 2017-11-29 15:12:28 -0500



H-01-005 StreamStats Report WATER FORT RIVER, ST 47 BAY RD

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	54.6	square miles
ELEV	Mean Basin Elevation	491	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	8.43	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.21	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	1	dimensionless
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.843	percent
ACRSDFT	Area underlain by stratified drift	27.1	
BSLDEM10M	Mean basin slope computed from 10 m DEM	8.32	percent
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	119255.9	

Parameter Code	Parameter Description	Value	Unit
CENTROIDY	Basin centroid vertical (y) location in state plane units	901529.2	
CRSDFT	Percentage of area of coarse-grained stratified drift	42.35	percent
FOREST	Percentage of area covered by forest	59.8	percent
LAKEAREA	Percentage of Lakes and Ponds	0.6	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	13.2	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	3.08	percent
MAXTEMPC	Mean annual maximum air temperature over basin area, in degrees Centigrade	14.3	
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	111095	
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	898585	
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	42.35	percent
PRECPRIS00	asin average mean annual precipitation for 1971 to 2000 from PRISM	47	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	131	miles
WETLAND	Percentage of Wetlands	7.49	percent

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	0.16	512
ELEV	Mean Basin Elevation	491	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	8.43	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	1030	ft^3/s	531	2020	42.3
5 Year Peak Flood	1670	ft^3/s	845	3290	43.4
10 Year Peak Flood	2160	ft^3/s	1070	4370	44.7
25 Year Peak Flood	2870	ft^3/s	1370	6000	47.1
50 Year Peak Flood	3460	ft^3/s	1610	7470	49.4
100 Year Peak Flood	4080	ft^3/s	1840	9070	51.8
200 Year Peak Flood	4760	ft^3/s	2080	10900	54.1
500 Year Peak Flood	5720	ft^3/s	2420	13500	57.6

Peak-Flow Statistics Citations

Zarriello, P.J.,2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (https://dx.doi.org/10.3133/sir20165156)

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.21	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	4.843	percent	0.32	24.6

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
50 Percent Duration	56.5	ft^3/s	31	102	17.6	17.6
60 Percent Duration	44.1	ft^3/s	19.5	99.2	19.8	19.8
70 Percent Duration	38.1	ft^3/s	15.4	93.5	23.5	23.5
75 Percent Duration	33.2	ft^3/s	13.5	80.7	25.8	25.8
80 Percent Duration	29.5	ft^3/s	12.1	71.1	28.4	28.4
85 Percent Duration	24.7	ft^3/s	10.2	58.7	31.9	31.9
90 Percent Duration	21.1	ft^3/s	8.52	51	36.6	36.6
95 Percent Duration	14.9	ft^3/s	5.27	40.8	45.6	45.6
98 Percent Duration	10.8	ft^3/s	3.23	34.1	60.3	60.3
99 Percent Duration	8.76	ft^3/s	2.45	29.4	65.1	65.1

Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.843	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.21	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
7 Day 2 Year Low Flow	14.1	ft^3/s	4.45	43.2	49.5	49.5
7 Day 10 Year Low Flow	8.86	ft^3/s	2.27	32.2	70.8	70.8

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

August Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.843	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.21	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1

August Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
August 50 Percent Duration	26.9	ft^3/s	11	65.1	33.2	33.2

August Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	8.32	percent	2.2	23.9

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
Bankfull Width	74.6	ft	21.3
Bankfull Depth	3.07	ft	19.8
Bankfull Area	229	ft^2	29
Bankfull Streamflow	855	ft^3/s	55

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (http://pubs.usgs.gov/sir/2013/5155/)

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	54.6	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	42.35	percent	0	100
FOREST	Percent Forest	59.8	percent	0	100
MAREGION	Massachusetts Region	1	dimensionless	0	1

Probability Statistics Disclaimers [Perennial Flow Probability]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Probability Statistics Flow Report [Perennial Flow Probability]

Statistic	Value	Unit
Probability Stream Flowing Perennially	0.999	dim

Probability Statistics Citations

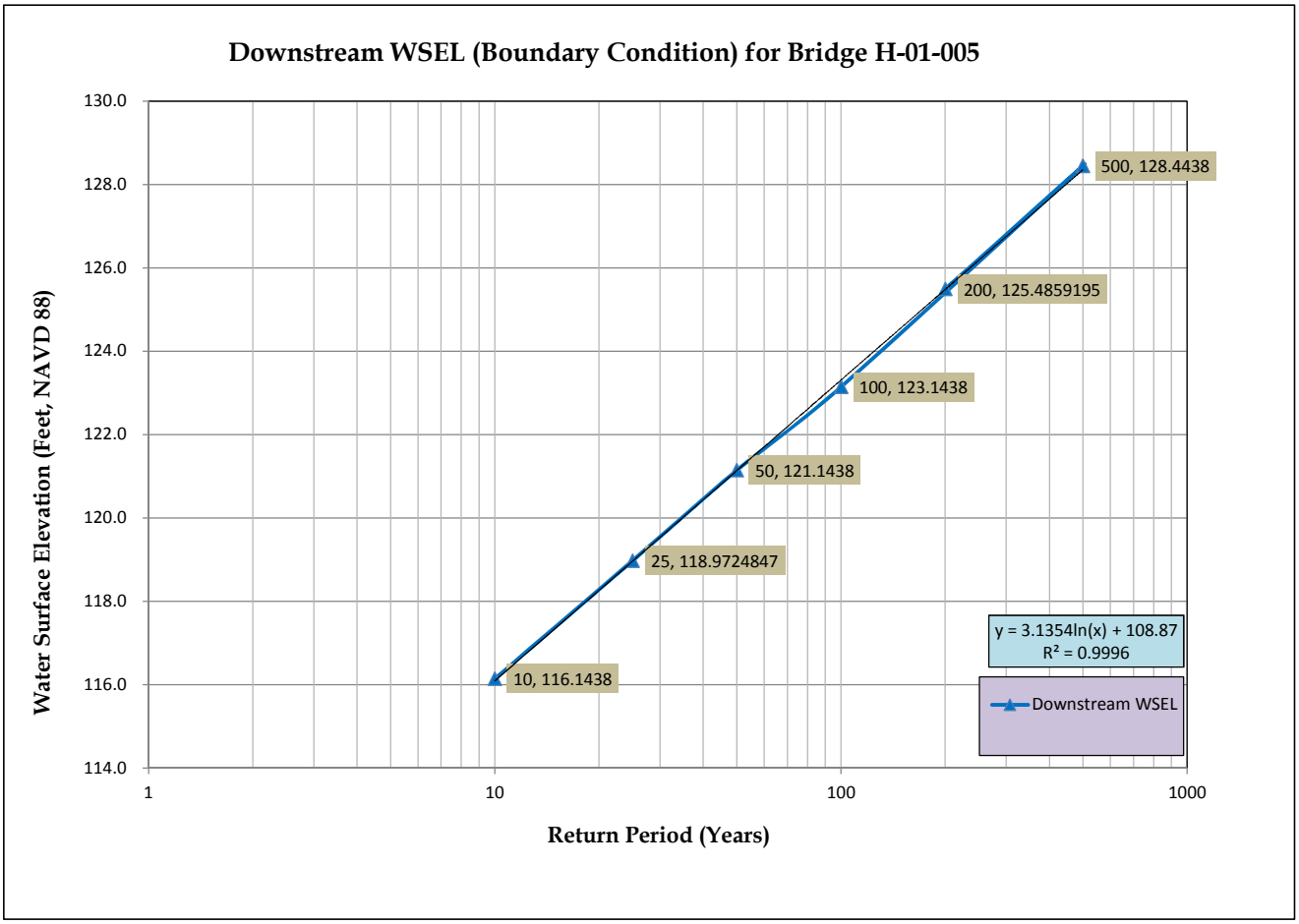
Bent, G.C., and Steeves, P.A.,2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006–5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

Boundary Condition Estimation

River: Fort River
County: Hampshire County
Hadley (H-01-005) Boundary Condition Calculation

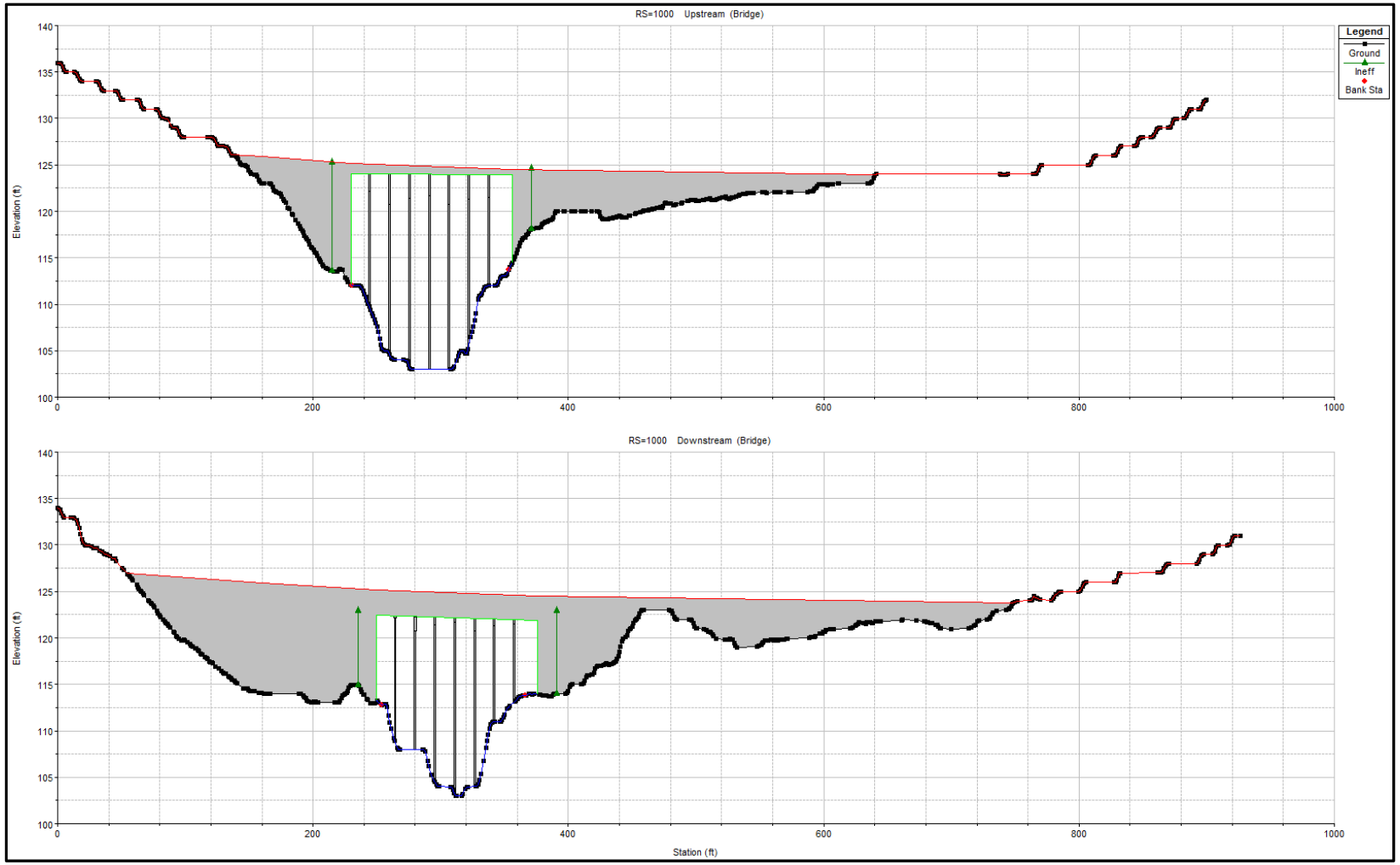
Based on FEMA FIS, the following water surface elevations have been used as downstream boundary condition. WSEL for Q_{25} is calibrated using other FEMA values.

WSEL at confluence of Fort River with Connecticut River(Feet)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)	Q_{500} (cfs)	Q_{200} (cfs)
	10	*25*	*50*	*100*	*500*	200
NGVD 29	116.8		121.8	123.8	129.1	
NAVD 88	116.1	119.0	121.1	123.1	128.4	125.5

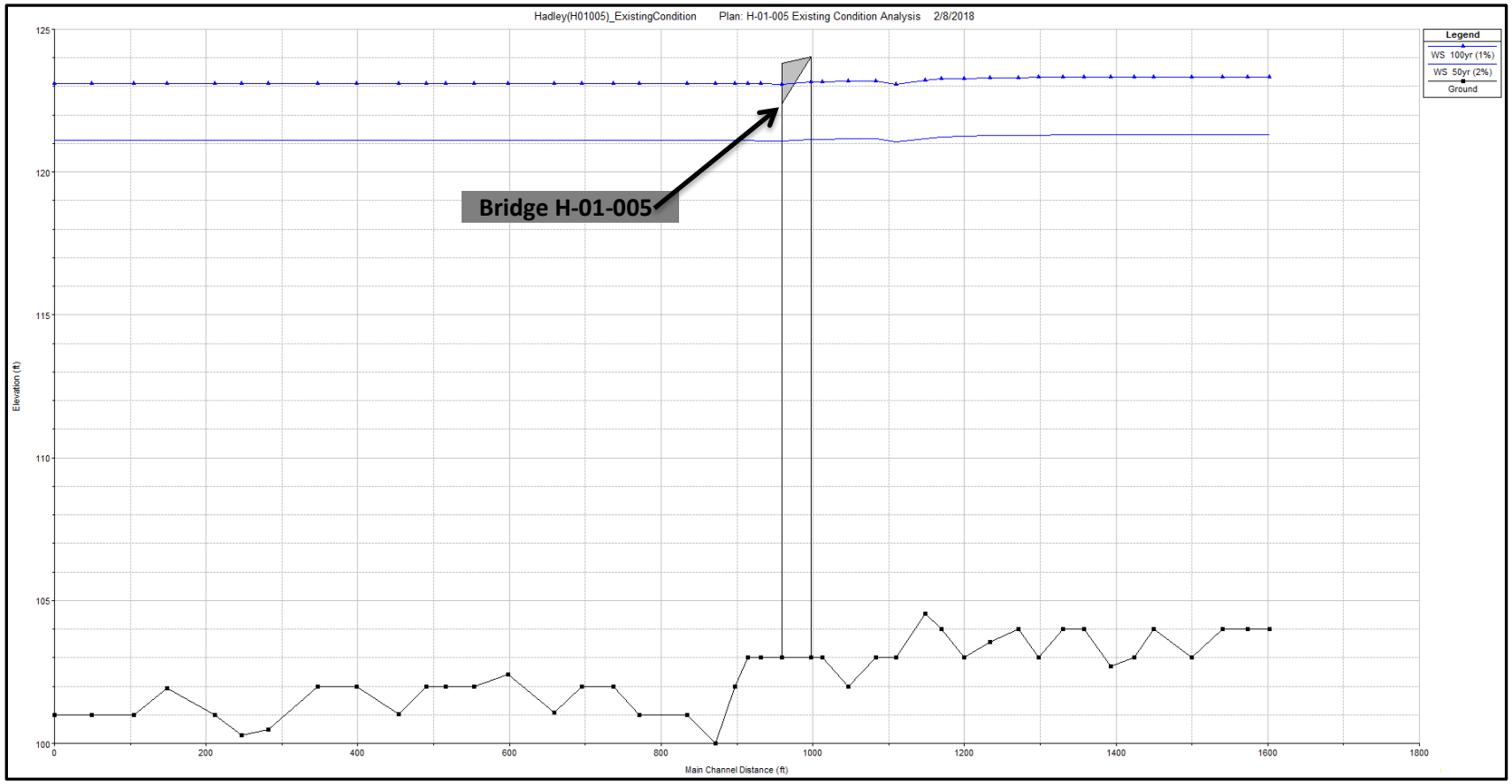


7.2 Hydraulic Analyses

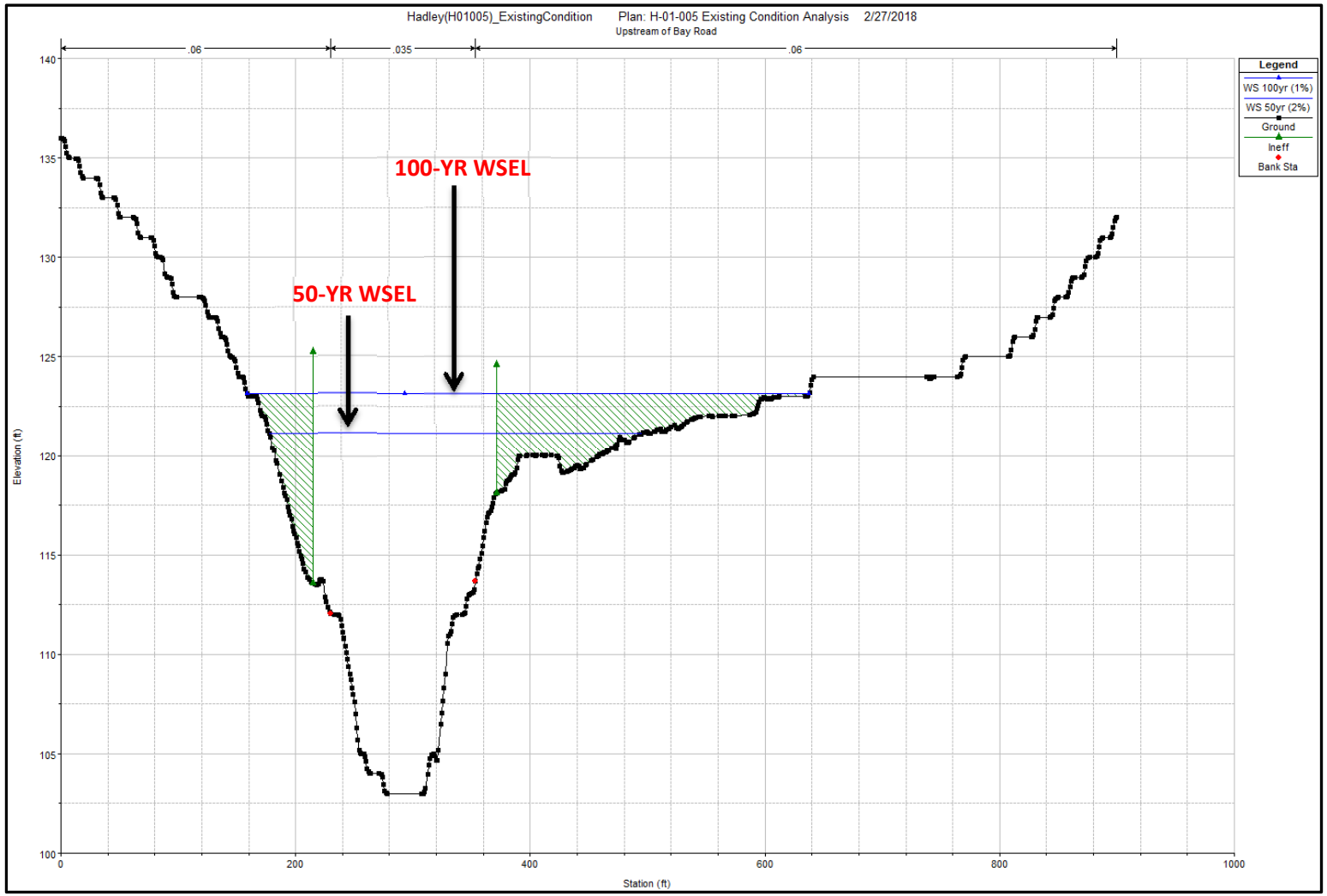
7.2.1 Existing Condition Bridge Cross Section
7.2.2 Existing Condition Channel Profile
7.2.3 Existing Condition WSEL Upstream of the Bridge
7.2.4 Existing Condition Analysis Summary Table
7.2.5 Proposed Condition Bridge Cross Sections
7.2.6 Proposed Condition Channel Profiles
7.2.7 Proposed Condition WSEL's Upstream of the Bridge
7.2.8 Proposed Condition Analysis Summary Tables



7.2.1 Existing Condition Bridge Cross Section



7.2.2 Existing Condition Channel Profile

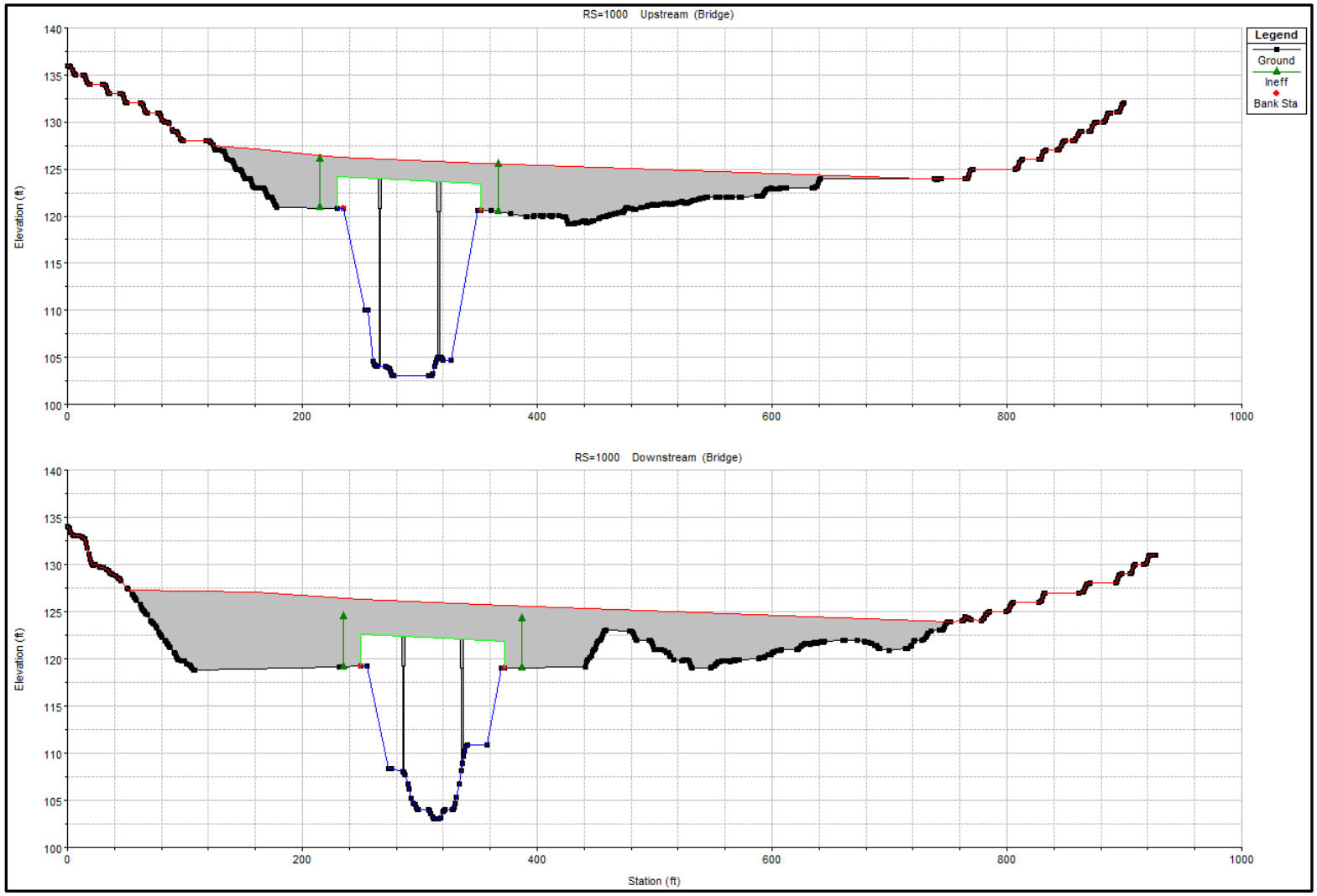


7.2.3 Existing Condition WSEL upstream of the Bridge

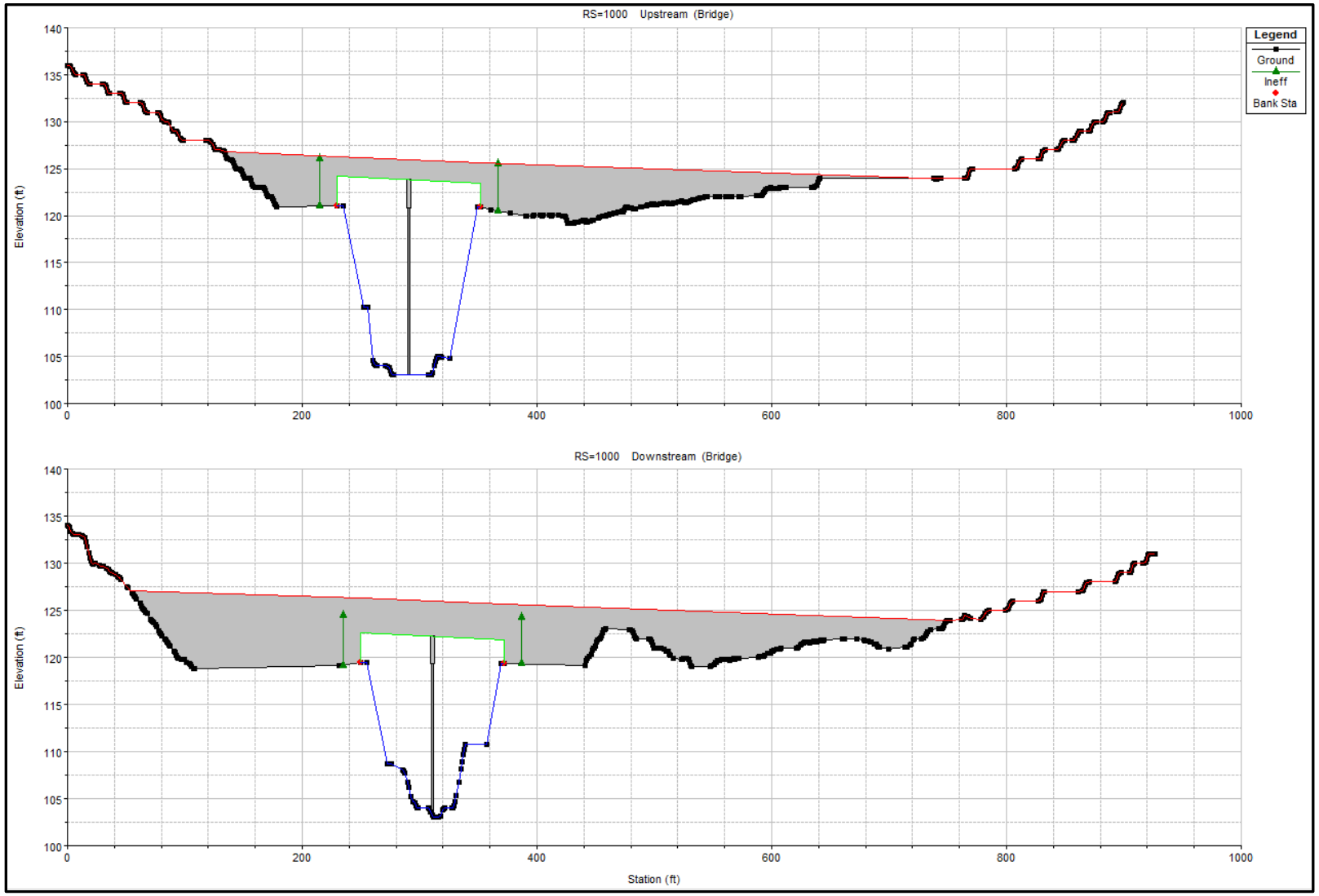
7.2.4 HEC-RAS Existing Condition Analysis

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.31	0.000015	0.97	7072.03	799.44	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.32		123.32	0.000012	0.92	8700.59	818.63	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6858.18	763.36	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.32		123.32	0.000012	0.96	8402.73	771.79	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6823.48	733.19	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.32		123.32	0.000012	0.96	8307.74	742.15	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.3		121.31	0.000018	1.09	6134.46	659.46	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.31		123.32	0.000015	1.05	7475.55	675.09	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.3		121.31	0.000023	1.17	5349.73	541.81	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.31		123.32	0.000018	1.14	6456.41	558.31	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.3		121.31	0.000022	1.19	5087.75	478.09	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.31		123.32	0.000018	1.18	6061.34	489.99	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.29		121.31	0.000026	1.23	4678.6	434.66	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.31		123.32	0.000022	1.24	5571.59	458.71	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.29		121.3	0.000031	1.36	4339.67	418.85	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.3		123.32	0.000026	1.35	5209.6	449.46	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.29		121.3	0.000036	1.49	4110.34	418.07	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.3		123.32	0.000031	1.48	4985.54	452.88	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.28		121.3	0.000039	1.56	3918.4	404.19	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.3		123.31	0.000032	1.54	4754.78	434.86	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.28		121.3	0.000044	1.65	3707.7	396.3	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.29		123.31	0.000036	1.61	4540.33	424.59	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.27		121.3	0.000052	1.8	3633.03	441.64	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.29		123.31	0.00004	1.72	4564.72	478.08	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.24		121.29	0.000075	2.21	2590.65	335.04	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.26		123.31	0.000058	2.11	3280.77	348.7	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.29	0.00009	2.35	2109.02	321.47	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.24		123.3	0.00007	2.26	2848.85	397.55	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.16		121.28	0.000144	2.92	1666.2	275.55	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.19		123.3	0.000113	2.82	2313.13	374.66	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.05		121.26	0.00026	4.07	1097.49	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.04		123.28	0.00024	4.24	1265.96	110.78	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.22	0.000074	2.18	1694.27	227.83	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.15		123.23	0.000065	2.21	2310.37	526.12	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.17		121.21	0.000038	1.69	2942.07	428.67	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.18		123.21	0.000033	1.69	3849.3	557.57	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.15	108	121.2	0.000059	1.88	1977.03	318.01	0.09
Reach1	1060.067	100yr (1%)	4080	103	123.16	108.49	123.21	0.000052	1.92	2290.02	479.3	0.08
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.09	109.84	121.16	0.000086	2.14	1807.9	508.81	0.1
Reach1	979.5606	100yr (1%)	4080	103	123.1	110.34	123.13	0.000043	1.66	4230.08	668.14	0.08
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

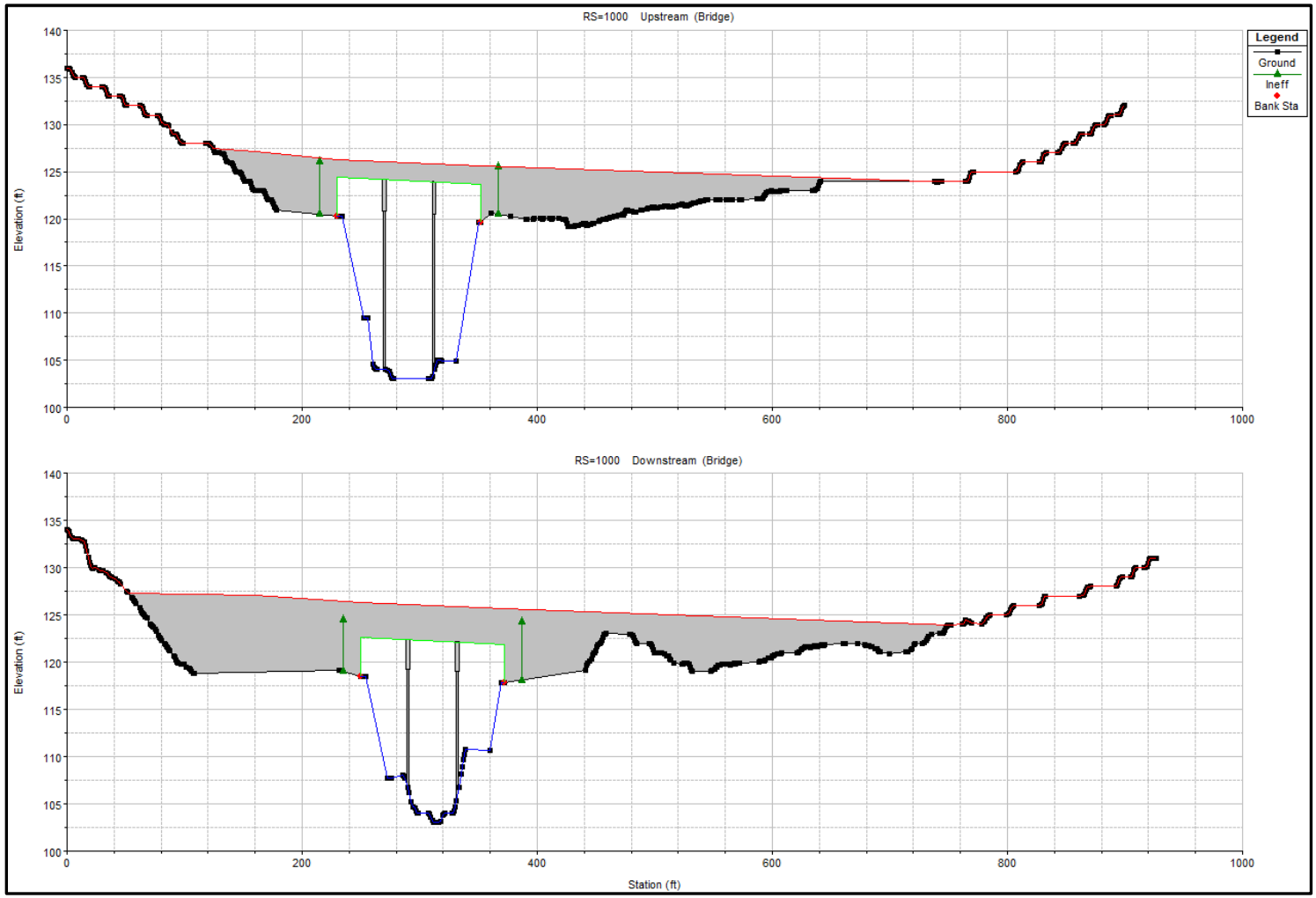
Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04



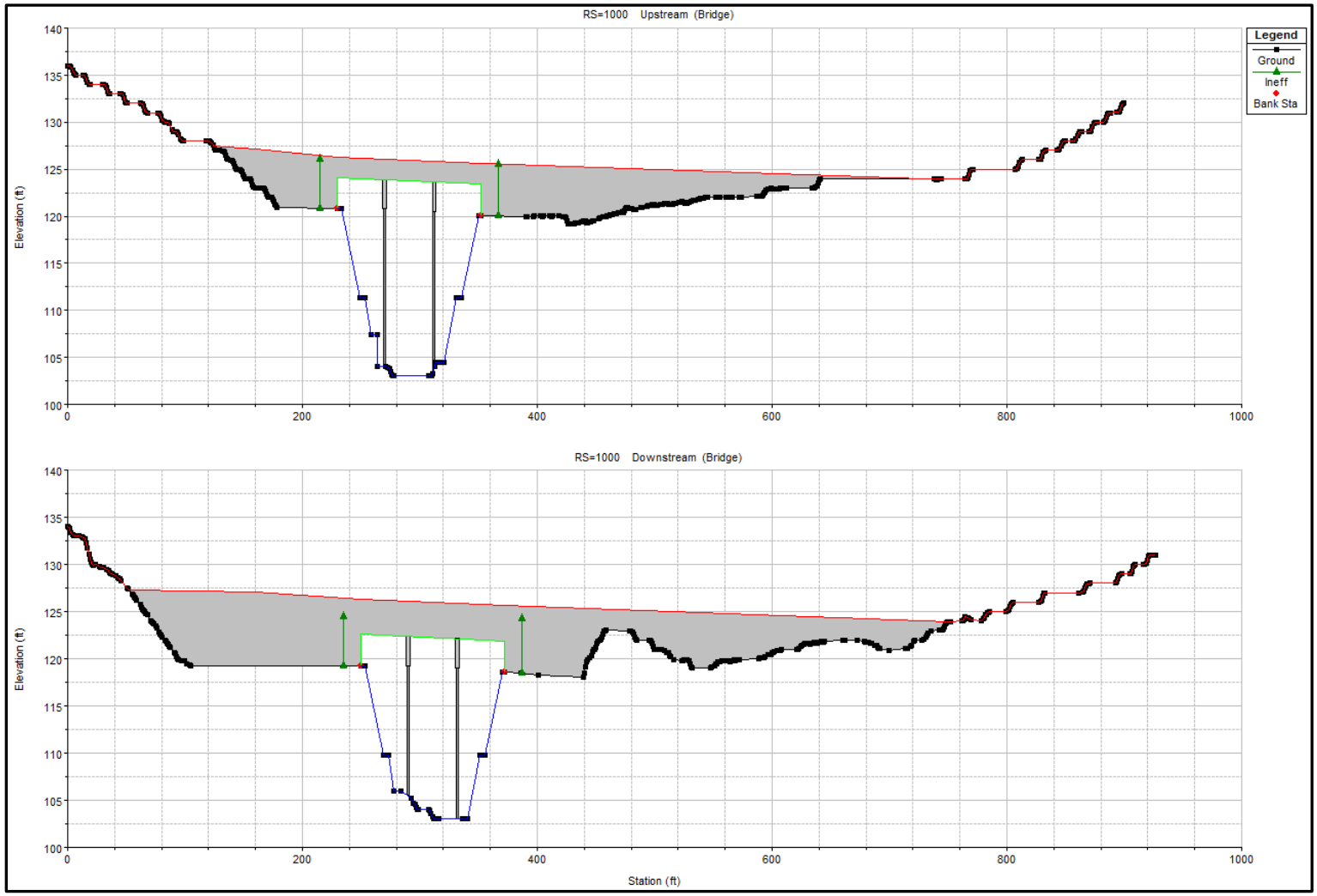
7.2.5 (a) Proposed Alternative-01 Bridge Cross Section



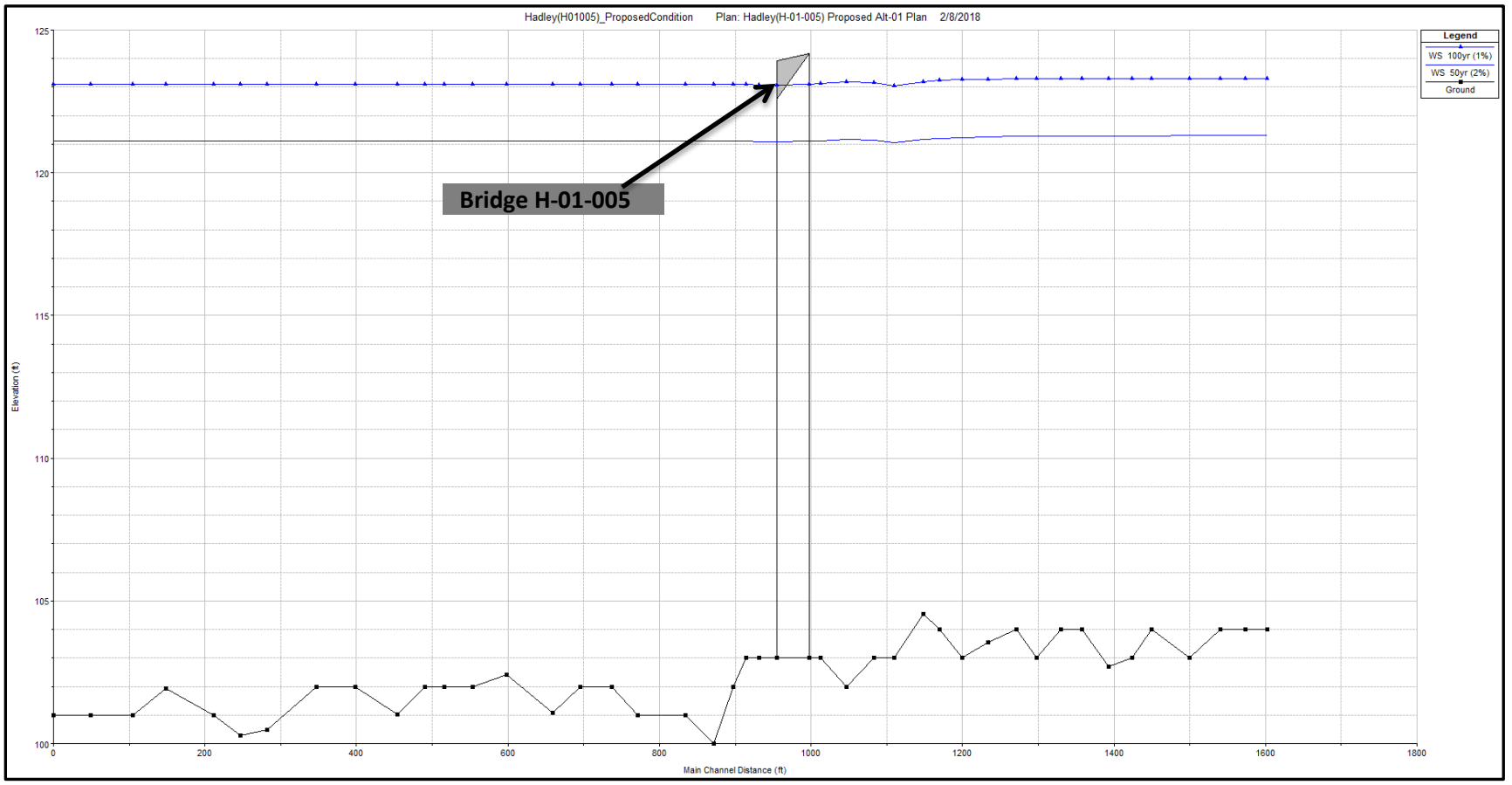
7.2.5 (b) Proposed Alternative-02 Bridge Cross Section



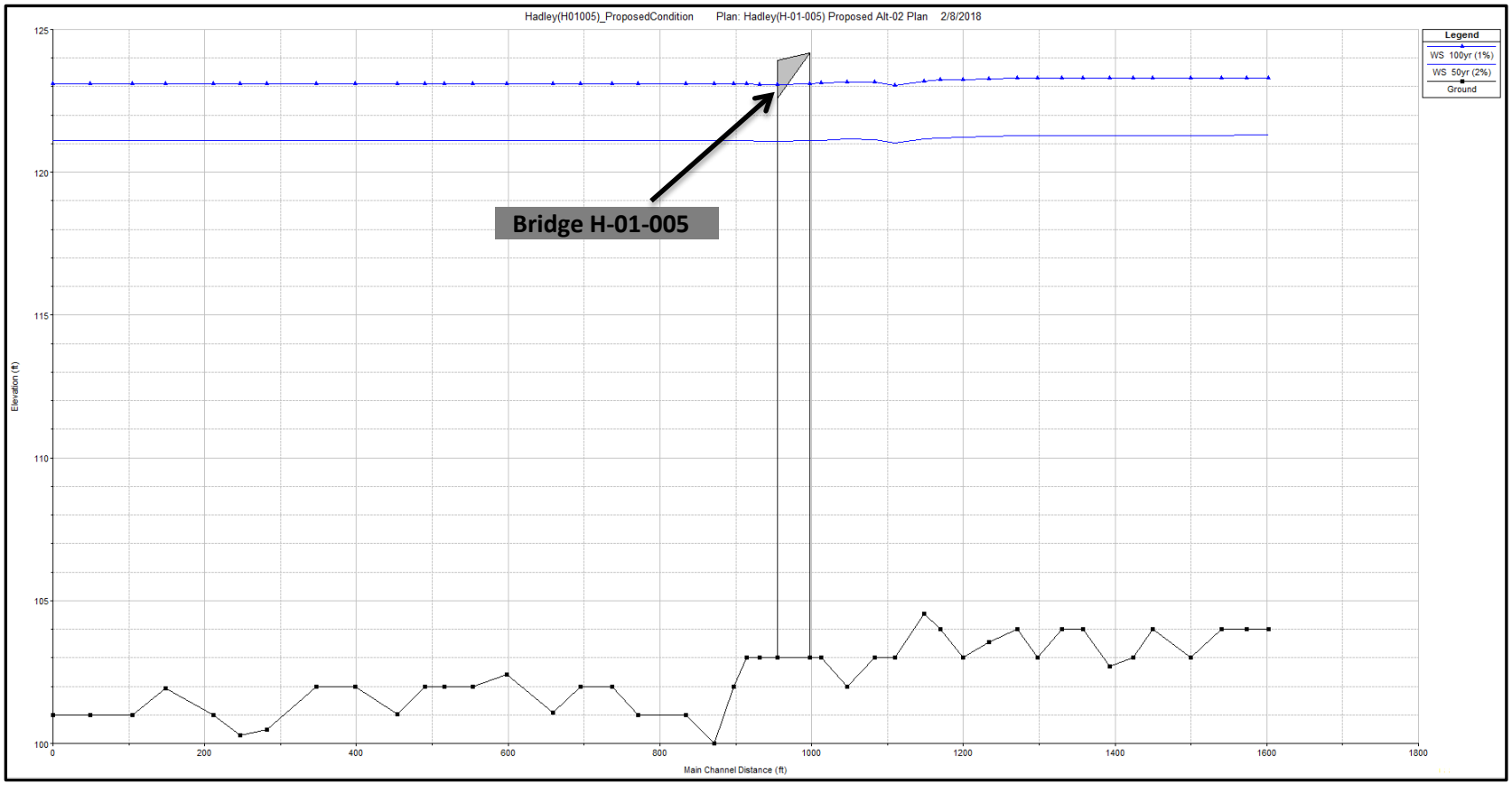
7.2.5 (c) Proposed Alternative-03 Bridge Cross Section



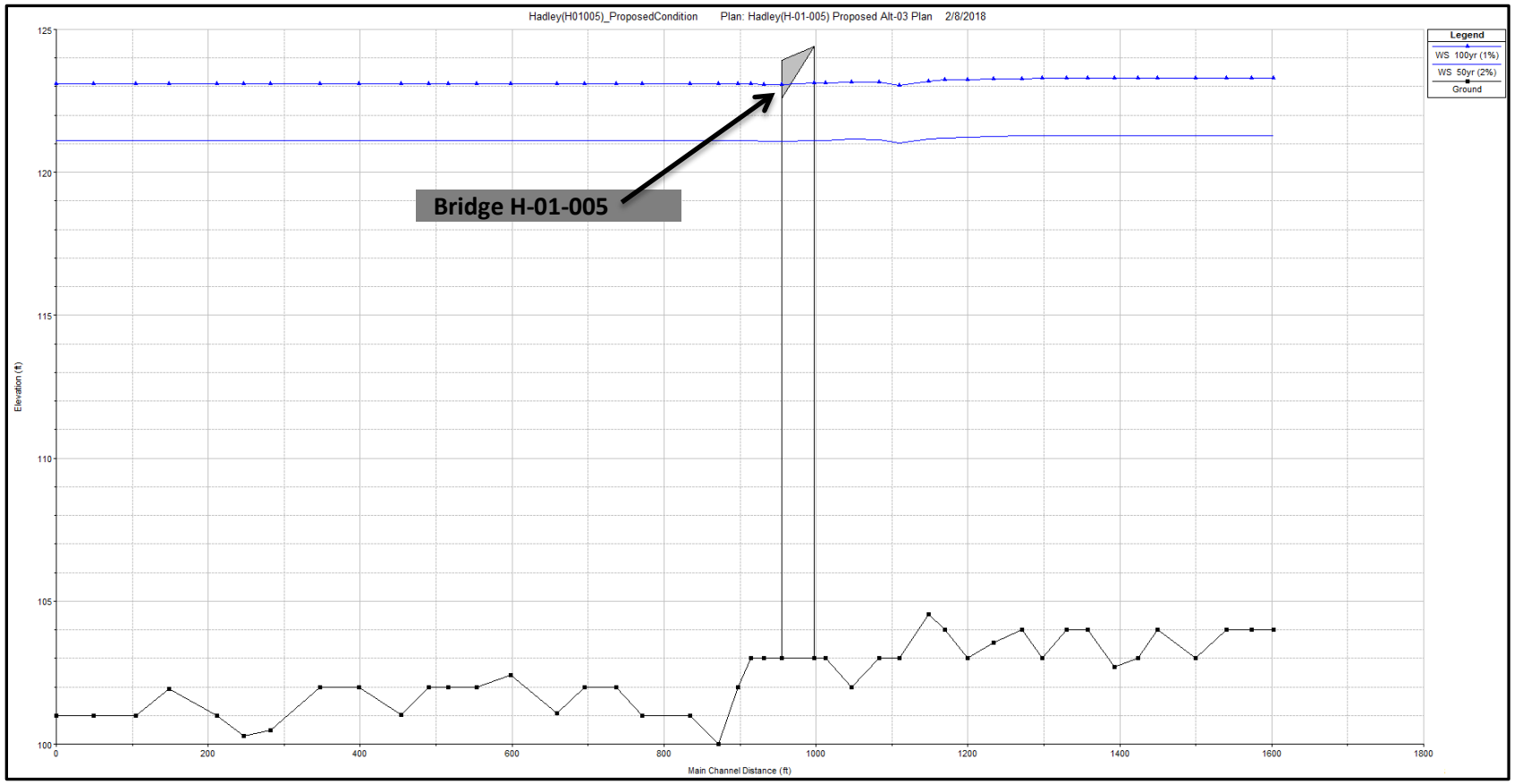
7.2.5 (d) Proposed Alternative-04 Bridge Cross Section



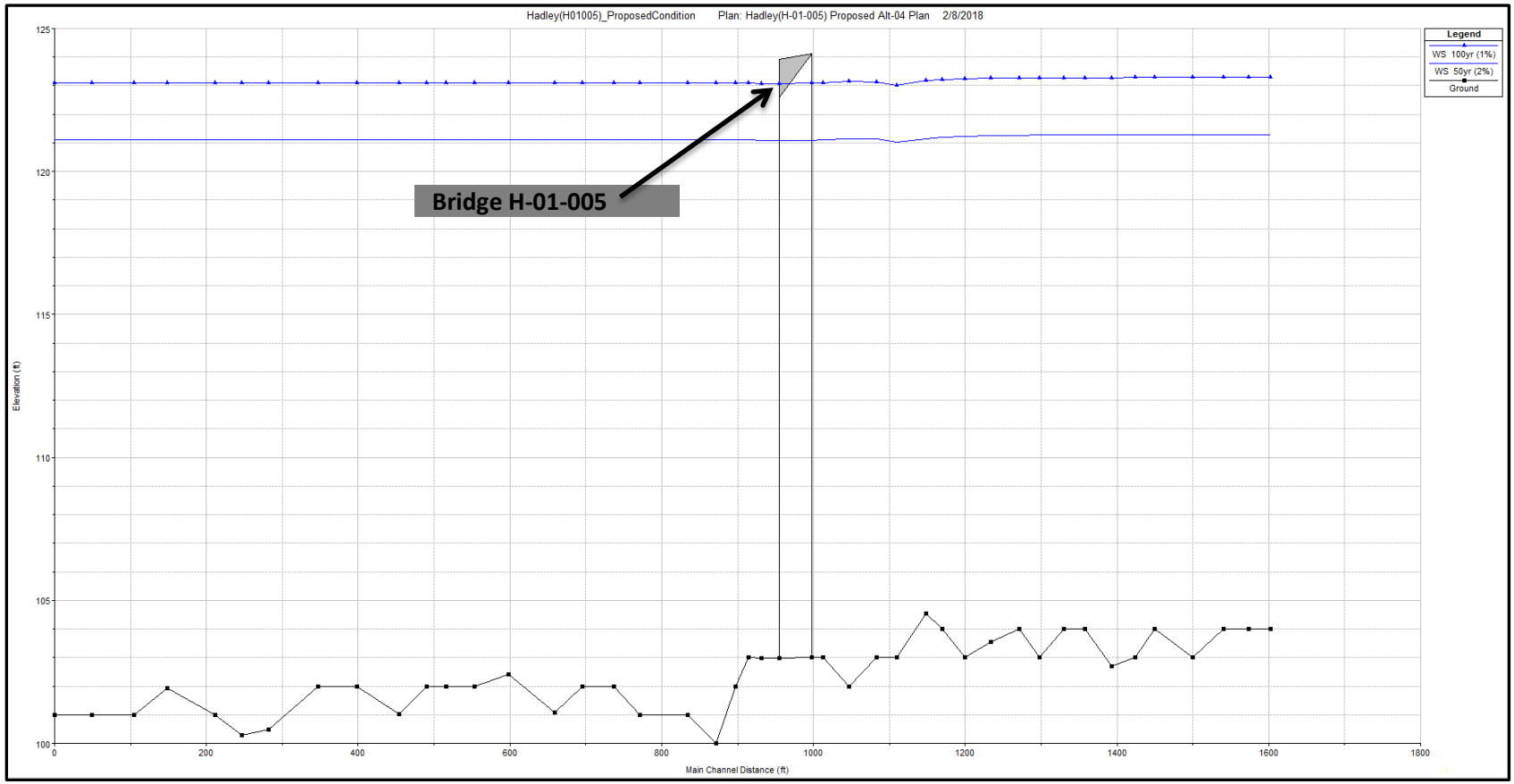
7.2.6 (a) Proposed Alternative-01 Channel Profile



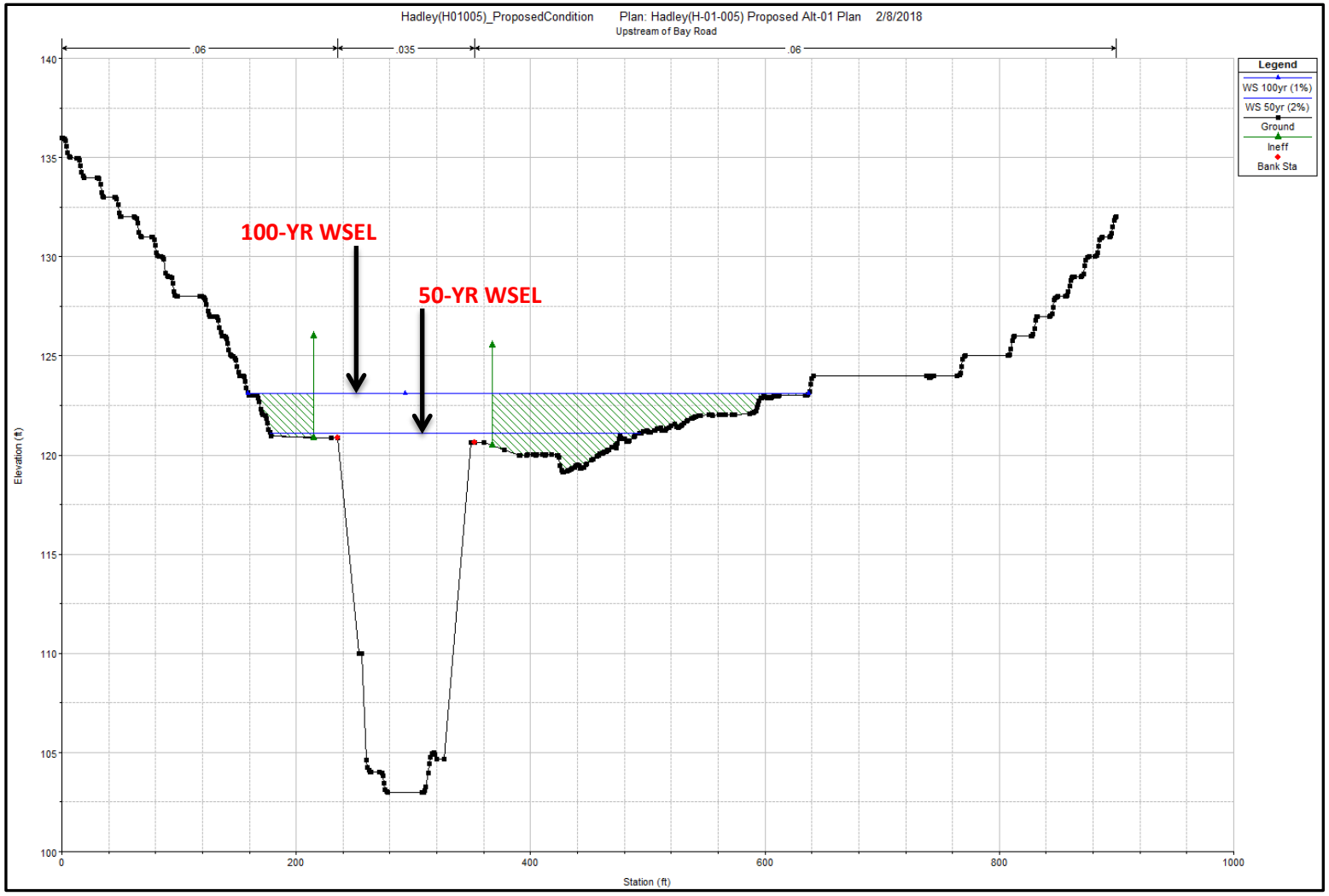
7.2.6 (b) Proposed Alternative-02 Channel Profile



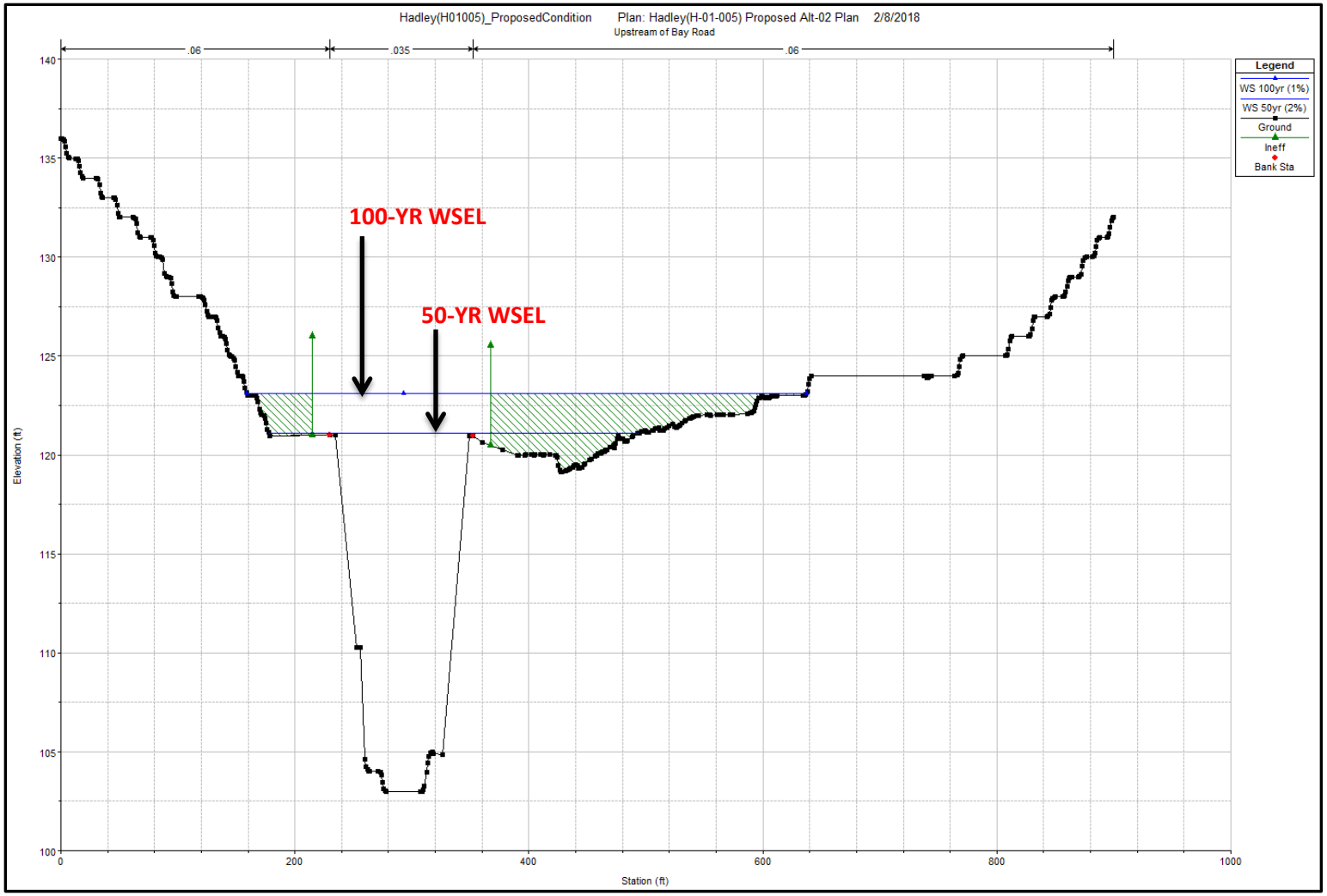
7.2.6 (c) Proposed Alternative-03 Channel Profile



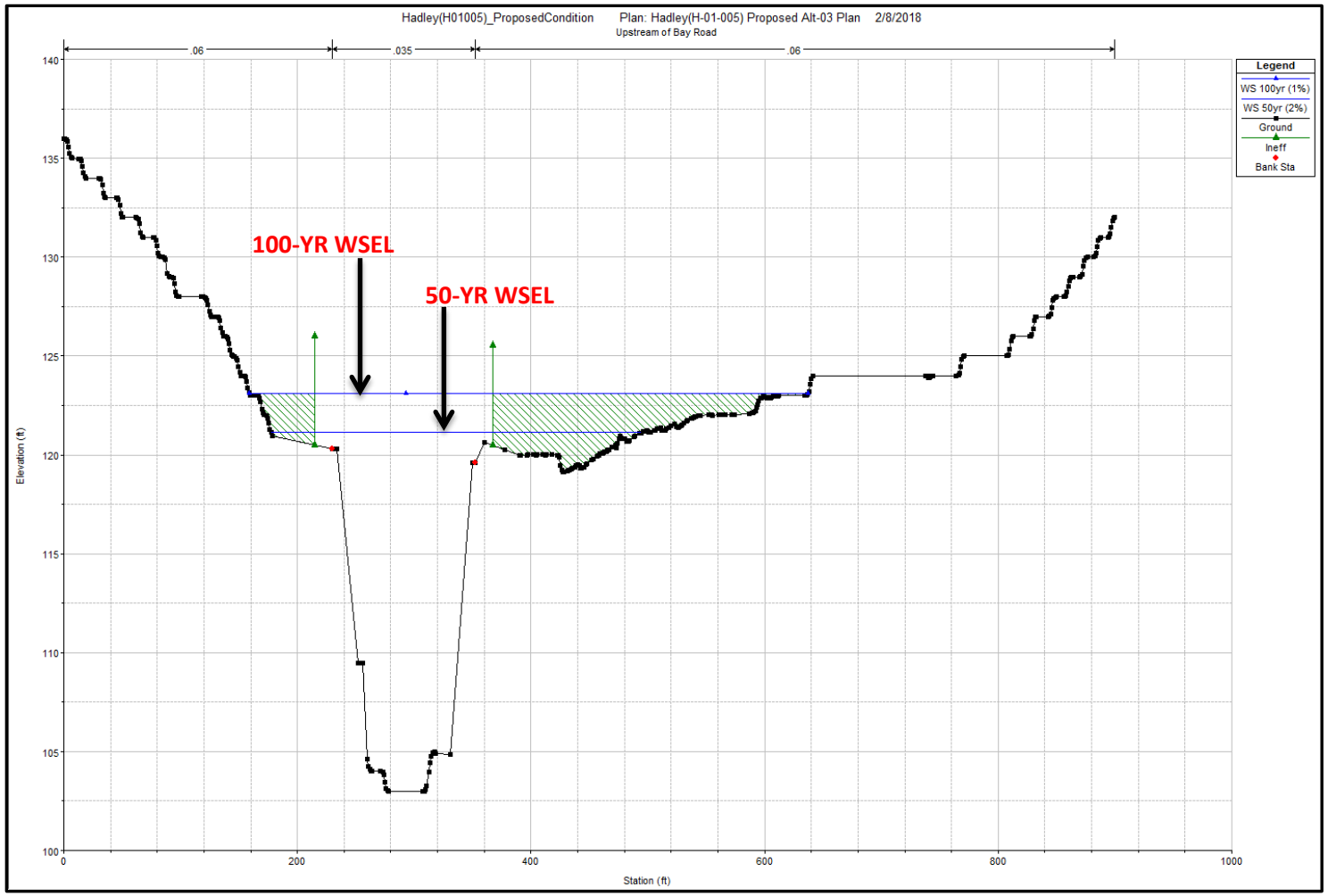
7.2.6 (d) Proposed Alternative-04 Channel Profile



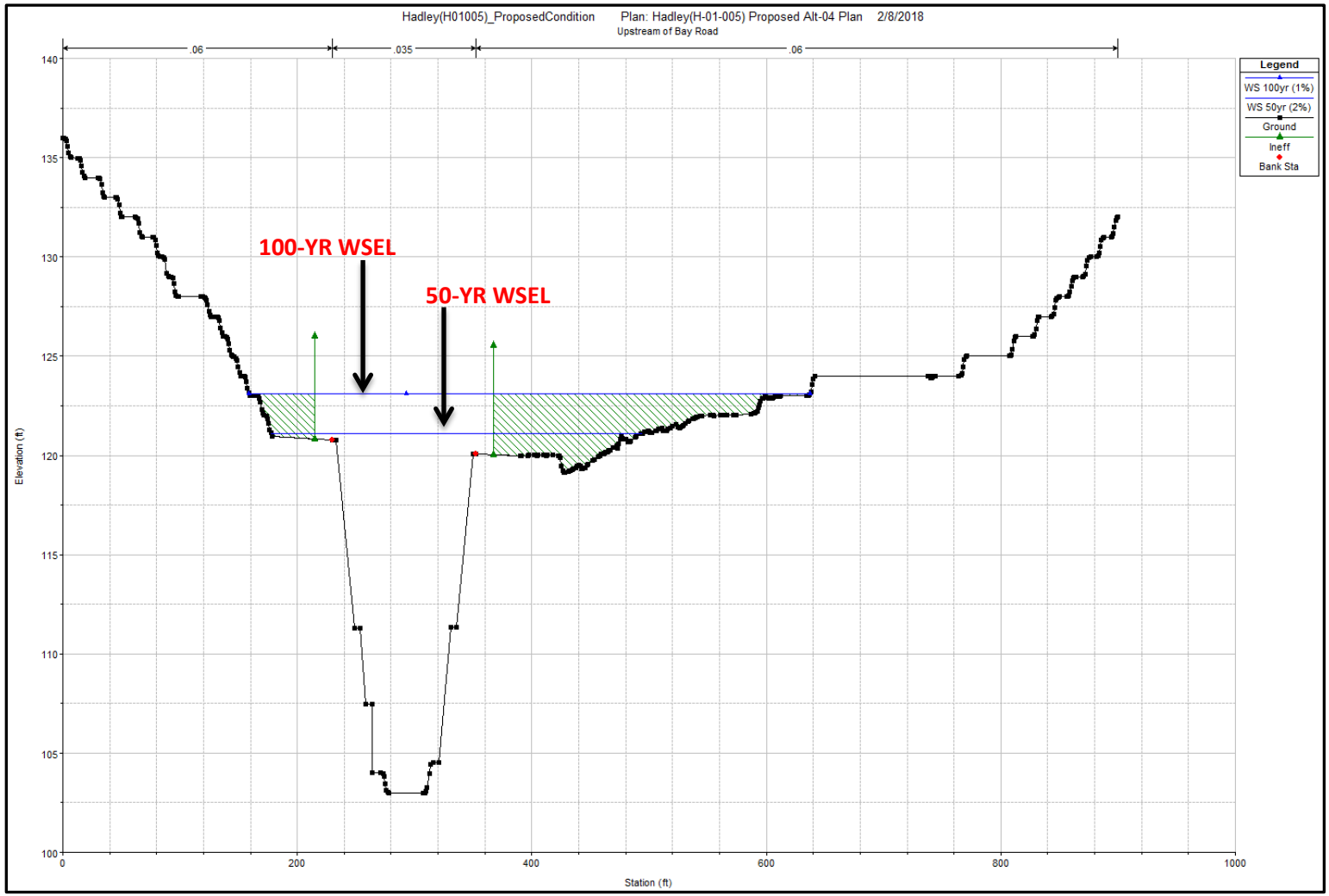
7.2.7 (a) Proposed Alternative-01 WSEL upstream of the Bridge



7.2.7 (b) Proposed Alternative-02 WSEL upstream of the Bridge



7.2.7 (c) Proposed Alternative-03 WSEL upstream of the Bridge



7.2.7 (d) Proposed Alternative-04 WSEL upstream of the Bridge

7.2.8 HEC-RAS Proposed Alternative-01

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.31	0.000015	0.97	7069.46	799.43	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.31		123.32	0.000012	0.92	8696.37	818.59	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6855.72	763.34	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.31		123.32	0.000012	0.96	8398.75	771.77	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.3		121.31	0.000016	1.01	6821.12	733.17	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.31		123.32	0.000012	0.96	8303.91	742.13	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.3		121.31	0.000018	1.09	6132.34	659.44	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.31		123.31	0.000015	1.05	7472.06	675.06	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.29		121.3	0.000023	1.17	5347.99	541.78	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.3		123.31	0.000018	1.14	6453.52	558.27	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.29		121.3	0.000022	1.19	5086.22	478.07	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.3		123.31	0.000018	1.18	6058.8	489.96	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.29		121.3	0.000026	1.23	4677.2	434.65	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.3		123.31	0.000022	1.24	5569.21	458.61	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.29		121.3	0.000031	1.36	4338.32	418.83	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.3		123.31	0.000026	1.36	5207.27	449.37	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.28		121.3	0.000036	1.49	4109	418.02	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.29		123.31	0.000031	1.48	4983.19	452.8	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.28		121.3	0.000039	1.56	3917.1	404.15	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.29		123.31	0.000032	1.55	4752.52	434.8	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.27		121.3	0.000044	1.65	3706.42	396.27	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.29		123.31	0.000036	1.61	4538.13	424.56	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.27		121.3	0.000052	1.81	3631.6	441.61	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.28		123.31	0.00004	1.72	4562.24	478.02	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.23		121.29	0.000075	2.21	2589.56	335.02	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.25		123.3	0.000058	2.11	3278.94	348.66	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.29	0.00009	2.35	2107.97	321.1	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.23		123.3	0.000071	2.26	2846.75	397.47	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.16		121.28	0.000144	2.92	1665.29	275.5	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.19		123.29	0.000113	2.82	2311.12	374.57	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.04		121.26	0.000261	4.07	1097.22	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.04		123.27	0.00024	4.24	1265.36	110.66	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.21	0.000074	2.18	1693.52	227.72	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.15		123.22	0.000065	2.21	2307.57	525.92	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.16		121.2	0.000038	1.69	2940.67	428.64	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.17		123.21	0.000033	1.69	3846.35	557.47	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.12	107.97	121.2	0.0001	2.23	1560.7	317.19	0.11
Reach1	1060.067	100yr (1%)	4080	103	123.12	108.46	123.2	0.000085	2.27	1865.41	478.78	0.1
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.08	109.93	121.17	0.000132	2.4	1486.82	508.16	0.12
Reach1	979.5606	100yr (1%)	4080	103	123.08	110.48	123.16	0.000106	2.4	1789.75	667.67	0.11
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.2.8 HEC-RAS Proposed Alternative-02

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.3	0.000015	0.97	7066.94	799.42	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.31		123.31	0.000012	0.92	8693.14	818.56	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.3		121.3	0.000016	1.01	6853.31	763.33	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.31		123.31	0.000012	0.96	8395.7	771.76	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.3		121.3	0.000016	1.01	6818.81	733.16	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.31		123.31	0.000012	0.97	8300.98	742.11	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.29		121.3	0.000018	1.09	6130.26	659.43	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.3		123.31	0.000015	1.05	7469.39	675.04	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.29		121.3	0.000023	1.17	5346.28	541.75	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.3		123.31	0.000018	1.14	6451.31	558.24	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.29		121.3	0.000022	1.19	5084.71	478.06	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.3		123.31	0.000018	1.18	6056.86	489.93	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.29		121.3	0.000026	1.23	4675.82	434.63	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.3		123.31	0.000022	1.24	5567.4	458.55	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.28		121.3	0.000031	1.36	4336.99	418.81	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.29		123.31	0.000026	1.36	5205.5	449.3	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.28		121.3	0.000036	1.49	4107.67	417.96	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.29		123.31	0.000031	1.48	4981.4	452.74	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.28		121.3	0.000039	1.56	3915.82	404.1	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.29		123.31	0.000032	1.55	4750.81	434.76	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.27		121.29	0.000044	1.65	3705.16	396.24	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.28		123.3	0.000036	1.61	4536.44	424.54	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.26		121.29	0.000052	1.81	3630.19	441.57	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.28		123.3	0.00004	1.72	4560.34	477.98	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.23		121.29	0.000075	2.21	2588.48	335	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.25		123.3	0.000058	2.11	3277.55	348.63	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.28	0.00009	2.35	2106.94	320.75	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.23		123.3	0.000071	2.27	2845.15	397.41	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.16		121.28	0.000144	2.92	1664.38	275.45	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.19		123.29	0.000113	2.82	2309.59	374.51	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.04		121.26	0.000261	4.07	1096.94	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.03		123.27	0.000241	4.24	1264.91	110.56	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.21	0.000074	2.18	1692.79	227.61	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.14		123.22	0.000065	2.21	2305.45	525.75	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.16		121.2	0.000038	1.69	2939.28	428.62	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.17		123.2	0.000033	1.69	3844.1	557.39	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.11	108.01	121.19	0.000108	2.25	1544.7	317.07	0.11
Reach1	1060.067	100yr (1%)	4080	103	123.12	108.5	123.2	0.000091	2.27	1849.42	478.71	0.1
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.08	109.97	121.17	0.000133	2.41	1477.81	508.14	0.12
Reach1	979.5606	100yr (1%)	4080	103	123.08	110.88	123.16	0.000107	2.4	1780.74	667.66	0.11
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.2.8 HEC-RAS Proposed Alternative-03

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.3		121.3	0.000015	0.97	7064.91	799.41	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.31		123.31	0.000012	0.92	8691.25	818.54	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.29		121.3	0.000016	1.01	6851.37	763.32	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.3		123.31	0.000012	0.96	8393.92	771.75	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.29		121.3	0.000016	1.01	6816.94	733.15	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.3		123.31	0.000012	0.97	8299.26	742.1	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.29		121.3	0.000018	1.09	6128.57	659.41	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.3		123.31	0.000015	1.05	7467.83	675.02	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.29		121.3	0.000023	1.17	5344.9	541.73	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.3		123.31	0.000018	1.14	6450.02	558.22	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.29		121.3	0.000022	1.19	5083.49	478.04	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.3		123.31	0.000018	1.18	6055.73	489.91	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.28		121.3	0.000026	1.23	4674.71	434.62	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.29		123.31	0.000022	1.24	5566.34	458.51	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.28		121.3	0.000031	1.36	4335.92	418.8	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.29		123.31	0.000026	1.36	5204.46	449.26	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.28		121.29	0.000036	1.49	4106.6	417.92	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.29		123.3	0.000031	1.48	4980.35	452.7	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.27		121.29	0.000039	1.56	3914.78	404.06	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.28		123.3	0.000032	1.55	4749.79	434.74	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.27		121.29	0.000044	1.65	3704.14	396.22	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.28		123.3	0.000036	1.61	4535.46	424.52	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.26		121.29	0.000052	1.81	3629.06	441.55	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.28		123.3	0.00004	1.72	4559.22	477.96	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.23		121.28	0.000075	2.21	2587.61	334.98	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.25		123.3	0.000058	2.11	3276.73	348.61	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.21		121.28	0.00009	2.35	2106.11	320.46	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.23		123.29	0.000071	2.27	2844.21	397.37	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.15		121.27	0.000144	2.92	1663.66	275.41	0.13
Reach1	1195.823	100yr (1%)	4080	104.54	123.18		123.29	0.000113	2.82	2308.7	374.47	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.04		121.26	0.000261	4.07	1096.72	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.03		123.27	0.000241	4.24	1264.65	110.5	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.14		121.21	0.000075	2.18	1692.19	227.52	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.14		123.21	0.000065	2.21	2304.2	525.65	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.16		121.2	0.000038	1.69	2938.16	428.6	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.17		123.2	0.000033	1.69	3842.78	557.34	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.12	107.88	121.19	0.000089	2.12	1650.15	317.26	0.1
Reach1	1060.067	100yr (1%)	4080	103	123.13	108.36	123.2	0.000076	2.16	1954.77	478.82	0.1
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	103	121.09	109.83	121.17	0.000114	2.29	1571.32	508.4	0.12
Reach1	979.5606	100yr (1%)	4080	103	123.08	110.35	123.16	0.000093	2.3	1874.16	667.79	0.11
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.2.8 HEC-RAS Proposed Alternative-04

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1650.604	50yr (2%)	3460	104	121.29		121.3	0.000015	0.97	7061.05	799.39	0.04
Reach1	1650.604	100yr (1%)	4080	104	123.29		123.3	0.000012	0.92	8681.69	818.44	0.04
Reach1	1621.731	50yr (2%)	3460	104	121.29		121.3	0.000016	1.01	6847.69	763.3	0.04
Reach1	1621.731	100yr (1%)	4080	104	123.29		123.3	0.000012	0.96	8384.91	771.7	0.04
Reach1	1587.947	50yr (2%)	3460	104	121.29		121.3	0.000016	1.02	6813.4	733.12	0.04
Reach1	1587.947	100yr (1%)	4080	104	123.29		123.3	0.000012	0.97	8290.6	742.05	0.04
Reach1	1547.45	50yr (2%)	3460	103	121.29		121.29	0.000018	1.09	6125.39	659.39	0.05
Reach1	1547.45	100yr (1%)	4080	103	123.29		123.3	0.000015	1.05	7459.95	674.95	0.04
Reach1	1497.09	50yr (2%)	3460	104	121.28		121.29	0.000023	1.17	5342.28	541.69	0.05
Reach1	1497.09	100yr (1%)	4080	104	123.29		123.3	0.000018	1.14	6443.5	558.13	0.05
Reach1	1471.374	50yr (2%)	3460	103	121.28		121.29	0.000022	1.19	5081.17	478.02	0.05
Reach1	1471.374	100yr (1%)	4080	103	123.28		123.3	0.000018	1.18	6050.01	489.83	0.05
Reach1	1440.469	50yr (2%)	3460	102.7	121.28		121.29	0.000026	1.23	4672.61	434.6	0.06
Reach1	1440.469	100yr (1%)	4080	102.7	123.28		123.29	0.000022	1.24	5560.98	458.3	0.05
Reach1	1405.818	50yr (2%)	3460	104	121.28		121.29	0.000031	1.36	4333.9	418.77	0.06
Reach1	1405.818	100yr (1%)	4080	104	123.28		123.29	0.000026	1.36	5199.21	449.04	0.06
Reach1	1377.667	50yr (2%)	3460	104	121.27		121.29	0.000036	1.49	4104.57	417.84	0.07
Reach1	1377.667	100yr (1%)	4080	104	123.28		123.29	0.000031	1.49	4975.06	452.51	0.06
Reach1	1346.002	50yr (2%)	3460	103	121.27		121.29	0.000039	1.56	3912.82	403.99	0.07
Reach1	1346.002	100yr (1%)	4080	103	123.27		123.29	0.000033	1.55	4744.7	434.62	0.06
Reach1	1319.493	50yr (2%)	3460	104	121.26		121.29	0.000044	1.65	3702.22	396.18	0.07
Reach1	1319.493	100yr (1%)	4080	104	123.27		123.29	0.000036	1.61	4530.48	424.46	0.07
Reach1	1281.867	50yr (2%)	3460	103.54	121.26		121.28	0.000052	1.81	3626.91	441.5	0.08
Reach1	1281.867	100yr (1%)	4080	103.54	123.26		123.29	0.00004	1.72	4553.62	477.84	0.07
Reach1	1247.179	50yr (2%)	3460	103	121.22		121.28	0.000075	2.21	2585.97	334.95	0.1
Reach1	1247.179	100yr (1%)	4080	103	123.24		123.28	0.000058	2.12	3272.62	348.52	0.09
Reach1	1217.897	50yr (2%)	3460	104	121.2		121.28	0.00009	2.35	2104.54	319.91	0.11
Reach1	1217.897	100yr (1%)	4080	104	123.22		123.28	0.000071	2.27	2839.49	397.19	0.1
Reach1	1195.823	50yr (2%)	3460	104.54	121.15		121.27	0.000145	2.92	1662.28	275.33	0.14
Reach1	1195.823	100yr (1%)	4080	104.54	123.17		123.28	0.000114	2.83	2304.18	374.27	0.12
Reach1	1157.396	50yr (2%)	3460	103	121.03		121.25	0.000261	4.07	1096.31	82.93	0.18
Reach1	1157.396	100yr (1%)	4080	103	123.02		123.26	0.000241	4.24	1263.34	109.98	0.18
Reach1	1131.055	50yr (2%)	3460	103	121.13		121.2	0.000075	2.18	1691.07	227.35	0.1
Reach1	1131.055	100yr (1%)	4080	103	123.13		123.2	0.000065	2.21	2297.94	525.03	0.09
Reach1	1094.456	50yr (2%)	3460	102	121.15		121.19	0.000038	1.69	2936.04	428.56	0.07
Reach1	1094.456	100yr (1%)	4080	102	123.15		123.19	0.000033	1.69	3836.17	557.1	0.07
Reach1	1060.067	50yr (2%)	3460	103	121.11	108.33	121.19	0.000111	2.27	1544.44	316.83	0.11
Reach1	1060.067	100yr (1%)	4080	103	123.1	108.86	123.18	0.000093	2.29	1848.22	478.46	0.11
Reach1	1000		Bridge									
Reach1	979.5606	50yr (2%)	3460	102.99	121.09	108.39	121.16	0.00009	2.14	1668.75	508.69	0.1
Reach1	979.5606	100yr (1%)	4080	102.99	123.08	108.89	123.16	0.000077	2.17	1971.48	667.87	0.1
Reach1	961.9952	50yr (2%)	3460	103	121.12		121.13	0.000033	1.5	5163.21	747.97	0.07
Reach1	961.9952	100yr (1%)	4080	103	123.11		123.12	0.000024	1.38	6718.68	816.11	0.06
Reach1	944.9946	50yr (2%)	3460	102	121.12		121.13	0.00003	1.43	5395.36	777.94	0.06

Reach1	944.9946	100yr (1%)	4080	102	123.11		123.12	0.000021	1.29	6988.41	813.72	0.05
Reach1	919.8867	50yr (2%)	3460	100	121.12		121.13	0.000018	1.24	5800.88	771.63	0.05
Reach1	919.8867	100yr (1%)	4080	100	123.11		123.12	0.000014	1.16	7377.76	804.85	0.04
Reach1	882.1997	50yr (2%)	3460	101	121.12		121.13	0.000021	1.25	5721.04	762.02	0.05
Reach1	882.1997	100yr (1%)	4080	101	123.11		123.12	0.000016	1.16	7281.01	797.35	0.05
Reach1	818.6871	50yr (2%)	3460	101	121.12		121.13	0.000026	1.37	5663.68	763.33	0.06
Reach1	818.6871	100yr (1%)	4080	101	123.11		123.12	0.000019	1.25	7207	804.41	0.05
Reach1	784.9803	50yr (2%)	3460	102	121.12		121.13	0.000024	1.31	5860.43	770.26	0.06
Reach1	784.9803	100yr (1%)	4080	102	123.11		123.12	0.000018	1.2	7414.88	801.6	0.05
Reach1	743.2909	50yr (2%)	3460	102	121.12		121.13	0.000025	1.33	5967.73	792.23	0.06
Reach1	743.2909	100yr (1%)	4080	102	123.11		123.12	0.000018	1.21	7584.99	836.38	0.05
Reach1	707.1439	50yr (2%)	3460	101.08	121.12		121.13	0.000023	1.31	6073.3	787.35	0.05
Reach1	707.1439	100yr (1%)	4080	101.08	123.11		123.12	0.000018	1.23	7688.43	877.86	0.05
Reach1	645.7866	50yr (2%)	3460	102.41	121.12		121.12	0.000018	1.13	6544.67	783.97	0.05
Reach1	645.7866	100yr (1%)	4080	102.41	123.11		123.12	0.000014	1.09	8158.55	872.07	0.04
Reach1	600.9033	50yr (2%)	3460	102	121.12		121.12	0.000014	1.01	7438.75	853.71	0.04
Reach1	600.9033	100yr (1%)	4080	102	123.11		123.12	0.00001	0.94	9146.84	859.28	0.04
Reach1	563.9904	50yr (2%)	3460	102	121.11		121.12	0.000019	1.17	6645.76	852.81	0.05
Reach1	563.9904	100yr (1%)	4080	102	123.11		123.12	0.000014	1.07	8356.8	861.91	0.04
Reach1	538.0463	50yr (2%)	3460	102	121.11		121.12	0.000021	1.23	6398.16	860.2	0.05
Reach1	538.0463	100yr (1%)	4080	102	123.11		123.12	0.000015	1.11	8124.89	870.06	0.04
Reach1	501.3869	50yr (2%)	3460	101.01	121.11		121.12	0.000019	1.18	6634.76	852.33	0.05
Reach1	501.3869	100yr (1%)	4080	101.01	123.11		123.12	0.000014	1.08	8345.73	862.01	0.04
Reach1	446.4301	50yr (2%)	3460	102	121.11		121.12	0.00002	1.26	6370.12	867.44	0.05
Reach1	446.4301	100yr (1%)	4080	102	123.11		123.11	0.000014	1.13	8115.36	879.72	0.05
Reach1	395.2574	50yr (2%)	3460	102	121.11		121.12	0.000024	1.27	5949.54	906.14	0.06
Reach1	395.2574	100yr (1%)	4080	102	123.1		123.11	0.000016	1.12	7775.71	920.94	0.05
Reach1	329.998	50yr (2%)	3460	100.48	121.1		121.12	0.000019	1.2	6500.25	996.88	0.05
Reach1	329.998	100yr (1%)	4080	100.48	123.1		123.11	0.000013	1.07	8500.01	1003.84	0.04
Reach1	294.4993	50yr (2%)	3460	100.29	121.11		121.12	0.00002	1.16	6665.35	964.66	0.05
Reach1	294.4993	100yr (1%)	4080	100.29	123.1		123.11	0.000014	1.04	8607.08	977.96	0.04
Reach1	259.7332	50yr (2%)	3460	101	121.1		121.11	0.00002	1.21	6390.19	915.3	0.05
Reach1	259.7332	100yr (1%)	4080	101	123.1		123.11	0.000014	1.08	8229.86	925.08	0.04
Reach1	196.0043	50yr (2%)	3460	101.94	121.1		121.11	0.000015	1.08	6765.99	916.34	0.05
Reach1	196.0043	100yr (1%)	4080	101.94	123.1		123.11	0.000011	0.99	8610.59	928.91	0.04
Reach1	152.6657	50yr (2%)	3460	101	121.1		121.11	0.000021	1.22	6328.57	886.53	0.05
Reach1	152.6657	100yr (1%)	4080	101	123.1		123.11	0.000015	1.1	8115.35	901.81	0.04
Reach1	96.59769	50yr (2%)	3460	101	121.1		121.11	0.00002	1.27	6518.13	876.41	0.05
Reach1	96.59769	100yr (1%)	4080	101	123.1		123.11	0.000014	1.15	8282.72	888.78	0.04
Reach1	47.77264	50yr (2%)	3460	101	121.1	106.84	121.11	0.000016	1.17	6764.95	855.91	0.05
Reach1	47.77264	100yr (1%)	4080	101	123.1	107.48	123.11	0.000012	1.08	8492.37	871.95	0.04

7.3 Scour and Countermeasures Calculations

7.3.1 Scour Sediment Sampling Results

7.3.2 Scour Calculations



GZA
Proactive by Design

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

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January 11, 2018
File No. 01.173284.00

Anthony Timperio, P.E.
Alfred Benesch & Company
50 Redfield Street
Boston, Massachusetts 02122

Re: Scour Sediment Sampling Services
Bay Road over Fort River
Bridge No. H-01-005
Hadley, Massachusetts

Dear Tony:

GZA GeoEnvironmental, Inc. (GZA) is pleased to submit the results of our sediment sampling and geotechnical laboratory testing services to Alfred Benesch & Company (Benesch) associated with the scour evaluation of Bay Road (Rt. 47) over the Fort River Bridge (Bridge No. H-01-005) in Hadley, Massachusetts. The objective of our services was to obtain river bottom sediment samples and to perform geotechnical laboratory testing in accordance with the recommendations of the Massachusetts Department of Transportation (MassDOT) Hydraulic Engineer.

Sample Collection

On August 21 and September 25, 2017 GZA representatives collected a total of eight (8) sediment samples for laboratory testing. Sampling dates and locations were coordinated with MassDOT to avoid conflict with bridge (pile) repair work that was ongoing within cofferdams by others. Sample locations were in general accordance with the "Locations of Soil Samples for Scour Evaluation, Multi-Span Bridge," specified by MassDOT. Three sediment samples were obtained at approach locations upstream of the existing bridge, and five sediment samples were obtained at the upstream face of each pier that is located in the water (Pier Nos. 2 through 6). Samples were collected by GZA personnel using hand tools to depths of about 12 to 24 inches below the existing river bottom/ground surface. Samples collected at the piers were taken from within the cofferdams. Samples upstream of the existing bridge were collected in accessible areas located as close as possible to planned sampling locations based on the referenced MassDOT requirements.

Based on our observations, the river bottom is covered by frequent stones, however sufficient material was present to obtain samples within the upper 2 feet of river bottom/flood plain sediment. The sampling locations were located by tape measurements, to the extent feasible from the existing bridge structure. Sediment sampling locations are summarized in **Table 1** and shown on the attached **Figure 2**. A Site Locus is shown on **Figure 1**.

Table 1: Sediment Sampling Locations

Sample No.	Approximate Location	Sampling Depth (feet)
US-NE	Northeast River Bank Approx. 160 ft Upstream of Bridge	0 - 2
US-NW	Northwest River Bank Approx. 160 ft Upstream of Bridge	0 – 2
US-C	North Central w/in River Approx. 168 ft Upstream of Bridge	0 – 2
BR-P2	Bridge – Pier 2	0 – 2
BP-P3	Bridge – Pier 3	0 – 2
BP-P4	Bridge – Pier 4	0 – 2
BP-P5	Bridge - Pier 5	0 – 2
BP-P6	Bridge – Pier 6	0 – 2

Notes:
1. Sampling locations were selected in general accordance with the plan entitled "Locations of Soil Sample for Scour Evaluation, Multi-Span Bridge" provided by MassDOT.
2. Sampling depths are referenced below the existing ground surface or bottom of river.
3. No sampling at Pier Nos. 1 and 7. These piers are located on land.

Geotechnical Laboratory Testing

A total of eight (8) gradation analyses were performed by Thielsch Engineering, Inc. of Cranston, Rhode Island in accordance with ASTM D422. Results of the laboratory testing, including D_{50} and D_{84} particles sizes for the streambed samples as well as additional gradation coefficients are provided in **Appendix A**.

We appreciated the opportunity to assist you on this project. Please call Terese Kwiatkowski (781) 278-3817 or Stephen Spink (781) 278-5838 with any questions or comments.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

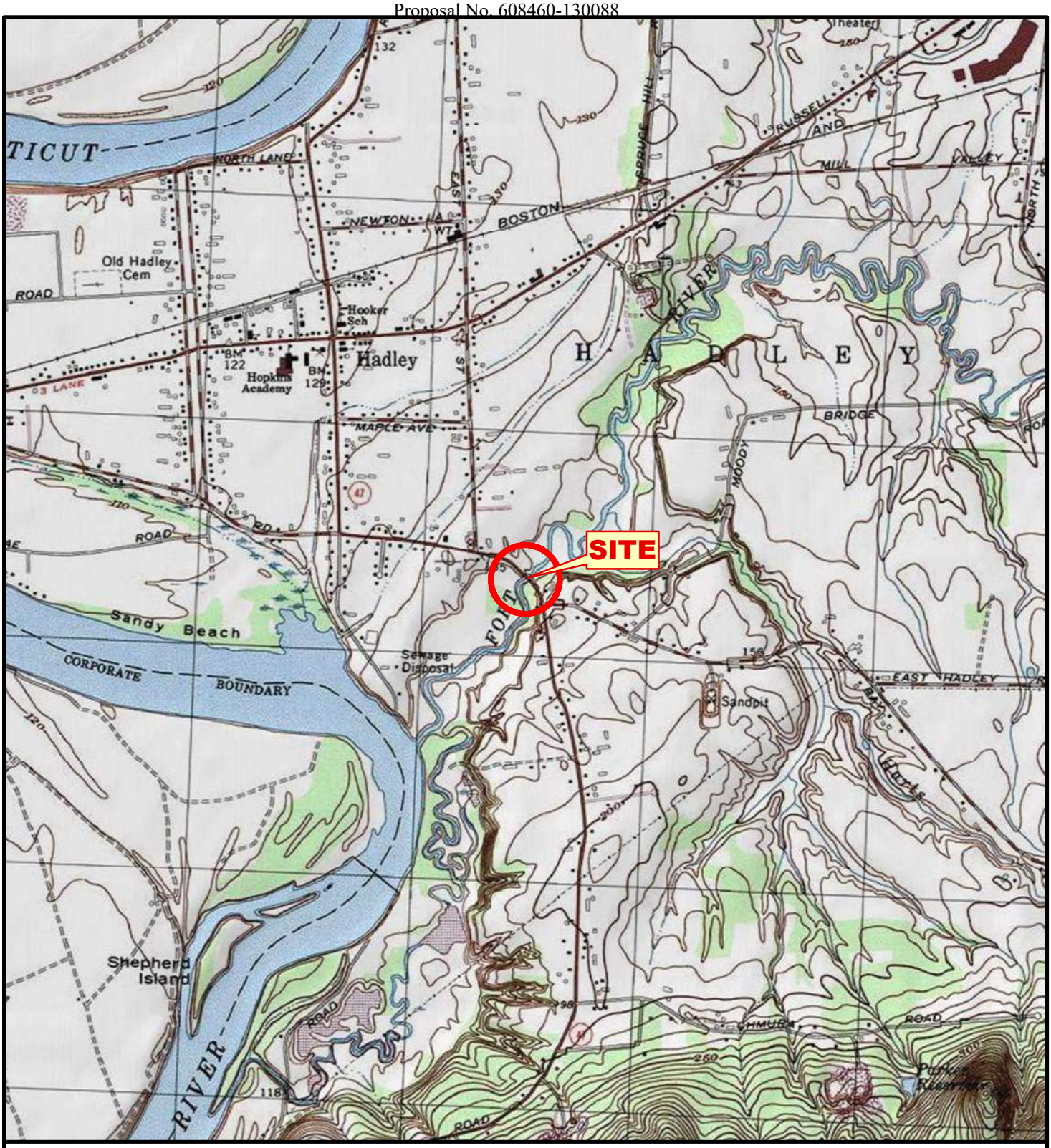
Stephen T. Spink, P.E.
Senior Project Manager

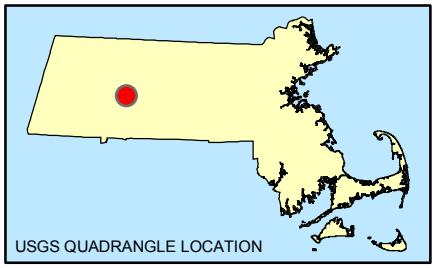
Terese M. Kwiatkowski, P.E.
Senior Principal

Attachments: Figures
Appendix A - Geotechnical Laboratory Test Results

Proactive by Design

FIGURES





SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

Data Supplied by : esri

0 1,000 2,000 4,000 6,000

SCALE IN FEET

N W E S

PROJ. MGR.: STS
DESIGNED BY: STS
REVIEWED BY: TMK
OPERATOR: ADP

DATE: 12-04-2017

LOCUS PLAN

JOB NO. 01.0173284.00

MASSDOT PROJ. NO. 608460 - BRIDGE NO. H-01-005
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

FIGURE NO. 1

A00826 - R1

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LEGEND

BR-P2 SCOUR SAMPLE LOCATION

BB-1 BRIDGE BORING

ALIGNMENT A–A'

NOTES:

1. THE BING AERIAL BACKGROUND WAS PROVIDED BY MICROSOFT CORPORATION ON JULY 3, 2017.
2. THE LEVEL 3 ASSESSORS' PARCEL MAPPING DATA SET WAS DEVELOPED THROUGH COMPETITIVE PROCUREMENT FUNDED BY MASSGIS. THE SPECIFICATION FOR THIS WORK WAS LEVEL 3 OF THE MASSGIS DIGITAL PARCEL STANDARD. THIS DATA WAS DISTRIBUTED BY MASSGIS ON APRIL 28, 2017.
3. BORING LOCATIONS BASED ON TAPED MEASUREMENTS AND/OR LINE OF SIGHT FROM EXISTING SITE FEATURES. EXPLORATION LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. BORING LOCATIONS SHOWN HEREIN SHOULD BE CONSIDERED APPROXIMATE.
4. BRIDGE BORINGS (BB SERIES) WERE PERFORMED FROM THE BAY ROAD BRIDGE DECK (BB–2), AND FROM THE ROADWAY (BB–1, BB–3).
5. THE GROUND SURFACE CONTOURS AND EDGE OF WATER WERE GENERATED FROM THE MASSGIS DIGITAL TERRAIN MODEL (DTM) FILES. THIS DATA IS MAINTAINED BY MASS GIS AND WAS LAST UPDATED ON APRIL 9, 2013.

0 20 50 100

SCALE: 1" = 20'

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PROPOSED BRIDGE
BAY ROAD OVER FORT RIVER
HADLEY, MASSACHUSETTS

EXPLORATION LOCATION PLAN

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		benesch	
PROJ MGR: STS	REVIEWED BY: STS	CHECKED BY: TMK	FIGURE
DESIGNED BY: STS	DRAWN BY: ADP	SCALE: 1" = 20 FEET	2
DATE: 12-04-2017	PROJECT NO. 01.0173284.00	REVISION NO.	

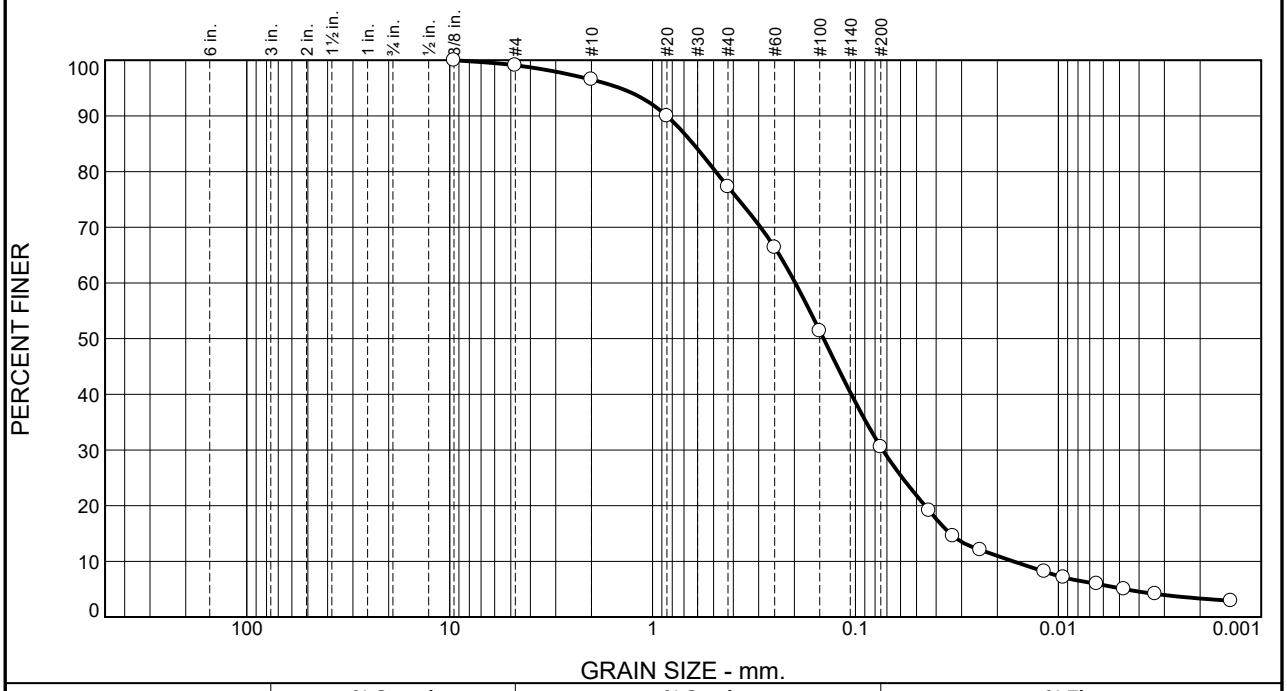
© 2013 – GZA GeoEnvironmental, Inc. G:\ZA–d\170,000–179,999\173284\173284–00.STS\FIGURES\CAD\DWG\608460_BR1–2(H01005).dwg [Sheet1_GZA–TB] December 04, 2017 – 2:08pm anthony.pungitore

Proactive by Design

APPENDIX A

GEOTECHNICAL LABORATORY RESULTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	2.6	19.2	46.8	27.2	3.3

Test Results (D7928 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	99.1		
#10	96.5		
#20	90.0		
#40	77.3		
#60	66.4		
#100	51.4		
#200	30.5		
0.0433 mm.	19.1		
0.0331 mm.	14.5		
0.0243 mm.	12.1		
0.0117 mm.	8.2		
0.0094 mm.	7.1		
0.0065 mm.	6.0		
0.0048 mm.	5.0		
0.0033 mm.	4.1		
0.0014 mm.	2.9		

* (no specification provided)

Material Description

Brown f-m SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.8502 D_{85}= 0.6307 D_{60}= 0.1980
D_{50}= 0.1436 D_{30}= 0.0734 D_{15}= 0.0342
D_{10}= 0.0167 C_u= 11.87 C_c= 1.63

Remarks

Material was visually checked for plasticity and appeared non-plastic.

Date Received: 12/28/17 **Date Tested:** 1/5/18

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: US-NE

Thielsch Engineering Inc.

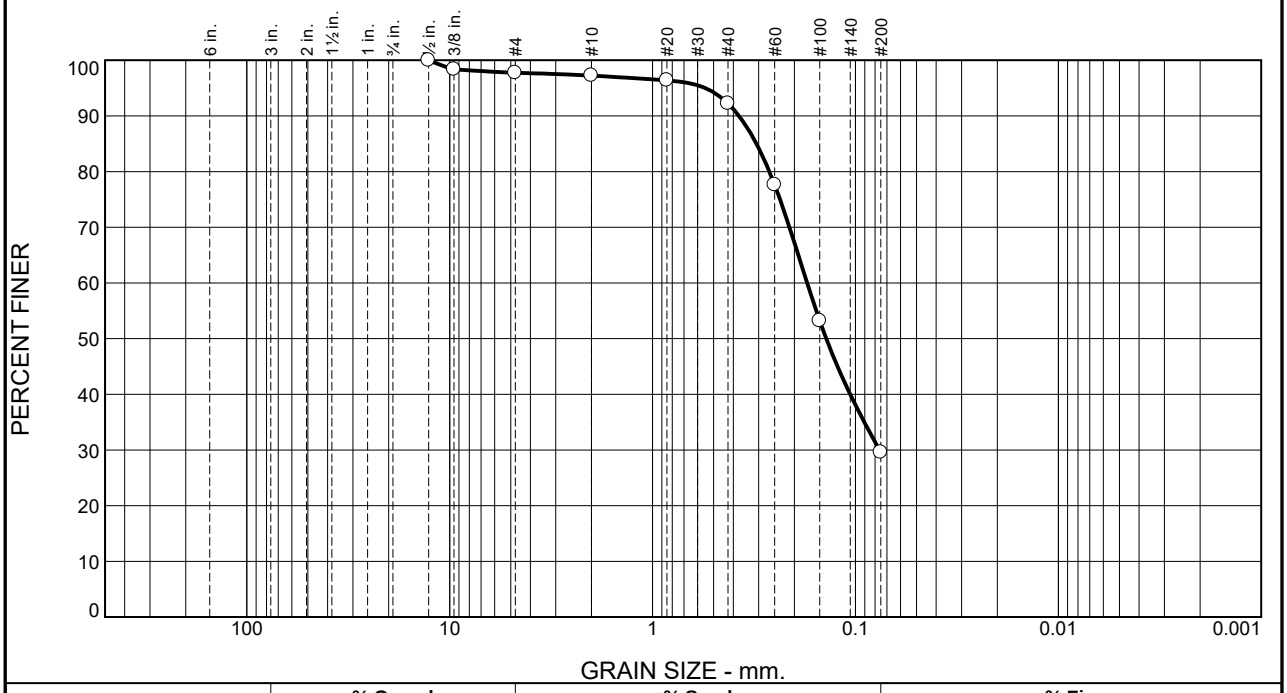
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.3	0.5	5.0	62.6	29.6	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5"	100.0		
0.375"	98.4		
#4	97.7		
#10	97.2		
#20	96.4		
#40	92.2		
#60	77.6		
#100	53.2		
#200	29.6		

* (no specification provided)

Material Description

Brown fine SAND, some Silt, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.3749 D_{85}= 0.3075 D_{60}= 0.1731
D_{50}= 0.1393 D_{30}= 0.0762 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample contained trace roots.

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: US-NW

Thielsch Engineering Inc.

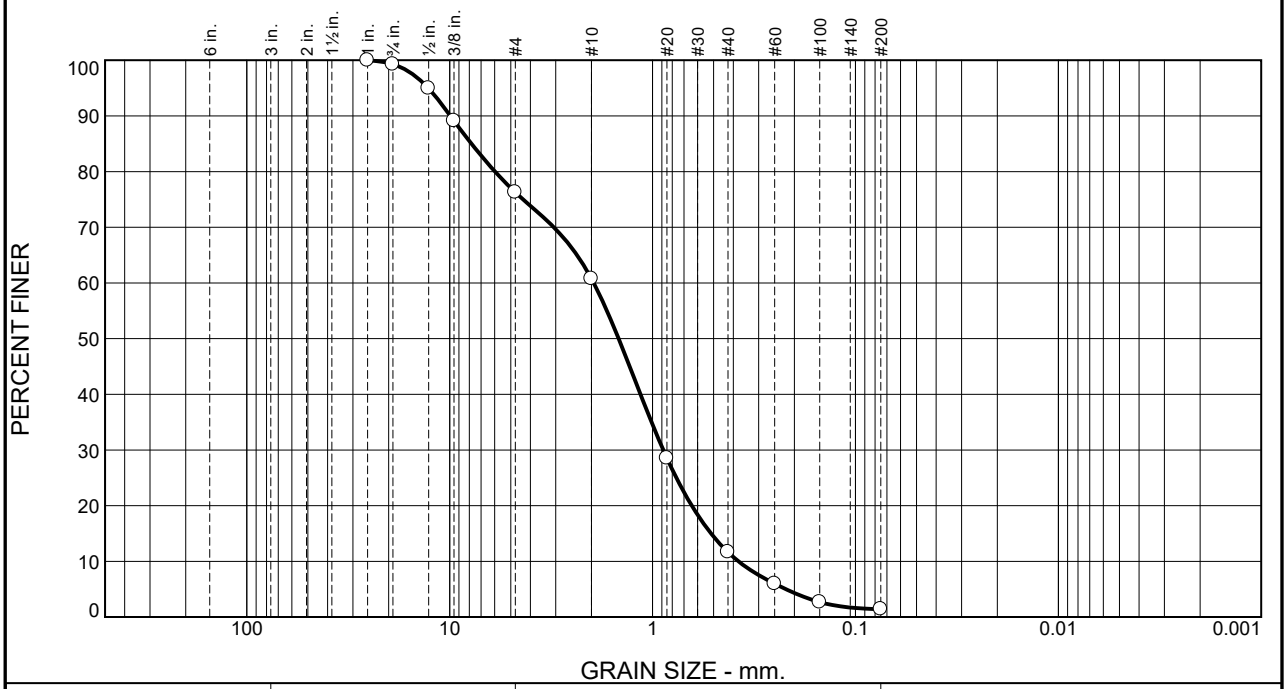
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.7	23.0	15.6	49.1	10.2	1.4	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	99.3		
0.5"	95.0		
0.375"	89.1		
#4	76.3		
#10	60.7		
#20	28.5		
#40	11.6		
#60	6.0		
#100	2.7		
#200	1.4		

* (no specification provided)

Material Description

Brown f-c SAND, some fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 9.9283 D_{85}= 7.8075 D_{60}= 1.9508
D_{50}= 1.4702 D_{30}= 0.8858 D_{15}= 0.5149
D_{10}= 0.3772 C_u= 5.17 C_c= 1.07

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: US-C

Thielsch Engineering Inc.

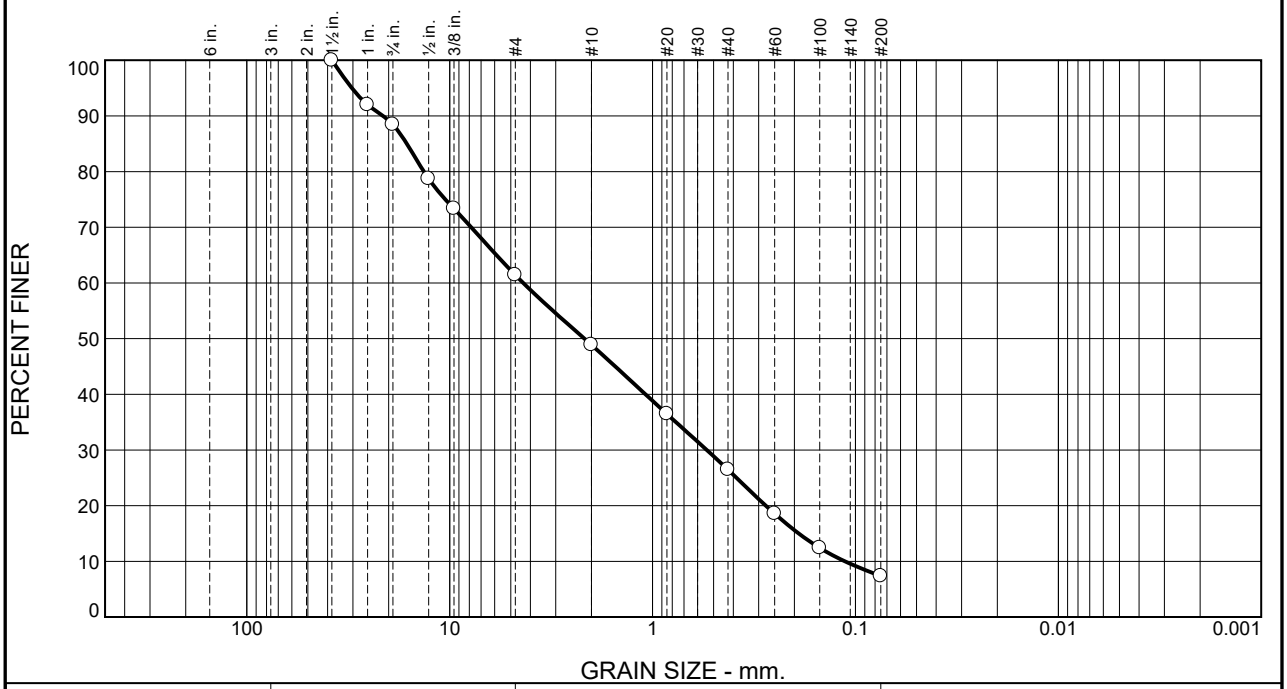
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.5	27.1	12.5	22.4	19.2	7.3	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	92.0		
0.75"	88.5		
0.5"	78.7		
0.375"	73.4		
#4	61.4		
#10	48.9		
#20	36.5		
#40	26.5		
#60	18.5		
#100	12.4		
#200	7.3		

* (no specification provided)

Material Description

Brown f-c SAND and f-c GRAVEL, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 21.2922 D_{85}= 16.2570 D_{60}= 4.3413
D_{50}= 2.1672 D_{30}= 0.5407 D_{15}= 0.1904
D_{10}= 0.1127 C_u= 38.53 C_c= 0.60

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P2

Thielsch Engineering Inc.

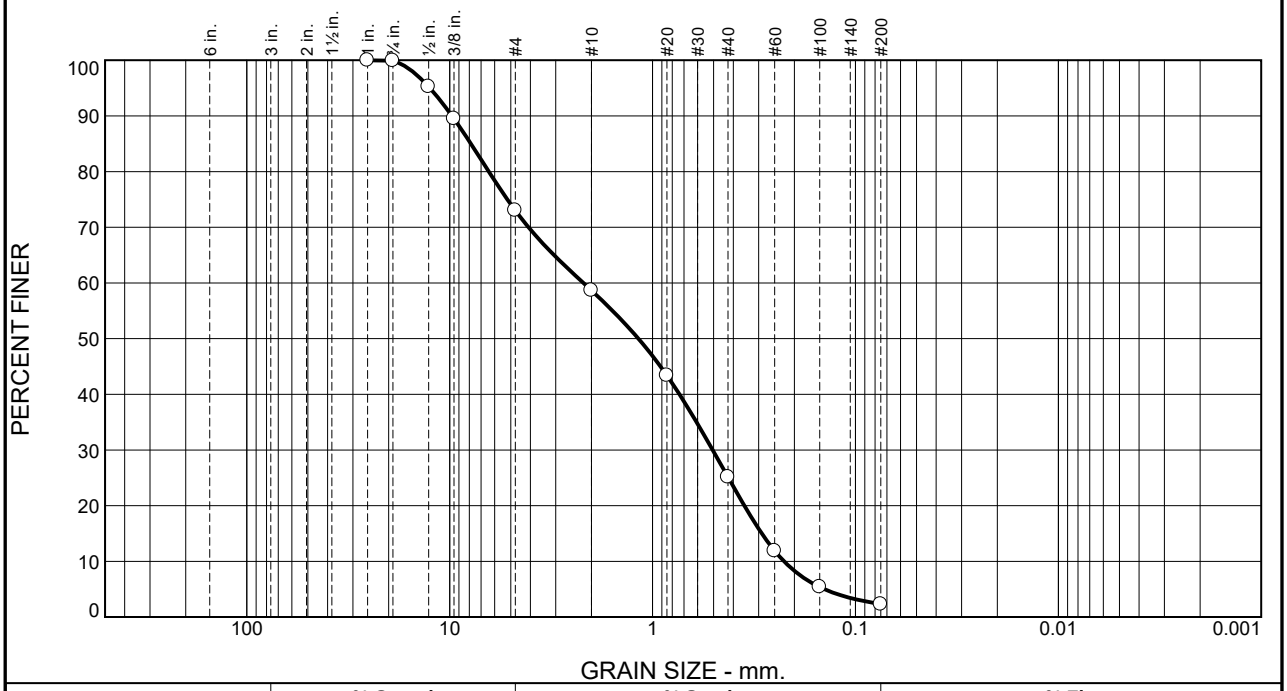
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	26.9	14.4	33.5	22.8	2.3	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	99.9		
0.5"	95.2		
0.375"	89.5		
#4	73.0		
#10	58.6		
#20	43.4		
#40	25.1		
#60	11.9		
#100	5.4		
#200	2.3		

* (no specification provided)

Material Description

Brown f-c SAND, some fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 9.7420 D_{85}= 7.8653 D_{60}= 2.1921
D_{50}= 1.1744 D_{30}= 0.5056 D_{15}= 0.2894
D_{10}= 0.2250 C_u= 9.74 C_c= 0.52

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P3

Thielsch Engineering Inc.

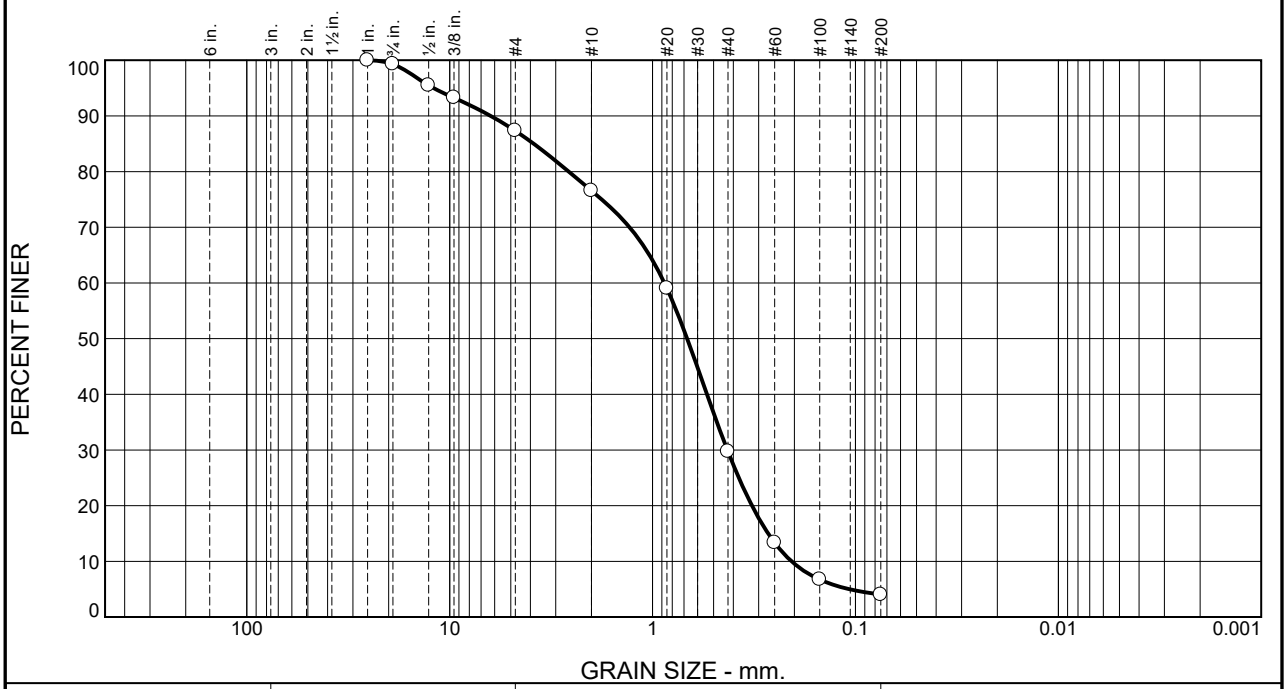
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-5

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.7	12.0	10.7	46.9	25.7	4.0	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	99.3		
0.5"	95.5		
0.375"	93.3		
#4	87.3		
#10	76.6		
#20	59.1		
#40	29.7		
#60	13.3		
#100	6.7		
#200	4.0		

* (no specification provided)

Material Description

Brown f-c SAND, little fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 6.2819 D_{85}= 3.8539 D_{60}= 0.8740
D_{50}= 0.6753 D_{30}= 0.4280 D_{15}= 0.2695
D_{10}= 0.2065 C_u= 4.23 C_c= 1.02

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P4

Thielsch Engineering Inc.

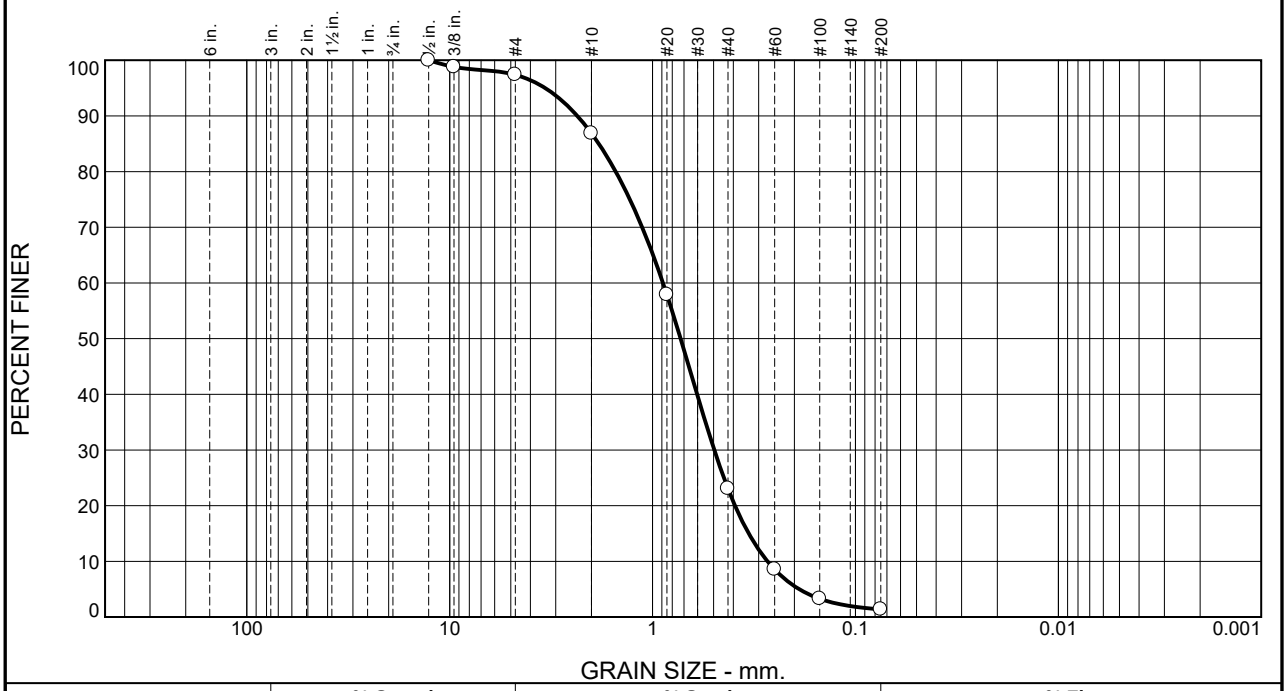
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-6

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.6	10.5	63.9	21.6	1.4	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5"	100.0		
0.375"	98.8		
#4	97.4		
#10	86.9		
#20	57.9		
#40	23.0		
#60	8.5		
#100	3.3		
#200	1.4		

* (no specification provided)

Material Description

Brown f-c SAND, trace fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 2.3495 D_{85}= 1.8408 D_{60}= 0.8885
D_{50}= 0.7276 D_{30}= 0.4962 D_{15}= 0.3358
D_{10}= 0.2713 C_u= 3.27 C_c= 1.02

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P5

Thielsch Engineering Inc.

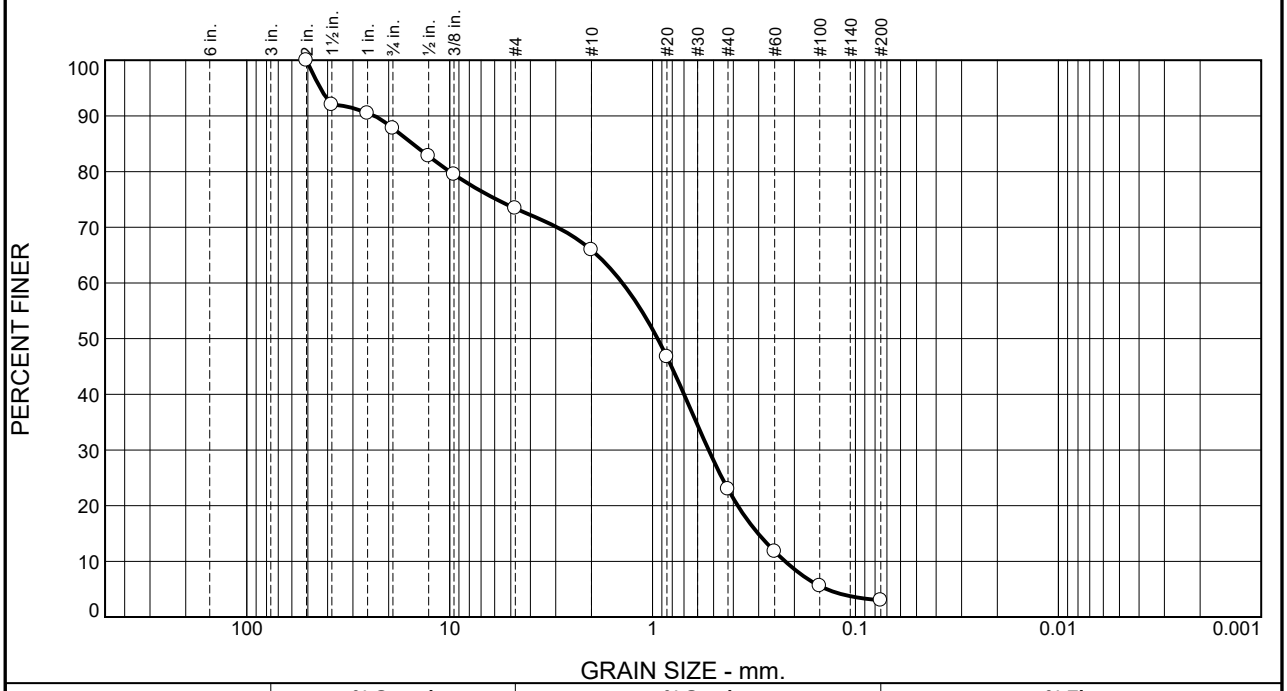
Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-7

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.2	14.4	7.5	42.9	20.0	3.0	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100.0		
1.5"	92.0		
1"	90.5		
0.75"	87.8		
0.5"	82.8		
0.375"	79.5		
#4	73.4		
#10	65.9		
#20	46.7		
#40	23.0		
#60	11.8		
#100	5.6		
#200	3.0		

* (no specification provided)

Material Description

Brown f-c SAND, some f-c Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 23.4273 D_{85}= 15.2223 D_{60}= 1.4081
D_{50}= 0.9443 D_{30}= 0.5291 D_{15}= 0.3019
D_{10}= 0.2222 C_u= 6.34 C_c= 0.90

Remarks

Date Received: 11/6/17 **Date Tested:** 11/9/17

Tested By: JAL

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Grab Samples **Depth:** 0-2' **Date Sampled:**

Sample Number: BR-P6

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental / Benesch

Project: MassDOT Bay Road (Rt. 47) over Fort River
Hadley, MA

Project No: 01.0173284.00 **Figure** S-8

2-DIST	B.I.N.
02	12J

UNDERWATER OPERATIONS TEAM
ROUTINE UNDERWATER INSPECTION REPORT

BR. DEPT. NO.: H-01-005

CITY/TOWN	8-STRUCTURE NO.	LEVEL OF INSPECTION	93B-DATE INSPECTED
HADLEY	H01005-12J-DOT-NBI	IV	MAR 24, 2016

07-FACILITY CARRIED	ACCESS TO BRIDGE	UNDERWATER OPERATIONS ENGINEER
ST 47 BAY RD	EMBANKMENT	RANDI E. BONICA

06-FEATURES INTERSECTED	DEPTH	VISIBILITY	TEAM LEADER (DIVE MASTER)	*Report submitted by:*
WATER FORT RIVER	1.2 m	1 m	JOHN A. MANKOWSKY	

BOTTOM CONDITION	CURRENT	TEAM MEMBERS
SAND, SILT, COBBLES	MODERATE	S. J. AUSEVICH, M. DOSTAL

ITEM 60 *SUBSTRUCTURE*

		DEF
1. Abutments	N	
a. Pedestals	N	-
b. Bridge Seats	N	-
c. Backwalls	N	-
d. Breastwalls	N	-
e. Wingwalls	N	-
f. Slope Paving/Rip-Rap	N	-
g. Pointing	N	-
h. Footings	N	-
i. Piles	N	-
j. Scour	N	-
k. Settlement	N	-
l.	N	-
2. Piers or Bents	N	
a. Pedestals	N	-
b. Caps	N	-
c. Columns	N	-
d. Stems/Webs/Pierwalls	N	-
e. Pointing	N	-
f. Footing	N	-
g. Piles	N	-
h. Scour	N	-
i. Settlement	N	-
j.	N	-
k.	N	-
3. Pile Bents	7	
a. Pile Caps	N	-
b. Piles	7	-
c. Diagonal Bracing	N	-
d. Horizontal Bracing	N	-
e. Fasteners	N	-
UNDERMINING (Y/N)		N

ITEM 61 *CHANNEL & CHANNEL PROTECTION*

		DEF
1. Channel Scour	6	-
2. Embankment Erosion	7	-
3. Debris	6	-
4. Vegetation	7	-
5. Utilities	N	-
6. Rip-Rap/Slope Protection	7	-
7. Aggradation	7	-
8. Fender System	N	-
a. Piles	N	-
b. Diagonal Bracing	N	-
c. Horizontal Bracing	N	-
d. Wales	N	-
e. Fasteners	N	-
f. Ladders	N	-
9.	N	-

ITEM 59 *SUPERSTRUCTURE*

		DEF
	N	-
	N	-
	N	-

ITEM 62 *CULVERTS*

		DEF
1. Roof	N	-
2. Floor	N	-
3. Walls	N	-
4. Headwall	N	-
5. Wingwall	N	-
6. Pipe	N	-
7. Protective Coating	N	-
8. Embankment	N	-
9. Wearing Surface	N	-
10. Railing	N	-
11. Sidewalks	N	-
12. Utilities	N	-
13. Member Alignment	N	-
14. Deformation	N	-
15. Scour	N	-
16. Settlement	N	-
17.	N	-
18.	N	-
UNDERMINING (Y/N)		N

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency- - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor scouring, etc.

S= Severe/Major Deficiency- Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroding rebars, Deteriorated timber piles, Considerable settlement, Considerable scouring or undermining, etc.

C-S= Critical Structural Deficiency- A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency- A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Any part of piles or fender system which are projecting outward and may become a safety hazard for the navigational traffic, etc.

URGENCY OF REPAIR:

I=Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her.]

A=ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the responsible party (if not a State owned bridge) upon receipt of the Inspection Report.]

P=Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available.]

X=UNKNOWN **N=NOT APPLICABLE** **H=HIDDEN/INACCESSIBLE** **R=REMOVED**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	**12J**	**H-01-005**	**H01005-12J-DOT-NBI**	**MAR 24, 2016**

REMARKS

GENERAL REMARKS

Structure is a pile bent bridge with a continuous concrete deck slab.

Orientation:

Per bridge plans, State 47 travels north and south over the Fort River, which flows from east to west.

When facing downstream, the 8 spans & 7 bents are numbered from left (south) to right (north).
Piles are numbered from downstream to upstream.

The water fluctuates by approximately 10' at this structure following big storm events. At the time of this inspection, both abutments and Bents 1, 2, & 7 were dry. Please see Plan Sketch.

General:

In March, 2016, a three ton load restriction was posted for the bridge due to the deterioration in some timber piles above water.
At the request of the D2 DBIE, divers were summoned to inspect the pile bents underwater. Divers were also used to stabilize the ladder underwater while inspectors checked the upper portions of each pile. Team Leader Dennis Sullivan and Team Member Will Morin were on site to conduct the Special Inspection.

ITEM 60 - SUBSTRUCTURE

Item 60.3 - Pile Bents

Item 60.3.b - Piles

The 10" diameter timber piles located in the water are wrapped with steel jackets, 1.5' diameter x approximately 10' high. Jackets are filled with concrete. The steel jackets exhibit various levels of deterioration from light rust to 100% section loss. Please see details below:

Bent 3 (Piles 6, 7, 8, & 9 have steel jackets)

Pile 9 - The timber pile is exposed below the steel jacket, 1.6' height, and is in good condition.

Bent 4 (All piles have steel jackets)

Pile 1 - The steel jacket has 100% loss along the lower 0.5'. The concrete filler is still intact.
Pile 2 - The steel jacket has 100% loss along the lower 0.3'. The concrete filler is still intact.
Piles 5, 6, 7, & 8 - The steel jacket has random small rust holes along the lower 2'. The concrete filler is still intact.
Pile 9 - The timber pile is exposed below the steel jacket, 0.7' height, and is in good condition.

Bent 5 (All piles have steel jackets)

Pile 3 - Minor rust holes are present in the jacket, up to 0.2' diameter.
Piles 5-8 - Numerous rust holes are present along the lower 2'. The concrete filler is still intact.
Pile 9 - The timber pile is exposed below the jacket, 1.0' height along the upstream face.

Bent 6 (All piles have steel jackets)

Pile 1 - The steel jacket has rust holes up to 0.1' diameter.
Piles 2 & 3 - A minor hole at the base of the jacket extends to the timber pile. Timber piles were probed and are solid.
Pile 6 - Timber pile is exposed below the jacket, 0.6' height at the upstream left side.
Pile 7 - Timber pile is exposed below the jacket, 0.7' height at the upstream left side.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	**12J**	**H-01-005**	**H01005-12J-DOT-NBI**	**MAR 24, 2016**

REMARKS

Item 60.3 - Pile Bents
Item 60.3.b - Piles (Cont'd)

Pile 8 - Timber pile is exposed below the jacket, 1.0' height along the left side.

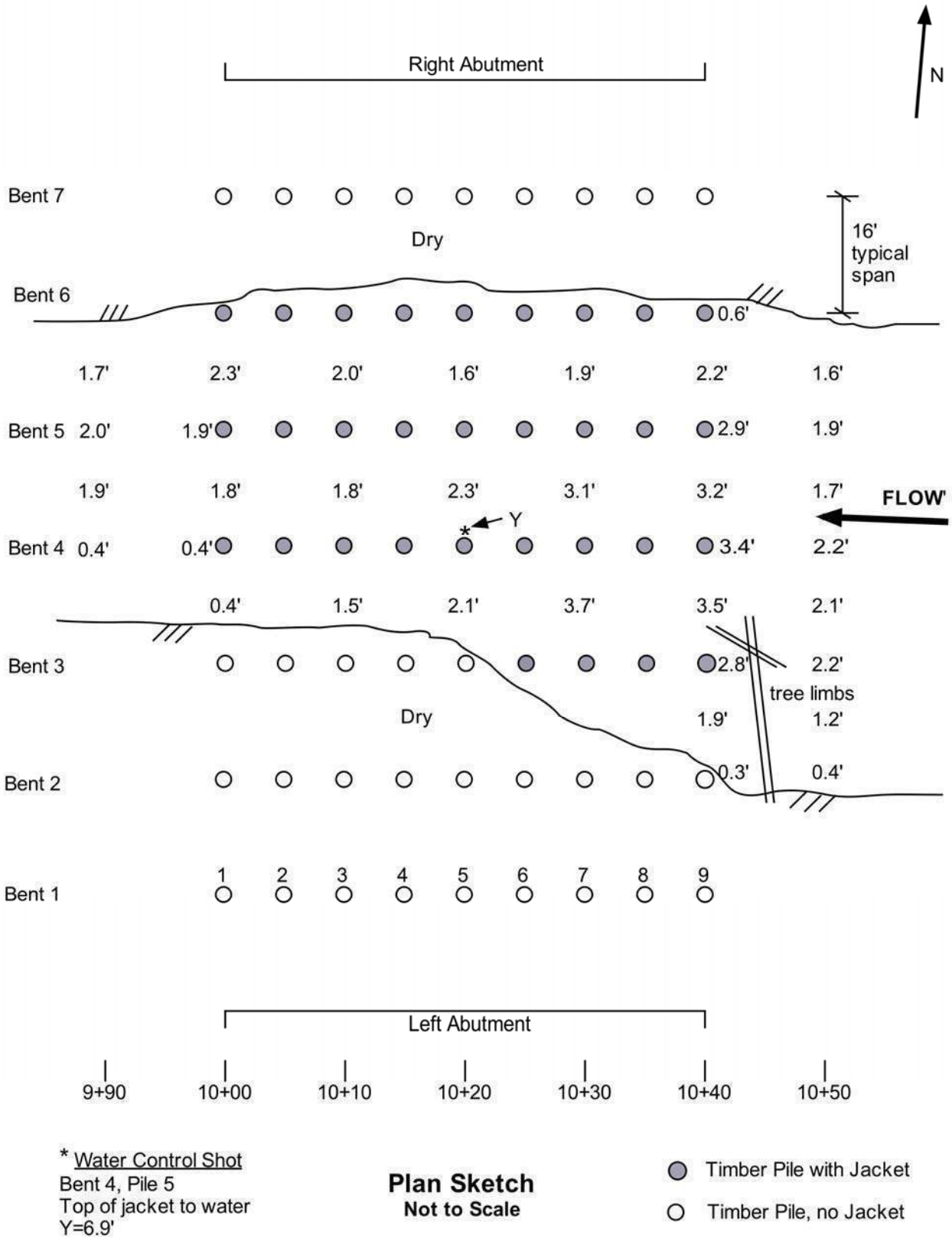
ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.1 - Channel Scour
At the upstream ends of Bents 3, 4, & 5, minor scour has exposed the timber piles below the steel jacket. See soundings on Plan Sketch.

Sketch Log
Sketch 1 : Plan Sketch

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HADLEY	12J	H-01-005	H01005-12J-DOT-NBI	MAR 24, 2016

SKETCHES



* Water Control Shot
Bent 4, Pile 5
Top of jacket to water
Y=6.9'

Plan Sketch
Not to Scale

● Timber Pile with Jacket
○ Timber Pile, no Jacket

Sketch 1: Plan Sketch

Report Date: January 23, 2018

Proposal No. 608460-130088

State Information

BDEPT#= H01005 Agency Br.No.

Town= Hadley L.O. MHD

B.I.N= 12J AASHTO= 052.4

RANK= 758 H.I.= 85.7 % FHWA Select List= Y

Identification

(8) Structure Number H0100512JDOTNBI

(5) Inventory Route 131000470

(2) State Highway Department District 02

(3) County Code 015 (4) Place code 27690

(6) Features Intersected **WATER FORT RIVER**

(7) Facility Carried **ST 47 BAY RD**

(9) Location .1 M S JCT MIDDLE ST.

(11) Kilometerpoint 0010.621

(12) Base Highway Network Y

(13) LRS Inventory Route & Subroute 000000000000

(16) Latitude 42 DEG 19 MIN 57.63 SEC

(17) Longitude 72 DEG 34 MIN 43.27 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Concrete continuous Code 201

Slab Jointless bridge type: INTEGRAL (timber

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 008

(46) Number of approach spans 0000

(107) Deck Structure Type - Concrete Cast-in-Place Code 1

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - Built-up Code 1

C) Type of deck protection - None Code 0

Age and Service

(27) Year Built 1935

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 02 Under structure 00

(29) Average Daily Traffic 005073

(30) Year of ADT 2016 (109) Truck ADT 11 %

(19) Bypass, detour length 018 KM

Geometric Data

(48) Length of maximum span 0004.9 M

(49) Structure Length 00037.8 M

(50) Curb or sidewalk: Left 01.4 M Right 00.0 M

(51) Bridge Roadway Width Curb to Curb 009.1 M

(52) Deck Width Out to Out 011.5 M

(32) Approach Roadway Width (w/shoulders) 006.1 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared N

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 03.6 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

	Code
(112) NBIS Bridge Length	Y
(104) Highway System	Y
(26) Functional Class - Urban Arterial	14
(100) Defense Highway	0
(101) Parallel Structure	N
(102) Direction of Traffic - 2-way traffic	2
(103) Temporary Structure	Y
(105) Federal Lands Highways	0
(110) Designated National Network	N
(20) Toll - On free road	3
(21) Maintain - State Highway Agency	01
(22) Owner - State Highway Agency	01
(37) Historical Significance undetermined	

Condition

	Code
(58) Deck	5
(59) Superstructure	5
(60) Substructure	5
(61) Channel & Channel Protection	6
(62) Culverts	N

Load Rating and Posting

	Code
(31) Design Load - H 15=M 13.5	2
(63) Operating Rating Method - Load Factor (LF)	1
(64) Operating Rating	32.3
(65) Inventory Rating Method - Load Factor (LF)	1
(66) Inventory Rating	25.4
(70) Bridge Posting	4
(41) Structure - Posted for load	P

Appraisal

	Code
(67) Structural Evaluation	5
(68) Deck Geometry	3
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	0 0 0 0
(113) Scour Critical Bridges	4

Inspections

(90) Inspection Date 10/31/17 (91) Frequency 06 MO

(92) Critical Feature Inspection: (93) CFI DATE

(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	03/24/16
(C) Other Special Inspection	Y	06	MO C)	10/31/17
(*) Other Inspection (LN Restriction)	N	00	MO *)	02/26/16
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) UW Special Inspection	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	02/19/08

Rating Loads

Report Date 12/01/15	H20	Type 3	Type 3S2	Type HS
Operating	25.0	37.0	59.0	38.0
Inventory	0.0	0.0	0.0	0.0

Field Posting

Status POSTED Posting Date 02/03/16

	2 Axle	3 Axle	5 Axle
Actual	03	03	03
Recommended	03	03	03

Missing Signs N

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel Y Jointless Bridge

Freeze/Thaw

Accessibility (Needed/Used)

N / N	Liftbucket	N / N	Rigging	N / N	Other
Y / Y	Ladder	N / N	Staging		
N / N	Boat	P / N	Traffic Control		
Y / Y	Wader	N / N	RR Flagperson		
P / N	Inspector 50	P / N	Police		

Inspection Hours: 012

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Existing Condition Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.28	3.43
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.20	21.69	4.99
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.12
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-01 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.28	3.43
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.22	21.71	5.02
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.13
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-02 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.27	3.42
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.22	21.71	5.01
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.13
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-03 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.03	19.27	3.42
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.21	21.70	5.01
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.13
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative-04 Contraction Scour Check

Design Flood Frequency, $Q_s = Q_{100}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.02	19.26	3.41
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.25	3.09	1.06
Mean Velocity (ft/s), V =	0.60	1.69	0.32
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Check Flood Frequency, $Q_c = Q_{200}$

Critical Velocity:

$V_c = 11.17\ Y^{1/6}\ D^{1/3}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.1)

	LEFT BANK	CHANNEL	RIGHT BANK
Average Depth of Flow upstream of the Bridge (ft), Y =	9.20	21.68	4.99
D_{50} in mm	0.14	1.47	0.14
Patricle Size for V_c (ft),D =	0.000	0.005	0.000
Critical Velocity (ft/s), V_c =	1.26	3.15	1.12
Mean Velocity (ft/s), V =	0.53	1.59	0.36
$V_c > V$ (Clear-Water)	Yes	Yes	Yes
$V_c < V$ (Live-Bed)	No	No	No
	Clear-Water	**Clear-Water**	**Clear-Water**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Existing Contraction Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

$Y_s = Y_2 - Y_o$ ref: HEC-18, 5th Edition, April 2012, Equation (6.5)

Design Flood Frequency, $Q_s = Q_{100}$

	Left	Channel	Right
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	0.43	4032.83	46.74
D_{50} in mm	0.14	1.47	0.14
Median diameter of bed material (mm), D_{50} =	0.20	1.47	0.20
Median diameter of bed material (ft), D_{50} =	0.000656	0.004823	0.000656
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0008	0.0060	0.0008
Bottom width of the contracted section less pier width(s),(ft), W =	0.24	112.55	2.87
K_u =	0.0077	0.0077	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	1.56	11.50	10.34
Average existing depth in the contracted section (ft), Y_o =	11.06	16.43	9.01
Average contraction scour depth (ft), Y_s =	**-9.50**	**-4.93**	**1.33**

Check Flood Frequency, $Q_c = Q_{200}$

	Left	Channel	Right
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	1.57	4346.35	412.08
D_{50} in mm	0.14	1.47	0.14
Median diameter of bed material (mm), D_{50} =	0.20	1.47	0.20
Median diameter of bed material (ft), D_{50} =	0.000656	0.004823	0.000656
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0008	0.0060	0.0008
Bottom width of the contracted section less pier width(s),(ft), W =	33.68	123.05	457.05
K_u =	0.0077	0.0077	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	0.07	11.36	0.87
Average existing depth in the contracted section (ft), Y_o =	0.25	16.50	1.35
Average contraction scour depth (ft), Y_s =	**-0.18**	**-5.14**	**-0.48**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternatives Contraction Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

$Y_s = Y_2 - Y_o$ ref: HEC-18, 5th Edition, April 2012, Equation (6.5)

Design Flood Frequency, $Q_s = Q_{100}$

	Channel
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	4080.00
D_{50} in mm	1.47
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.004823
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bottom width of the contracted section less pier width(s),(ft), W =	116.00
K_u =	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	11.32
Average existing depth in the contracted section (ft), Y_o =	14.71
Average contraction scour depth (ft), Y_s =	**-3.39**

Check Flood Frequency, $Q_c = Q_{200}$

	CHANNEL
Flow through the bridge or on the set-back overbank area at the bridge associated with the width W, (ft^3/s), Q =	4760.00
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.004823
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bottom width of the contracted section less pier width(s),(ft), W =	116.00
K_u =	0.0077
Average equilibrium depth in the contracted section after contraction scour (ft), Y_2 =	12.92
Average existing depth in the contracted section (ft), Y_o =	30.14
Average contraction scour depth (ft), Y_s =	**-17.22**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Existing Condition Pressure Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

Separation Zone Thickness

$t = 0.5\,(h_b \,.\, h_t/h_u^2)^{0.2}\ (1- h_w/h_t)^{-0.1} \,.\, h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.16)

Pressure Scour

$Y_s = Y_2 + t - h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.14)

Design Flood Frequency, $Q_s = Q_{100}$ with no overtopping

Upstream channel and bridge opening width, W =	105.0
Total discharge, Q, =	4080.0
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.5
Distance from water surface to lower face of bridge girders, h_t =	0.7
Upstream channel flow depth, h_u =	20.2
Weir flow height, h_w =	0.0
Average depth in contracted section after contraction, Y_2 =	12.3
Separation zone thickness, t =	5.26
Pressure scour, Y_s =	-2.95

Check Flood Frequency, $Q_c = Q_{200}$

Upstream channel and bridge opening width, W =	105.0
Total discharge, Q, =	4305.9
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.5
Distance from water surface to lower face of bridge girders, h_t =	1.6
Upstream channel flow depth, h_u =	22.7
Weir flow height, h_w =	0.7
Average depth in contracted section after contraction, Y_2 =	12.9
Separation zone thickness, t =	6.25
Pressure scour, Y_s =	-1.34

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Proposed Condition Pressure Scour

Clear-Water Contraction Scour:

$Y_2 = [(K_u Q^2)/(D^{2/3} W^2)]^{3/7}$ ref: HEC-18, 5th Edition, April 2012, Equation (6.4)

Separation Zone Thickness

$t = 0.5\ (h_b \,.\, h_t/h_u^2)^{0.2}\ (1- h_w/h_t)^{-0.1} \,.\, h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.16)

Pressure Scour

$Y_s = Y_2 + t - h_b$ ref: HEC-18, 5th Edition, April 2012, Equation (6.14)

Design Flood Frequency, $Q_s = Q_{100}$ with no overtopping

Upstream channel and bridge opening width, W =	119.0
Total discharge, Q, =	4080.0
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.8
Distance from water surface to lower face of bridge girders, h_t =	0.5
Upstream channel flow depth, h_u =	20.1
Weir flow height, h_w =	0.0
Average depth in contracted section after contraction, Y_2 =	11.1
Separation zone thickness, t =	4.93
Pressure scour, Y_s =	-4.83

Check Flood Frequency, $Q_c = Q_{200}$

Upstream channel and bridge opening width, W =	119.0
Total discharge, Q, =	4760.0
K_u =	0.0077
Median diameter of bed material (mm), D_{50} =	1.47
Median diameter of bed material (ft), D_{50} =	0.005
Diameter of the smallest nontransportable particle in the bed material ($1.25D_{50}$) in the contracted section (ft), D_m =	0.0060
Bridge opening height, h_b =	20.8
Distance from water surface to lower face of bridge girders, h_t =	1.7
Upstream channel flow depth, h_u =	22.7
Weir flow height, h_w =	1.3
Average depth in contracted section after contraction, Y_2 =	12.6
Separation zone thickness, t =	7.10
Pressure scour, Y_s =	-1.07

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Existing Pier Scour

HEC-18 Pier Scour Equation:

$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$ ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	37.83
Pier Width (ft), a =	1.32
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	16.37
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.42**
Maximum Pier Scour	**2.42**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	37.83
Pier Width (ft), a =	1.32
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	18.79
Froude Number directly u/s of the pier, Fr_1 =	0.07
Scour Depth (ft), Y_s =	**2.33**
Maximum Pier Scour	**2.33**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
Project No.: 608460

Proposed Alternative -01 Pier Scour

HEC-18 Pier Scour Equation:

$$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$$

ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	15.27
Froude Number directly u/s of the pier, Fr_1 =	0.10
Scour Depth (ft), Y_s =	**2.58**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	17.73
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.45**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
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Proposed Alternative -02 Pier Scour

HEC-18 Pier Scour Equation:

$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$ ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	14.60
Froude Number directly u/s of the pier, Fr_1 =	0.11
Scour Depth (ft), Y_s =	**2.57**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	17.06
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.46**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
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Proposed Alternative -03 Pier Scour

HEC-18 Pier Scour Equation:

$$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$$

ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, Θ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	15.34
Froude Number directly u/s of the pier, Fr_1 =	0.10
Scour Depth (ft), Y_s =	**2.53**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, Θ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	17.79
Froude Number directly u/s of the pier, Fr_1 =	0.08
Scour Depth (ft), Y_s =	**2.45**

Town: Hadley
Bridge No.: H-01-005
Bay Road (ST 47) Over Fort River
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Proposed Alternative -04 Pier Scour

HEC-18 Pier Scour Equation:

$Y_s = [2.0\ K_1\ K_2\ K_3\ (a/y_1)^{0.65}\ Fr_1^{0.43}]\ y_1$ ref: HEC-18, 5th Edition, April 2012, Equation (7.1)

Design Flood Frequency, $Q_s = Q_{100}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	14.49
Froude Number directly u/s of the pier, Fr_1 =	0.11
Scour Depth (ft), Y_s =	**2.57**

Check Flood Frequency, $Q_c = Q_{200}$

	Pier max
Correction factor for pier nose shape, K_1 =	1.00
Length of Pier (ft), L	42.50
Pier Width (ft), a =	1.33
Angle of attack of flow, ϴ	0.00
Correction factor for angle of attack of flow, K_2 =	1.00
Correction factor for bed condotion, K_3 =	1.10
Flow depth directly u/s of the pier (ft), Y_1 =	16.92
Froude Number directly u/s of the pier, Fr_1 =	0.10
Scour Depth (ft), Y_s =	**2.61**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
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Existing Condition Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Design Flood Frequency, $Q_s = Q_{100}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	19.3
Upstream velocity (ft/s), =	1.7
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3342.0
Total discharge in the bridge opening (cfs), =	4080.0
Flow depth in the contracted section (ft), y_2 =	16.4
Velocity in the contracted section (ft/s), =	2.2
Width of the bridge opening (ft) =	112.6
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	36.3
Upstream unit discharge (ft^2/s), q_1, =	32.5
q_2/q_1 =	1.12
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	12.6
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.60
Maximum flow depth resulting from abutment scour (ft), y_{max} =	32.7
Flow depth prior to scour (ft), Y_0 =	19.3
Abutment scour depth (ft), Y_s =	**13.4**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Existing Condition Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Check Flood Frequency, $Q_c = Q_{200}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	21.7
Upstream velocity (ft/s), =	1.6
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3548.4
Total discharge in the bridge opening (cfs), =	4346.4
Flow depth in the contracted section (ft), y_2 =	16.5
Velocity in the contracted section (ft/s), =	2.1
Width of the bridge opening (ft) =	123.1
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	35.3
Upstream unit discharge (ft^2/s), q_1, =	34.5
q_2/q_1 =	1.02
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	12.3
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.6
Maximum flow depth resulting from abutment scour (ft), y_{max} =	32.0
Flow depth prior to scour (ft), Y_0 =	21.7
Abutment scour depth (ft), Y_s =	**10.3**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Proposed Alternatives Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Design Flood Frequency, $Q_s = Q_{100}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	19.27
Upstream velocity (ft/s), =	1.7
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3343.4
Total discharge in the bridge opening (cfs), =	4080.0
Flow depth in the contracted section (ft), y_2 =	14.7
Velocity in the contracted section (ft/s), =	2.3
Width of the bridge opening (ft) =	119.0
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	34.3
Upstream unit discharge (ft^2/s), q_1, =	32.5
q_2/q_1 =	1.05
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	12.0
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.60
Maximum flow depth resulting from abutment scour (ft), y_{max} =	31.2
Flow depth prior to scour (ft), Y_0 =	19.3
Abutment scour depth (ft), Y_s =	**11.9**

Town: Hadley
Bridge No.: H-01-005
Bay Rd (ST 47) Over Fort River
Project No.: 608460

Proposed Alternatives Abutment Scour

NCHRP 24-20 Abutment Scour Approach:

$y_c = y_1 (q_{2c}/q_1)^{6/7}$ *for Live-bed abutment scour* ref: HEC-18 Equation 8.5

$y_c = [q_{2c}/K_u D_{50}^{1/3}]^{6/7}$ *for Clear-water abutment scour* ref: HEC-18 Equation 8.6

Check Flood Frequency, $Q_c = Q_{200}$

	Abutment
D_{50} (ft)	0.005
Length of the embankment (ft), L =	10
Width of the floodplain (ft), B_f =	50
L/B_f =	0.2
Contraction scour calculation method used =	*Clear-water*
Upstream flow depth (ft), y_1 =	21.71
Upstream velocity (ft/s), =	1.6
Width upstream (ft) =	102.9
Total discharge upstream (cfs), =	3544.7
Total discharge in the bridge opening (cfs), =	4760.0
Flow depth in the contracted section (ft), y_2 =	22.9
Velocity in the contracted section (ft/s), =	2.6
Width of the bridge opening (ft) =	119.0
Unit discharge in the constricted opening accounting for non-uniform flow distribution (ft^2/s), q_2 =	40.0
Upstream unit discharge (ft^2/s), q_1, =	34.5
q_2/q_1 =	1.16
Flow depth inlcuding live-bed or clear-water contraction scour (ft), y_c =	13.7
Amplification factor for live-bed conditions, α_A =	
Amplification factor for clear-water conditions, α_B =	2.6
Maximum flow depth resulting from abutment scour (ft), y_{max} =	34.9
Flow depth prior to scour (ft), Y_0 =	21.7
Abutment scour depth (ft), Y_s =	**13.2**

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT G

Sediment Analysis of Material to be Dredged

NOTE: New Sediment Samples are being performed concurrently with the filing of this application. Results of the sampling will be provided once received.

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT H

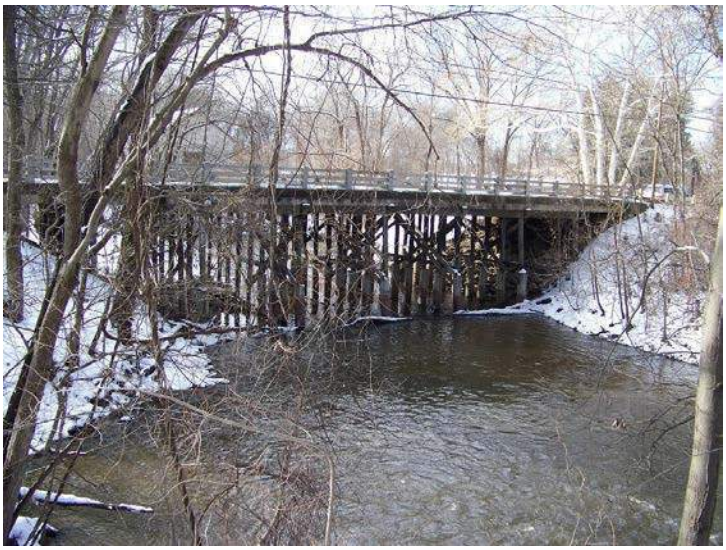
Project Photos



General Topside From South Abutment with One-Way Alternating TTC, Looking North



Lane Configuration on Bridge without One-Way Alternating TTC, Looking South



East Elevation, Looking West



West Elevation, Looking East



Fort River Downstream of Bridge, Looking West



Fort River Upstream of Bridge Showing Historic Bay Road Bridge Foundations, Looking East



Typical Pier with Repairs, Looking East



Typical Deck Underside and 8” Water Main on East Side of Bridge, Looking East

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT I

Stormwater Management Memo

To: MassDOT

Date: September 27, 2024

Project #: 608460

From: Benesch

Re: *Bay Road (Route 47) over Fort River*

This Stormwater Management Memorandum has been prepared to show compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Water Quality Certification Regulations (314 CMR 9.00) to support the Project's Section 401 Water Quality Certificate Application.

Project Description

The Applicant, MassDOT, is proposing Project 608460 to construct a bridge replacement (the Project) located in Hadley, MA. As proposed, the Project consists of replacing two integral abutments and two pipe pile bents with reinforced concrete pile caps. New riprap will be installed at the base of the south and north abutment walls. The entire bridge superstructure will be replaced and widened using precast concrete deck beams. The proposed Bay Road roadway section on the bridge will provide two 12-foot wide lanes (one in each direction) of vehicular traffic with 5-foot wide outside shoulders, as well as a sidewalk on the east side of the bridge. A terrestrial wildlife passage is proposed adjacent to the south abutment, and a drainage channel is proposed southeast of the bridge.

Existing and Proposed Drainage Conditions

The proposed project area is approximately 740 ft of Bay Road (Route 47) and the Bay road bridge over the Fort river. In this area Bay Road is approximately 28 - 34 ft wide. The Fort River flows in the southwesterly direction. The channel width at the bridge varies approximately from 40-70 ft. Existing drainage structures in the project area include 1 deep sump catch basin and 1 drainage outfall. This outfall discharges into the Fort River. According to the FEMA Flood Insurance Rate Map (Community-Panel Number 2501630002B), this area of the Fort River lies within a 100-year flood zone. At the bridge the 100-year flood is at an elevation of 123 ft.

The project will include construction of new drainage structures, the restoration and relocation of existing outfall, the construction of a drainage channel, and an increase in impervious surface area of 2900 sf. This increase is required to provide ADA compliant cement concrete sidewalk along the bridge, and to widen Bay Road to accommodate two 12 ft lanes with 5 ft shoulders. On the South side of the bridge, one deep sump catch basin will be constructed as well as a drainage manhole. An outfall with a concrete headwall and drainage channel is proposed southeast of the bridge. The proposed deep sump catch basin and the proposed drainage manhole will be connected with 12" RCP. The proposed drainage manhole and the relocated outfall will be connected with 12" CMP. The existing catch basin will be removed. At the relocated outfall, a 195 sf drainage channel is proposed.

BMP Stormwater Management Alternatives

Many Stormwater Control Measures (SCMs) were considered, however were not considered feasible for this project. The project will improve the existing conditions by providing pre-treatment to roadway runoff prior to being outlet to the river and maintaining existing drainage patterns with existing conditions. The following were considered:

- Deep-Sump Catch Basins – the catch basin proposed as part of this project will have a deep-sump. The deep-sump catch basin will be used to replace the existing corrugated pipe (without sump or structure) that conveys water to an existing outlet.

- Sediment Forebay/Infiltration Basin – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, forebays and infiltration basins with check dams were not considered feasible or effective. A stone apron, however, is provided at the proposed outlet location to prevent erosion and reduce water velocities. The stone apron transitions to a streambed material drainage channel to aid in temperature reduction of runoff before discharge into the river.

- Open-Graded Friction Course – the design coordinated with and approved by the MassDOT Pavement Management Section does not include open-graded friction course pavement. At this stage of design, it is not feasible to change the pavement design.

- Pavement Disconnection – The existing site relies primarily on "country drainage" or sheet flow to convey water away from the roadway. Some widening of the roadway is proposed (described in Section 2.3 above), however the existing pavement disconnection was maintained to the maximum extent practicable for the site. Bridge scuppers are not proposed on this bridge, therefore all roadway drainage within the project site will either exit the roadway to natural vegetated areas or be pre-treated within a deep-sump catch basin prior to being outlet to the river.

- Leaching Basins – due to the existing site topography and proximity of the toe of slope with the river bank, a leaching basin was not considered for the project site.

- Subsurface Infiltration System – due to the scope of this project, existing site topography, proximity of the toe of slope with the river bank and existing right-of-way, a subsurface infiltration system was not considered feasible for the project.

- Porous Pavement – the design coordinated with and approved by the MassDOT Pavement Section does not include porous pavement. Since this project is primarily a roadway project, porous pavement was not considered. Also, the proposed pedestrian sidewalk is limited to the length of the bridge and will be made of cement concrete.

- Stormwater Wetland Stormwater Control Measures (SCM) – due to the scope of this project, existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, stormwater wetland SCMs were not considered feasible for this project. Although not a constructed stormwater wetland, numerous upland plantings are being proposed as part of the project in order to improve the banks compared to the existing condition. There is also a streambed material drainage channel proposed between the drainage outfall location and the river bank.

Massachusetts Department of Environmental Protection (MassDEP) – Stormwater Management Standards

As demonstrated below, the proposed Project complies with the MassDEP Stormwater Management Standards (the Standards). Under the Stormwater Management Standards, the Project is considered a redevelopment project because it involves maintenance and improvement of an existing roadway. The existing bridge superstructure will be replaced and widened, new abutments will be installed along with new rip-rap. Two 12' wide lanes, 5' wide outside shoulders, and a 5'-6" cement concrete sidewalk along the bridge is also proposed. The Project has been designed to meet the Stormwater Management Standards to the maximum extent practicable and to improve upon existing conditions.

Standard 1: No New Untreated Discharges

No new stormwater conveyance (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The Project has been designed to comply with Standard 1 fully.

An existing stormwater outfall was relocated and restored from the southwest side of the bridge to the southeast side. The outfall was moved to reduce impact to Bordering Vegetated Wetlands. A flared pipe end outfall with cement concrete headwall will be constructed at the new outfall, as well as a 38 sf area of stone for pipe ends. Adjacent to the stone for pipe ends a 195 SF drainage channel of streambed material is proposed. The purpose of the drainage channel and stone pipe end is to prevent erosion to the Fort River and Bordering Vegetated Wetlands. The proposed stone pipe end will act as an energy dissipator for outflowing stormwater. The drainage channel will allow for temperature reduction before discharging to the river.

See Standard 4 for the water quality treatment provided by the Project.

Standard 2: Peak Rate Attenuation

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

The Project has been designed to comply with Standard 2 to the maximum extent practicable. Table 1 includes a summary of impervious cover impacts, which can be used as a metric to understand impacts to peak discharge rates following development.

The increase in impervious surface area is required to widen areas of bay road and the bay road bridge to accommodate two 12' lanes with 5' shoulders, as well as a 5'-6" sidewalk. These improvements result in a 2,900 SF increase in impervious surface area. The proposed catch basin and restored outfall will allow for the collected stormwater to be discharged to the Fort River. There is likely no flooding concern as prior precipitation would have also previously drained directly to the Fort River as well.

Table 1: Existing and proposed impervious cover

Existing Impervious Area (sq. ft)	Proposed Impervious Area (sq. ft)	Change In Impervious Area (sq. ft)	Percent Increase in Impervious Area (%)
22,700	25,600	2900	12%

Standard 3: Stormwater Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater management practices and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil types. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The Project has been designed to comply with Standard 3 to the maximum extent practicable. The purpose of this standard is to replenish groundwater by ensuring that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions. The relocation of the existing outfall will include the construction of a shallow-sloped drainage channel. This channel will be constructed of streambed material and will allow for similar infiltration as the existing outfall.

Standard 4: Water Quality

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a) *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
b) *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
c) *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

The Project has been designed to comply with Standard 4 to the maximum extent practicable.

Many Stormwater Control Measures (SCMs) were considered, however were not considered feasible for this project. The project will improve the existing conditions by providing pre-treatment of roadway runoff prior to being outlet to the river and maintaining existing drainage patterns with existing conditions. The following were considered:

- Deep-Sump Catch Basins – the catch basin proposed as part of this project will have a deep-sump. The deep-sump catch basin will be used to replace the existing corrugated pipe (without sump or structure) that conveys water to an existing outlet and provide 25% pre-treatment TSS removal.
- Sediment Forebay/Infiltration Basin – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, forebays and infiltration basins with check dams were not considered feasible or effective. A stone apron, however, is provided at the proposed outlet location to prevent erosion and reduce water velocities. The stone apron transitions to a streambed material drainage channel to aid in temperature reduction of runoff before discharge into the river.
- Open-Graded Friction Course – the design coordinated with and approved by the MassDOT Pavement Management Section does not include open-graded friction course pavement.
- Pavement Disconnection – The existing site relies primarily on "country drainage" or sheet flow to convey water away from the roadway. Some widening of the roadway is proposed, however the existing pavement disconnection was maintained to the maximum extent practicable for the site. Bridge scuppers are not proposed on this bridge, therefore all roadway drainage within the project site will either exit the roadway to natural vegetated areas or be pre-treated within a deep-sump catch basin prior to being outlet to the river.
- Leaching Basins – due to the existing site topography and proximity of the toe of slope with the river bank, a leaching basin was not considered for the project site.
- Subsurface Infiltration System – due to existing site topography, proximity of the toe of slope with the river bank and existing right-of-way, a subsurface infiltration system was not considered feasible for the project.
- Porous Pavement – the design coordinated with and approved by the MassDOT Pavement Section does not include porous pavement. Since this project is primarily a roadway project, porous pavement was not considered. Also, the proposed pedestrian sidewalk is limited to the length of the bridge and will be made of cement concrete.
- Stormwater Wetland Stormwater Control Measures (SCM) – due to existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, stormwater wetland SCMs were not considered feasible for this project. Although not a constructed stormwater wetland, numerous upland plantings are being proposed as part of the project in order to improve the banks compared to the existing condition. There is also a streambed material drainage channel proposed between the drainage outfall location and the river bank.

A Long-Term Pollution Prevention Plan (LTPPP) has been developed for the project in compliance with Standard 4. The Standard 9 section of this document includes this LTPPP.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

For Land Uses with Higher Potential Pollutant Loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all LUHPPLs cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable

for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from LUHPPLs shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Standard 5 does not apply to the Project. There are no Land Uses with Higher Potential Pollutant Loads within the project area.

Standard 6: Critical Areas

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a)1 or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The Project has been designed to comply with Standard 6 to the maximum extent practicable. Figure 3 shows the Critical Areas in the vicinity of the project site. The Fort River is considered a Coldwater Fishery. The relocated outfall will discharge into a drainage channel which will dissipate energy and aid in the lowering of stormwater temperatures. The proposed catch basin on this project will have a deep sump for sediment collection prior to entering the existing stormwater system.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The Project is considered a redevelopment and has been designed to comply with the Stormwater Management Standards to the maximum extent practicable.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls

A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The Project has been designed to comply with Standard 8 fully.

The implementation of erosion and sediment (E&S) controls during construction is considered a standard practice for all MassDOT projects. E&S controls will be installed before any land disturbance begins for the Project and will remain in place for the duration of the Project. The E&S controls for the Project are shown on the project plans. These control measures include the use of compost filter tubes along project limits, as well as catch basin silt sacks in the existing catch basin in the project area. The project disturbs less than 1 acre and therefore does not require filing for NPDES Construction General Permit Coverage.

Standard 9: Operation and Maintenance Plan

A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Project has been designed to comply with Standard 9 fully.

MassDOT O&M plans are implemented on a programmatic level by each MassDOT district. Each MassDOT district office is responsible for providing operation and maintenance for the MassDOT stormwater management systems within their respective jurisdictions. Appendix B includes the O&M Plan for this project.

Long-term pollution prevention for the Project includes litter pick-up, inspection and maintenance of stormwater assets, maintenance of landscaped areas, snow and ice management, street sweeping, prohibition of illicit discharges, and spill prevention and response.

Standard 10: Prohibition of Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

The Project has been designed to comply with Standard 10 fully.

Illicit Discharge Statement

The project's stormwater management system, as shown on the plans submitted with this report, have been designed in full compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or resolved through MassDOT's Illicit Discharge Detention and Elimination (IDDE) Program.

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT J

Stormwater Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

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[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

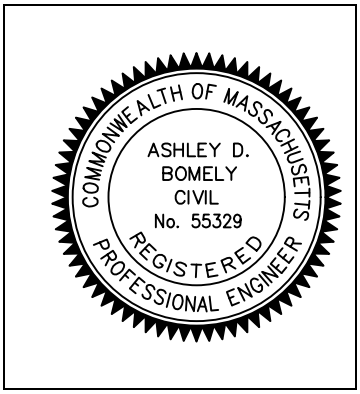
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Ashley Bomely 09/27/2024

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☒ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT K

O&M Plan and LTPPP

Bay Road (Route 47) over Fort River

Stormwater Management System Operation and Maintenance Plan and Long-Term Pollution Prevention Plan

Hadley, MA

PREPARED FOR



10 Park Plaza
Boston, MA 02116

PREPARED BY

Benesch
50 Redfield Street
Boston, MA, 02122

04/08/2024

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1

Stormwater Management System Operation and Maintenance (O&M) Plan

This Stormwater Management System Operation and Maintenance (O&M) Plan describes the approach for inspection and maintenance of drainage infrastructure and structural stormwater control measures (SCMs) to minimize contaminant loading for Bay Road (Route 47) over Fort River, town of Hadley MA. In general, inspection and maintenance activities will be conducted consistent with the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4) and MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit.

This document has been prepared per the requirements of Massachusetts Department of Environmental Protection (MassDEP) Regulations 310 CMR 10.05 (6)(k)(9) and satisfies the requirements of Massachusetts Stormwater Standard 9.

1.1 Responsible Party

In accordance with MassDOT procedures, the MassDOT District 2 office located in Northampton, MA, is responsible for the maintenance of all stormwater management systems on MassDOT roads within the project area.

Questions or concerns regarding activities associated with this O&M Plan should be addressed to MassDOT's District 2 office located at 811 North King Street, Northampton, MA 01060, phone (857)-368-2000 during regular weekday hours, or to MassDOT's Highway Operations Center located in South Boston, MA at (800) 227-0608 during all other times and days, including weekends and holidays.

1.2 Inspection and Maintenance Measures and Record-Keeping

See the Utility Plans for the proposed stormwater system within the project limits. The stormwater management system covered by this O&M Plan consists of the following measures:

- The construction of 1 catch basin, 1 drain manhole, 1 outfall relocation, and a 195 SF drainage channel.

MassDOT uses a performance-based inspection and maintenance program for SCMs and catch basins. For SCMs, MassDOT's overall approach is to inspect SCMs, and based on the results of the inspections, perform maintenance to preserve functionality. For catch basins, MassDOT's overall approach is to perform maintenance at an interval that maintains the functionality of the catch basin (e.g., sump is less than 50% full of sediment). Catch basin inspections, including documentation of sediment accumulation, and maintenance will generally occur simultaneously.

MassDOT's O&M program is data driven. Inspections and maintenance are recorded by personnel using hand-held tablets in the field to document sediment accumulation, maintenance action performed, and follow-up actions needed. Data are recorded in MassDOT's asset management system which is accessible in the field (mobile) or the office (desktop).

The table below summarizes data that is generally collected for each asset type. For all assets, the inspector and inspection date are recorded. Photo documentation of structure condition is taken and attached to the inspection record.

Inspection Form	Applicable Stormwater Assets	Information Collected
Inlets	› Catch basins › Outlet control structures	› Sediment accumulation › Trash/Debris accumulation › Signs of contamination › Frame and grate condition › Overall structure condition
SCMs	Consistent with the MassDOT Stormwater Design Guide (SDG), SCM categories include: › Infiltration SCMs › Stormwater wetland SCMs › Bioretention SCMs › Other SCMs	› SCM accessibility › Presence of standing water › Level of erosion › Sediment accumulation › Trash/Debris accumulation › Vegetation condition › Overall SCM condition
Storm Discharge Points	› Outlets to SCMs	› Presence of flow › Signs of contaminated flow › Sediment accumulation › Level of erosion › Pipe condition › Scour protection condition › Overall structure condition

Inspection and maintenance records can be made available using the asset management system through request with the MassDOT District 2 Environmental Engineer. Records will be kept for at least three years. Representatives of the Hadley Conservation Commission(s), MassDEP, and US EPA may obtain access to these records, upon request. Additionally,

MassDOT will allow members and agents of MassDEP and the Conservation Commission(s) to enter and inspect the premises, upon request, to evaluate and ensure that the Operation and Maintenance Plan requirements for each SCM are being followed.

Maintenance actions will not occur at any set frequency, but rather will be based on condition and impact to functionality. Maintenance to be performed on the stormwater system includes: Removing and disposing of trash, sediment, debris, and root intrusions, cleaning out of sumps at an interval to maintain functionality, jetting and repairing pipes, a d repairing damaged or eroded areas.

Based on the results of the inspection, repairs will be made in accordance with MassDOT standard practices. Maintenance will be prioritized given the urgency of the required maintenance and availability of staff, contracts, etc. Maintenance may require contracting if existing contracts are unavailable to perform the work. More intensive remedial activities may require permitting and/or an engineering solution.

1.3 Erosion and Sediment Control Measures during Maintenance Activities

For maintenance activities that could result in discharges of sediments or other contaminants into wetlands, waterways, or other resource areas regulated under 310 CMR 10.00, the responsible maintenance personnel will employ measures to prevent migration of these sediments/contaminants. Such temporary measures may include, but are not necessarily limited to, the use of siltation barriers, catch basin silt sacks/filter bags, pipe plugs, cofferdams deployed within the stormwater structure, turbidity curtains, or other practices designed to prevent such discharges.

Where maintenance occurs in areas that are confined, with no risk of discharge to adjacent water bodies, no special measures may be needed. Examples include, but are not limited to: (1) cleaning of a forebay under dry conditions when the work can be completed and exposed surfaces stabilized prior to placing it back into service; and (2) catch basin cleaning where the activity is limited to removing material from a sump below the elevation of the outlet pipe.

1.4 O&M Budget

MassDOT performs maintenance for stormwater management systems as part of their routine operation and maintenance budget for roadways and bridges. Budgets are managed at the district level and vary by fiscal year, depending on funding sources.

2

Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan (LTPPP) describes the approach for pollution prevention and related maintenance activities for Bay Road (Route 47) over Fort River Hadley, MA. In general, long-term pollution prevention and related maintenance activities will be conducted consistent with:

- The National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4),
- MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit, and
- Measures outlined in MassDOT's Stormwater Management Plan (SWMP).

This LTPPP satisfies the requirements related to pollution prevention under Massachusetts Stormwater Standards 4, 5, 6, and 10.

2.1 Practices for Long-Term Pollution Prevention

For the facilities covered, long-term pollution prevention includes the following measures.

2.1.1 Litter Pick-up

MassDOT will conduct litter pick-up from the stormwater management facilities in conjunction with routine road maintenance activities.

2.1.2 Inspection and Maintenance of Stormwater Assets

MassDOT will conduct inspection and maintenance of drainage infrastructure and the stormwater control measures (SCMs) in accordance with the O&M Plan, as described in Section 1.

2.1.3 Maintenance of Landscaped Areas

Routine mowing will be conducted according to standard MassDOT practices. SCM basin bottoms and embankments designed to impound water should be mowed as required to prevent establishment of woody vegetation.

Except in rare circumstances, MassDOT does not use fertilizers, herbicides, and pesticides for the maintenance of facilities. Exceptions include using fertilizer to ensure the survival of new plantings and herbicides to control invasive plants. Use of fertilizers and herbicides is reviewed and approved by the MassDOT Landscape Design Section and District 2 Environmental Engineer prior to application. Local Conservation Commission review may also be required.

2.1.4 Snow and Ice Management

Snow and Ice Management will be conducted consistent with the practices outlined in the MassDOT Snow and Ice Control Program Environmental Status and Planning Report (ESPR), formerly known as the Snow and Ice Control Generic Environmental Impact Report (GEIR).

In accordance with the Snow and Ice Control ESPR, no sand is used on MassDOT properties for snow and ice control. The exception to this rule is within reduced salt areas where high sodium levels have been found in drinking water sources.

2.1.5 Street Sweeping

Routine highway cleaning, with a brush-type street sweeper, will be conducted in accordance with standard MassDOT practices. Sweeping will occur annually in the Spring.

2.1.6 Prohibition of Illicit Discharges

The MassDEP Stormwater Management Standard 10 prohibits illicit discharges to the stormwater management system. Illicit discharges are discharges that do not consist entirely of stormwater, except for certain specified non-stormwater discharges.

In accordance with the existing MS4 permit and anticipated TS4 permit requirements, examples of discharges from the following sources are not considered illicit discharges:

- Firefighting activities*
- Foundation drains
- Water line flushing
- Footing drains
- Landscape irrigation
- Individual residential car washing
- Uncontaminated groundwater
- Rising groundwater
- Diverted stream flows
- Flows from riparian habitats/wetlands
- Potable water sources
- Dechlorinated swimming pool water
- Street wash waters
- Wash water from residential buildings (no detergents)
- Condensation from air conditioning units
- Run-on from private driveways caused by precipitation
- Lawn watering
- Water from crawl space pumps

*Water from firefighting activities is allowed and need only be addressed where they are identified as significant sources of pollutants to waters of the United States.

Based on plan review and confirmation in the field, there are no known or proposed illicit connections associated with the Bay Road (Route 47) Over Fort River. Should an interconnection to the stormwater management system be identified, the MassDOT PM will coordinate with the District Permits Engineer to confirm if the connections are authorized. For unauthorized connections, the MassDOT PM and/or MassDOT Environmental Services Section will investigate the connections and if they are determined to be illicit, the connections will be managed through MassDOT's Illicit Discharge Detection and Elimination (IDDE) program and/or through other agencies.

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT L

Relevant Project Special Provisions

ITEM 102.3 HERBICIDE TREATMENT FOR INVASIVE PLANTS HOUR

Work under this item consists of controlling invasive plants within the project limits. An Invasive Plant Management Strategy (IPMS) for their control shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on site. The IPMS shall be measured and paid for under Item 102.33, Invasive Plant Management Strategy.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Herbicide shall be applied during daytime hours only.

Payment is per hour on site and shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work.

The overall intent is to improve the habitat value of the site, protect proposed landscape restoration, improve future maintenance operations, and attempt to prevent future spread both on-site and to adjacent sites.

Measures to prevent the introduction of invasive plant species to the site and to correct their introduction as a result of construction-related activities shall be covered under the Standard Specifications, Division I - Sections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): “non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.”

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section is Tara Mitchell at tara.mitchell@dot.state.ma.us.

SUBMITTALS

No work shall begin without approval of the submittals.

Within 15 business days prior to the site walk, the Contractor shall submit all qualifications to the Engineer for approval by MassDOT Landscape Design.

Submittals include the following items.

Qualifications

1. Company must provide proof of qualifications by providing the following:
    a. Narrative describing company, its expertise and experience with invasive plant control.
    b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas
    c. Describe company's technical qualifications and past performance.

2. Company must meet licensing requirements:
    a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
    b. At least one or more applicator must have ROW certification if required for specific project.
    c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
    d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.

3. Company must provide proof of experience with invasive plant control and include following:
    a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
    b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
    c. Photo documentation of these projects.
    d. GPS coordinates of project locations, if available.

4. Crew leader must have expertise with invasive plant control and provide the following:
    a. Have held Core license for at least five (5) years.
    b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

The following companies are pre-approved by MassDOT Landscape Design Section:

Groundscapes Express, Inc.
P.O. Box 737
Wrentham, MA 02093
Contact: Butch Goodwin
Email: butch@groundscapesexpress.com
Phone: 508-400-5366

Solitude Lake Management
590 Lake Street
Shrewsbury, MA 01545
Contact: Keith Gazaille
kgazaille@solitudelake.com
Phone: 508-885-0101

Land Stewardship, Inc.
PO Box 511
Turner Falls, MA 01376
Contact: Chris Polatin
Email: info@landstewardshipinc.com
Phone: 413-367-5292

SWCA Environmental Consultants
15 Research Drive
Contact: Scott Fisher
Phone: 413-658.2056
Email: sfisher@swca.com
Amherst, MA 01002

Native Habitat Restoration
P.O. Box 582
Stockbridge, MA 01262
Contact: Jess M. Toro : 413-358-7400
Email: nativehabitatrestoration@gmail.com
Phone: 413-394-0277

Vegetation Control Service, Inc.
2342 Main St.
Athol, MA 01331
Contact: Andrew Powers
Email: apowers@vegetationcontrol.com
Phone: 800-323-7706

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Follow-Up Treatment

Depending on treatment results after the first year, the IPMS may be amended for the second year to address additional concerns or adjust to conditions. Treatment shall be adjusted accordingly.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report. Where applicable, the Contractor shall provide the name/s of the associated water body/bodies affected by potential discharge, per the requirements of Sections 7.1 and 7.2 of the USEPA Pesticide General Permit for the Discharges from the Application of Pesticides.

Photo Documentation

Digital photos with date and time stamp shall be provided with IPMS and follow-up reporting. Photos shall show existing conditions and post-treatment conditions.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

CONSTRUCTION METHODS

All methods used shall be as approved in the IPMS.

Prior to the start of any work, Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect. The purpose of the site inspection is to identify limits of work, mark locations of areas designated for treatment, and mark individual plants targeted for treatment or removal according to the IPMS. Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

Herbicide Applications

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material shall not be permitted unless written approval is given as part of the Invasive Plant Management Strategy.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

Where feasible, it is preferable to dispose of plants on site or to bury them on site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

Contractor shall be responsible for treating areas of re-growth due to improper disposal.

MONITORING

After initial herbicide treatment, all treated plants and areas shall be monitored through visual observation and re-treated as necessary and appropriate throughout the season and for the duration of the contract per the management proposal and schedule for control submitted by Contract. Monitoring shall be incidental paid for under Item 102.33, Invasive Plant Management Strategy.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of crew time spent on the project doing actual work. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools and all incidentals required to complete the work.

Payment will be based upon time spent on the project doing actual work and shall not include travel time to and from the Contractor's place of business and shall also not include time for investigative field trips.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33 INVASIVE PLANT MANAGEMENT STRATEGY HOUR

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants on the project site and shall be coordinated with Item 102.3 Control of Invasive Plants Existing on Site. The IPMS shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on site.

Invasive plant control treatment on site shall be as described under Item 102.3 Control of Invasive Plants Existing on Site and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control.

SUBMITTALS

Individual shall be from the same company as that providing services for Item 102.3 Control of Invasive Plants Existing on Site or shall meet the following requirements:

- Submit copy of current Core license
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.

Task Summary: for measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the following tasks performed, which shall include at least: Site Walk/s, IPMS Written Reports, Site Monitoring if required, and Final Report if required.

Invasive Plant Management Strategy (IPMS)

Prior to the start of any invasive plant control treatment, submit in writing an IPMS proposal and Schedule of Control for approval by the Engineer and MassDOT Landscape Architect at least thirty (30) days prior to proposed treatment. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall include the following:

1. Description of treatment areas including identification of targeted invasive plant species, locations, approximate size of areas and digital photos with time/date stamp. Delineate treatment areas with polygons outlining their perimeter or locations of individual plants. A free-hand sketch drawn on construction plans or an aerial photo can be used to show locations.
2. Note coordination as required with items for clearing, clearing and grubbing, tree removal, mowing, planting, and wetland mitigation.

3. Describe strategy for management of soils that contain invasive plant roots or seeds based on input from the Contractor and the Engineer.
4. Proposed methods of treatment for each species or area. Treatment may include manual removal if herbicides are not permitted.
5. If herbicides are proposed, submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
6. Proposed time of treatment based on target plant species and construction schedule.
7. Method for disposing of invasive plant material including stems, trunks, branches, roots, and roots, if required.
8. General monitoring schedule.
9. Preliminary re-treatment schedule. Re-treatment shall be based on assessment of initial results and time of year.
10. Proposed performance metrics, or measure of treatment success, which shall be agreed upon by MassDOT.
11. Expected end date of contract and last treatment.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide approved IPMS may jeopardize this item, in which case, the contractor will be responsible for control of invasive plants found on site at no cost to the contract.

Follow-Up Treatment Schedule

Depending on treatment results after the first year, the IPMS may be amended for the following year/s to address additional concerns or adjust to conditions. A follow-up treatment schedule shall follow the same format as outlined above and submitted to the Engineer and MassDOT Landscape Architect for approval at least thirty (30) days prior to proposed treatment.

Reporting

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report. Where applicable, the Contractor shall provide the name/s of the associated water body/bodies affected by potential discharge, per the requirements of Sections 7.1 and 7.2 of the USEPA Pesticide General Permit for the Discharges from the Application of Pesticides.

Final Report

A final report documenting status of invasive control at the end of the project may be required for regulatory purposes or for instances where control will be continued by other means. Report shall include photo documentation, notation on a plan or aerial image of area treated, summary of treatment performed, and control achieved.

Photo Documentation

Digital photos with date and time stamp shall be provided with IPMS and follow-up reporting.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools and all incidentals required to complete the work.

Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511 TREE PROTECTION – ARMORING & PRUNING EACH

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for furnishing and installing temporary tree trunk protection and for limb pruning to prevent injury to the tree from construction equipment and activities.

Trunk armoring is for instances where construction activity (the use of heavy equipment) comes close enough to potentially damage the tree trunk or limbs. It is to be used where shown on the plans and as directed by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Selected material shall be such that installation and removal will not damage the trunk.

Acceptable materials include 2x4 wood cladding with wire or metal strapping, or, for instances when duration of construction activities is less than three months, corrugated plastic pipe mounted with duct tape. Height of cladding shall be from base of tree (including root flare) to the bottom of the first branch or as recommended by the Arborist. Material and methods shall be approved by the Engineer.

Other materials or methods may be acceptable if approved by MassDOT Landscape Design or an Arborist.

METHODS OF WORK

Prior to construction activities, the Engineer, the Contractor, the Town Tree Warden, and the Arborist, if specified, shall review trees noted on the plans to be protected. Final decision as to trees armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be replaced and maintained such that it is effective for as long as required and shall be removed immediately upon completion of work activities adjacent to trees.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

DAMAGES & PENALTIES

In the event that trees designated for protection under this item are damaged, including root damage

from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of $500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per each. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

In the event of tree damage, cost of Arborist services, of remediation measures, and/or tree removal will be borne by the Contractor.

Payment under this item will be scheduled throughout the length of contract:

- 40% of value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% shall be paid at the end of construction operations that would damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the $500.00 per diameter inch penalty.

ITEM 102.521 TREE AND PLANT PROTECTION FENCE FOOT

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, removing and resetting, maintaining fence in a vertical and effective position at all times, and final removal of temporary fence.

The purpose of the fence is to prevent damage to tree roots, tree trunks, soil, and all other vegetation within a delineated Tree and Plant Protection Zone (TPPZ) as shown on the plans, as directed by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise directed.

MATERIALS

Temporary Fence shall be such that it provides a minimum 48-inch tall barrier that remains vertical and effective (not sagging) for the duration of period required. Fence shall be plastic orange safety fence (recommended where high visibility is necessary), wooden snow fencing, or other approved material.

Per the Arborist or Engineer, additional posts, deeper post depths, and/or additional attachments will be used if the fabric or fence sags, leans or otherwise shows signs of failing to create a sufficient barrier to access.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

ESTABLISHMENT OF TPPZ

Fencing shall be used for construction areas, staging areas, and stockpile areas as shown on the plans and as directed by the Engineer to establish the Tree and Plant Protection Zone (TPPZ).

Fence shall be located as close to the work zone limit and as far from the trunk as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the Drip Line of each tree or as close as possible to the Drip Line, and as shown on the plans and details. The Drip Line is defined as the limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer, including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets; and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks.

METHOD OF WORK

Fence shall be installed prior to any construction work or staging activities and shall be installed and maintained in a vertical and effective position at all times.

Fence shall be repositioned where and as necessary for optimum effectiveness. Repositioning shall be incidental to this item. Fence shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance. In the event of spills, compaction or damage, the Contractor shall take corrective action immediately using methods approved by the Engineer in coordination with an Arborist.

After construction activities are completed, or when directed by the Engineer, fence, stakes, and other materials shall be removed and disposed off-site by the Contractor.

REQUIRED WORK WITHIN THE TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading, the use of six inch depth of wood chips or approved matting for root protection, pruning of branches, and/or trunk protection. These protection measures will be paid under applicable items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where hand work is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

TREE AND PLANT DAMAGES OR LOSS

If the TPPZ is intruded upon, at the discretion of the Engineer, the Contractor will be required to provide a more durable barrier (e.g., Jersey Barriers) to secure the area. Cost of furnishing and installing additional or more durable barrier shall be borne by the Contractor.

If the Contractor intrudes into a TPPZ without approval, soil will be considered compacted and tree root damage will be assumed. Action will be taken as specified below.

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of $500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

Shrubs will be replaced with a plant of similar species and equal size or the largest size plants reasonably available. The Engineer will approve the size and quality of the replacement plant. Replacement will include a minimum of one year of watering and care.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.521 will be measured and paid for payment by the foot of Tree and Plant Protection Fence, complete in place. This includes all labor, materials, equipment, maintenance, final removal and disposal of the protective materials, damages repair, and all incidental cost required to complete the work.

Payment of 40 percent of value will be made upon installation of Fence. The remaining 60 percent will be made when protection materials have been removed and disposed off-site.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, or arborist services, but all costs in connection therewith shall be included in the Contract unit price bid.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the $500.00 per diameter inch penalty.

ITEM 127.51 TIMBER PILE – REMOVE AND DISCARD EACH

Work under this item shall conform to the relevant provisions of Section 112 and the following:

This item is for the removal of existing timber piles that are located at the existing piers and abutments of Bridge No. H-01-005. All timber piles at existing piers shall be cut-off and removed at an elevation located 5' below the existing river bed elevation. Many of the timber piles at piers have been reinforced by 18" diameter concrete jackets and steel sleeves, the removal of which shall be considered incidental to this item.

All existing timber piles at each abutment shall be cut-off 12" below the proposed trench and filled with crushed stone. Existing timber piles at each abutment in conflict with the proposed pile loactations shall be extracted by the congtractor. Any void left in the ground after extracting the pile shall be filled with 3/8" crushed stone (M2.01.6).

The Contractor may elect to extract some or all timber piles entirely rather than locally excating around them, cutting them off at the required elevation and then backfilling around the pile. If the Contractor elects to do this, the hole created by the extracted pile shall be backfilled filled with suitable material.

The Contractor shall legally dispose of the removed piles from the site.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Work for this item shall be measured and paid for at the contract unit price per each pile cut off, removed and legally disposed and shall include all labor, material and equipment to complete the work. The work shall include local excavation of soil around the pile, cutting, removing and disposing of the pile and backfilling. If the Contractor chooses to entirely extract the pile and backfill the void created by the extracted pile instead of cutting it off, then this method of removal will be considered to be at the Contractor's convenience and no additonal compensation will be provided.

ITEM 180.03 LICENSED SITE PROFESSIONAL SERVICES HOUR

Within limited areas of the project site, soils, sediments and/or groundwater may be contaminated. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include sampling, analysis and characterization of potentially contaminated media, preparation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the Massachusetts Contingency Plan (MCP). LSP hours related to the characterization and disposal of contaminated soil and/or sediment are incidental to the disposal items. An estimate of LSP services to be provided shall be submitted to the Engineer for approval before any LSP activity begins.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the DEP shall be submitted for all work assignments listed for the LSP and environmental technicians.

The LSP shall evaluate soil and/or sediment with discoloration, odor, and presence of petroleum liquid or sheening on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect soil and/or sediment. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall adequately characterize subsurface conditions prior to backfill in areas where contaminated material has been excavated. The Engineer shall approve the locations of the testing sites prior to the sampling.

ITEM 180.03 (Continued)

Contaminated soil, sediment and/or groundwater shall be handled in accordance with all applicable state and federal statutes, regulations and policies. The LSP shall adequately characterize contaminated media for comparison to the requirements of the MCP. The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations, and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise format which tracks the excavation, stockpiling, analysis and reuse/disposal of all suspect contaminated soils, sediments and groundwater. These records shall be up-to-date and available to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, penalties and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, penalties and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations, and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Department before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

Laboratory Testing In Support of LSP Services

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included.

ITEM 180.03 (Continued)

In order to maintain compliance with the MCP or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

Method of Measurement and Basis of Payment

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours. LSP hours related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The contractor will be reimbursed upon satisfactory written evidence of payment. The contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider. Laboratory testing related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

Laboratory Testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

ITEM 183.1 TREATMENT OF CONTAMINATED GROUNDWATER GALLON

This Item addresses the treatment and disposal of contaminated groundwater encountered during excavation operations. The work generally consists of furnishing the materials, equipment, labor, services, testing/sampling, waste characterization, transportation, disposal, permits and agreements necessary to perform the work required for the collection, treatment and disposal of contaminated groundwater.

The Contractor is advised that contaminated groundwater may be encountered during dewatering activities. The levels and nature of contamination may vary depending on location and/or depth. Soil contamination data for the dredging work, within the Land Under Water (LUW) resource, required at the bridge site has been provided in the Contract Documents indicating the types of contaminants that may be found in groundwater encountered during this work. For all other project locations that may require excavation in areas of possible groundwater contaminated areas, no data has been provided in indicating the types of contaminants that may be found in groundwater encountered during the work. It will be the responsibility of the Contractor to ensure that water removed during dewatering operations is treated and disposed of in accordance with all applicable laws and regulations and in accordance with this specification.

The Contractor shall monitor the quantity of groundwater collected for treatment using an in-line totalizer flowmeter or an alternate method approved by MassDOT. The Contractor shall, at all times, minimize the quantity of groundwater removed from the excavations. All groundwater determined to be contaminated will be managed in accordance with all applicable local, state and federal regulations.

It is not the intent herein for the Department to design for or specify to the Contractor which particular treatment is to be used, if necessary. Rather, it is the Department's intent to provide guidance to the Contractor for informational and bidding purposes only. It is, therefore, the Contractor's responsibility to use a treatment method to allow him/her to meet any and all laws, regulations, policies, guidelines and permit requirements. Treatment of contaminated groundwater for dewatering operations is generally performed using a mobile treatment trailer equipped with one or more granular-activated carbon (GAC) canisters, although other techniques are also used.

It is likely that treatment of the contaminated groundwater using granular-activated carbon will be required to complete the work under this Contract. The Methods described under Item 183.1 provides for the identification, testing, management and treatment or disposal of contaminated groundwater and shall be implemented, at a minimum and as necessary by the Contractor via Methods under Item 183.1.

The overall handling and management of contaminated groundwater is regulated under the provisions of 310 CMR 40.0000, 314 CMR 3.00 and 5.00, NPDES and other applicable laws. The unpermitted discharge of contaminated dewatering effluent into the environment (storm drain, surface water body, onto the ground) is a violation of federal and state laws and regulations. Should dewatering of contaminated groundwater be necessary, approvals must be sought from the appropriate federal, state, or local regulatory jurisdiction. The USEPA will not specify a treatment system or method, but normally requires that the treated discharge meet Massachusetts Drinking Water Standards.

ITEM 183.1 (Cont.)

The discharge standards are normally met by treating the dewatered groundwater through granular-activated carbon canisters, or similar techniques. Longer term discharges to surface waters or storm drains, and any discharges to the ground, require approval and/or issuance of a permit from the DEP Division of Water Pollution Control. The Contractor shall be responsible for applying for, paying all fees for and obtaining all permits required for treatment and/or disposal of contaminated groundwater. Additional requirements may be mandated by local/regional sewer authorities for discharge to sanitary sewer or Publicly Owner Treatment Works (POTW). Copies of permit applications and correspondence from federal and state agencies and sewer authorities shall be supplied to the Engineer prior to dewatering activities.

EPA regulations published in the Federal Register on September 9, 2005 (70 FR 53663) require a National Pollutant Discharge Elimination System (NPDES) Remediation & Miscellaneous Contaminated Sites General Permit (RGP) for all contaminated construction site dewatering activities in Massachusetts (MAG910000) that will involve the discharge of water to classes of receiving waters designated in the Massachusetts Water Quality Standards (314 CMR 4.00). The application requires that operators of proposed new discharges seeking coverage under this general permit submit a Notice of Intent (NOI) to EPA New England post-marked at least 14 days prior to commencement of discharge. The Contractor is solely responsible for applying for and obtaining coverage under the NPDES Remediation General Permit from EPA and, if applicable, DEP, including the costs associated with sampling and analysis of groundwater and any application fees. The Contractor is required to submit a completed copy of the NOI to the Engineer and the Director of Environmental Programs, Construction Division, 10 Park Plaza, Boston, prior to commencement of discharge.

Upon permanent cessation of the discharges authorized by the RGP, the Contractor shall be responsible for submitting a Notice of Termination (NOT) to EPA New England within 30 days of the permanent cessation. The Contractor is required to submit to MassDOT a completed copy of the NOT within 14 days of the permanent cessation of the discharges authorized by the RGP. All costs and fees associated with the submission of the NOT will be the responsibility of the Contractor.

The Contractor shall be responsible for adhering to regulations, specifications, and recognized standard practices related to contaminated groundwater handling during dewatering activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent local, state or federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing this work.

ITEM 183.1 (Cont.)

The Contractor shall be responsible for determining compliance with the requirements of any permit and for any sampling, testing, and disposal required in connection with said permits. MassDOT and the City/Town reserve the right to collect additional samples of dewatered groundwater to determine the Contractor's compliance with the Permit's requirements. All laboratory testing is to be performed by a DEP certified laboratory for all parameters being tested. Copies of all field and laboratory testing results, reports, etc. required by the permits must be supplied to the Engineer. MassDOT, DEP, and the permit-granting agency, where applicable, reserve the right to collect additional samples of discharged groundwater to verify compliance with permit requirements.

For the purpose of these specifications and to establish a basis for the bid, it is anticipated that granular-activated carbon will be the treatment medium for dewatered contaminated groundwater. The bidder shall factor into the payment item all costs associated with the testing and analyses that may be required by the permitting agency. In addition, any laboratory testing of groundwater is to be performed by a DEP certified laboratory for the parameters being tested. Copies of all field and laboratory testing results will be supplied to the Engineer. Bid price shall also include full compensation for labor, materials, maintenance, mobilization, rental and other related costs. Item 183.2 will be used for disposal of used granular-activated carbon canisters.

SUBMITTALS

Prior to initiating work, the Contractor shall submit an excavation dewatering plan to the MassDOT that includes a detailed description of the approach to dewatering, a description of methodology for sealing the excavation to minimize infiltration of groundwater, if deemed applicable to the work, anticipated treatment, discharge points, sampling frequency, required permits, transporters and waste facilities complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor plans to utilize for waste disposal. The plan shall be submitted for the record.

The Contractor shall submit to MassDOT for review, the proposed methods for dewatering and groundwater treatment and disposal for the various portions of the work to be done. The review shall be for methods only. The Contractor shall remain responsible for the maintenance, performance, structural integrity and safety of the systems installed for this work as well as regulatory compliance of the applicable local, state and federal discharge standards. The contractor shall provide all groundwater sampling and analyses, results and reports required by all applicable local, state and federal agencies. The Contractor shall submit to MassDOT for
review all plans and documents that must be submitted to the EPA and DEP, including NOI, NOT, treatment system analytical reports and correspondence. Copies of all permits and approvals and lab analyses and test results associated with groundwater treatment and disposal must be submitted to MassDOT within 3 days of receipt by the Contractor.

ITEM 183.1 (Cont.)

ESTABLISHMENT OF TREATMENT PROCEDURE

Since concentrations of contaminants in groundwater cannot be easily assessed in the field, all groundwater extracted from the ground will be considered contaminated and will be initially pumped and stored into open settling tank(s) or a fractionation tank until it can be sampled and analyzed, unless otherwise directed by MassDOT. The Contractor will perform initial sampling and analyses of the groundwater to determine the need for a permit to dispose of contaminated groundwater. Based on the results of the initial sample analysis, which must be provided to the Engineer within twenty-four (24) hours of the time the samples are received by the laboratory, the Contractor will determine the necessity for treatment(s) and disposal procedures. Sampling must also be performed to meet applicable discharge criteria as set by the appropriate regulatory agencies for the permit obtained for disposal. All discharges must meet regulatory standards set forth in the permits required for discharge. For the purposes of the bidding process, it is anticipated that the treatment system will consist of sedimentation tanks, an oil water separator and liquid-phase granular activated carbon as the primary on-site treatment medium for dewatered contaminated groundwater. MassDOT may require additional treatment processes if such is determined necessary during the groundwater testing procedure. The Contractor shall integrate the additional treatment process into the treatment system, if necessary.

The Contractor shall provide all labor, equipment and appurtenances required to treat the groundwater, subject to the approval of MassDOT. Groundwater stored and tested but not requiring treatment or off-site disposal shall be discharged to a location subject to the approval of MassDOT without payment to the Contractor.

TREATMENT UNITS

The Contractor shall furnish all labor and materials, and shall install and operate temporary groundwater treatment and disposal system(s) as necessary to treat contaminated groundwater pumped from excavations during construction activities under the Contract. Such systems shall be capable of treating groundwater to meet applicable discharge criteria as set by the appropriate regulatory agencies.

The Contractor or their Environmental Consultant shall operate, maintain and modify the selected treatment system, and conduct the necessary monitoring and reporting of influent, midpoint and effluent results, as required by the discharge permit for the disposal option selected.

ITEM 183.1 (Cont.)

METHOD OF MEASUREMENT:

Provide a treatment system that meets permit discharge requirements, mobilize it to the site, provide copies of laboratory analytical data indicating that the system is performing appropriately to meet permit requirements, and demobilize it from the site. This includes management and disposal of wastes generated during treatment prior to discharging such as activated carbon, etc. Work under Item 183.1 is based upon the number of gallons disposed or contaminated groundwater pumped through the granular-activated carbon (Item 183.2) as the medium for the treatment of contaminated groundwater that is found in pipe trenches, manhole excavations, catch basin excavations, that need to be dewatered.

BASIS OF PAYMENT

Payment shall be made at the unit price bid per gallon of groundwater pumped, stored, treated as needed and tested as required by discharge permits and regulatory requirements, which price shall be full compensation for all necessary labor and materials, mobilization, maintenance, demobilization of the appropriate unit(s), freight, rental costs, field and laboratory testing costs and permits. Costs associated with the disposal of granular-activated carbon shall be covered under Item 183.2.

ITEM 183.2 DISPOSAL OF GRANULAR ACTIVATED CARBON POUND

GENERAL

Work under Item 183.2 is based upon the disposal of used granular-activated carbon as the treatment medium for contaminated groundwater (Item 183.1) that is found during excavations in which contaminated groundwater is encountered.

BASIS OF PAYMENT

Payment shall be made at the unit price bid per pound of carbon that is properly disposed and replaced, as necessary, to meet treated water discharge requirements during dewatering operations at the site. Payment for Disposal of Granular Activated Carbon shall include compensation for all labor, equipment, materials, permits, characterization, sampling and on-site or laboratory analysis as needed or required by permits, for replacement and disposal of liquid-phase activated carbon for the on-site contaminated groundwater pumping, collection, treatment and treated water discharge system during the time period required to complete the work. No payments shall be made for replacing carbon which is spent due to the Contractor's failure to remove floating petroleum product or excess sediments prior to the groundwater entering the carbon treatment units. All other costs associated with treatment of contaminated groundwater will be covered under Item 183.1- Treatment of Contaminated Groundwater.

ITEM 697.1 SILT SACK EACH

Work under this item shall conform to the relevant provisions of Sections 227 and 670 of the Standard Specifications and the following:

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be "Siltsack – Type B (includes curb deflector)", ACF Environmental (800)-448-3636; "Siltsack – Type A", Terrafix Geosynthetics Inc. (416)-674-0363; "Siltsack – Type B (includes curb deflector)", The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions, and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Section 227 of the Standard Specifications.

METHOD OF MEASUREMENT AND BASIS PAYMENT

Silt sacks will be measured and paid at the Contract unit price per each, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 751.7 COMPOST TOPDRESSING SQUARE YARD

The work under this Item shall conform to the relevant provisions of Section 751 of the Standard Specifications and the following.

Work shall consist of furnishing and pneumatically applying compost as specified below. Compost shall be applied as a thin mulch blanket over prepared loam or prepared soil and shall be used in conjunction with seeding or planting unless specified otherwise. The intent of compost topdressing is to provide temporary soil stabilization and organic matter for plant growth.

For areas where compost is proposed with seeding, seed shall be broadcast and seeding shall occur in conjunction with compost topdressing, as specified under the relevant seeding item.

SUBMITTALS

Contractor shall submit to the Engineer samples and certified test results 60 days prior to application of compost. Test will be for compost, not a soil test, as specified below. Vender certification that material delivered meets the test results shall be submitted if requested.

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance. The Engineer will reject any material that does not meet the Specifications.

MATERIALS

Compost may be a blended product of compost and fine wood chips.

Compost testing shall be by a laboratory approved by the US Compost Council using the Testing Method for the Examination of Compost and Composting (TMECC) protocols.

- Organic matter content shall be minimum 30 percent (dry weight basis).
- Moisture content shall be 30-60 percent (wet weight basis).
- Bulk Density <1000 lb/cy
- pH shall be 5.5-7.5
- Conductivity shall be a maximum of 4 mmhos.
- Where soil is intended for vegetation (plants or grass), compost shall be tested for stability by CO2 method and shall produce a maximum of 8mg CO2-C per gram of organic material per day.

Particle size shall not exceed ¾ inch.

No kiln-dried wood, construction debris or ground palette is allowed.

The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Prior to application of compost, all areas to be topdressed shall have been graded to an even surface, and all debris and stones 2 inches or larger shall be removed. Surface preparation shall be compensated under applicable item for placement of loam, sand, ordinary borrow, topsoil rehandled and spread, or other specified substrate.

Compost topdressing shall be pneumatically applied (blown on) to a depth of one half to one inch unless specified otherwise on the plans.

For areas where compost is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost topdressing, as specified under the relevant seeding item.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.72 will be measured and paid for at the Contract unit price per Square Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost topdressing shall be compensated under applicable item for placement of loam, sand, ordinary borrow, topsoil rehandled and spread, or other specified substrate.

Seeding will be compensated for under the appropriate seeding item.

ITEM 755.45 INLAND WETLAND RESTORATION SQUARE YARD

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Geotextile Fabric for Temporary Soil Protection shall be as specified under that item.

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for

inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

Wetland Mix – Part Shade
Seeding Rate: Species ecotype shall be as native to New England region as possible.
Apply this mix at 20 lbs PLS/acre.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

Plant species and sizes to be included in the Restoration Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental

to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification
Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall be seeded with mulch as specified below. Seeding shall immediately follow soil preparation.

Seeding with Mulch
Upon approval of prepared soil, area shall be seeded. Seeding may be hand broadcast with straw mulch applied or hydroseeded per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Compost shall be pneumatically applied (blown on) to a depth of one half to one inch at the same time that seed is broadcast such that seed is covered by a light application of compost.

When planting occurs on projects with compost topdressing and seed application, planting shall occur prior to application of compost and seed. Otherwise, compost and seed shall be re-applied to the satisfaction of the Engineer and at not cost to the contract.

Seed tags shall be submitted at time of seeding.

Planting

Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist or the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND SEED ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant

replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

ITEM 765.431	**NATIVE TALL UPLAND MIX**	**SY**
ITEM 765.451	**PART SHADE ROADSIDE MIX**	**SY**
ITEM 765.555	**WETLAND MIX – PART SHADE**	**SY**

Work under this item shall consist of furnishing and applying the mix(es) specified below at the quantity required.

SUBMITTALS

1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.

2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.

3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.

4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

   Number of tags submitted must correspond to number of bags delivered.

   Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include: variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

   A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

5) Verification of Seed Delivery. Prior to payment, contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company

letterhead or a bill of lading. Supplier verification must include all information requested on the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance. Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section

6) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

SEEDING SEASON

The appropriate seeding seasons are:
Spring: April 1 - May 15
Fall: October 1 - December 1 for dormant seeding

PERMANENT SEED MIX(ES)

Seed Mix(es) shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

Application Rate Mix

Wetland Mix – Part Shade: 20 lbs/acre PLS. No cover crop shall be applied.
Native Tall Upland Mix: 20 lbs/acre PLS. No cover crop shall be applied.
Part Shade Roadside Mix: 20 lbs/acre PLS. No cover crop shall be applied.

Any species substitutions shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

50% Increase Adjustment for Field Conditions

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season
  OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Native Tall Upland Mix, Part Shade Roadside Mix and Wetland Mix Part Shade will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Native Tall Upland Mix, Part Shade Roadside Mix and Wetland Mix Part Shade will be paid at the contract unit price per pound of Pure Live Seed delivered and complete in place and upon approval of all Seed Submittal Documentation. Overseeding required to correct poor germination or establishment shall be incidental to the item.

NATIVE SEED WORKSHEET

Project Description: _____ Project No: _____

Contractor:_____ Contract No: _____

Seed Mix Number & Description: _____

Contractor: Complete Prior To Ordering

Pounds of Seed Required Per Contract:

_____lbs./acre for _____Acre(s) OR _____ SY

Additional 50% increase if required (out of season or seeding over compost blanket):

_____**lbs. Total Seed Required**

Calculated Quantity for **P**ure **L**ive **S**eed (PLS[1]):

_____ **Total Pounds PLS**

Engineer: Verification at Time of Application

Number pounds delivered to site[2]: _____ Date(s): _____

Actual Seed Bag Tag/s Received or photo documented by Engineer: _____

[1] PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).
*[2]Quantity delivered should match pounds **Total Pounds PLS** and **Verification of Seed Delivery**. Pounds should be shown on each Seed Tag.*

SUPPLIER VERIFICATION OF SEED DELIVERY FOR MASSDOT PROJECTS

Date_____

We hereby certify that (*Seed Supplier*):_____

Furnished to (*Contractor*): _____

For use on: (*Project Description*)_____

Project #: _____ Contract #:_____

Pounds of Pure Live Seed: _____

Of Mix (*Description*):_____

Lot Number _____

The material was delivered on (*Date*)_____.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): _____ Title: _____

Supplier:_____

Signature and Seal:_____

Part Shade Roadside Mix Seed Mix:

Botanical Name	Common Name	% Mix By Weight (PLS)	Approx. Cost 2021
Grass			
Festuca rubra	Creeping Red Fescue	26.0%	$0.51
Elymus virginicus	Virginia Wild Rye	24.0%	$1.44
Schizachyrium scoparium	Little Blue Stem	22.5%	$4.50
Panicum virgatum	Switch Grass	10.0%	$1.00
Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	7.0%	$1.26
Agrostis perennans	Upland Bentgrass	2.0%	$0.30
Carex vulpinoidea	Fox Sedge	2.0%	$0.92
Juncus effusus	Soft Rush	0.2%	$0.09
		93.7%	**$10.01**
Herb/Forb			
Chamaecrista fasciculata	Partridge Pea	3.0%	$0.18
Penstemon digitalis	Beard-tongue	1.0%	$1.71
Zizia aurea	Golden Alexanders	0.3%	$0.79
Solidago bicolor	White Goldenrod	0.2%	$0.68
Solidago caesia	Woodland Goldenrod	0.2%	$0.90
Rudbeckia hirta - VT ecotype	Black-eyed Susan - VT ecotype	0.2%	$0.04
Aster novae-angliae	New England Aster	0.2%	$0.97
Solidago odora	Licorice Scented Goldenrod	0.2%	$0.80
Aster divaricatus	White Wood Aster	0.2%	$0.79
Heliopsis helianthoides	Ox-Eye Sunflower	0.2%	$0.08
Pycnanthemum tenuifolium	Slender Mountain Mint	0.2%	$0.30
Monarda fistulosa	Wild Bergamot	0.1%	$0.11
Eupatorium perfoliatum	Boneset	0.1%	$1.24
Aster lateriflorus	Calico Aster	0.1%	$0.40
Oenothera fruticosa var. fruticosa	Sundrops	0.1%	$0.36
		6.3%	**$9.36**
Seeding Rate: 15.0 lbs PLS/Acre		**100.0%**	**$19.37**

Wetland Mix – Part Shade Seed Mix:

	Botanical Name	Common Name	%PLS By Weight
Grass			
	Poa palustris	Fowl Bluegrass	25.00%
	Elymus riparius	Riverbank Wild Rye	19.00%
	Carex lurida	Shallow Sedge	17.00%
	Carex vulpinoidea	Fox Sedge	10.00%
	Cinna arundinacea	Sweet Woodreed	5.00%
	Sparganium eurycarpum	Giant Bur Reed Eco PA	4.00%
	Carex scoparia	Broom sedge	4.00%
	Carex lupulina	Hop Sedge	4.00%
	Scirpus polyphyllus	Many Leaved Bulrush	3.00%
	Juncus effusus	Soft Rush	2.50%
	Carex intumescens	Bladder Sedge	2.00%
	Sparganium americanum	Burrweed	2.00%
	Scirpus cyperinus	Woolgrass	1.00%
	Carex crinita	Fringed Sedge	1.00%
	Juncus tenuis	Path Rush	0.50%
			100.00%

ITEM 765.635 NATIVE SEEDING AND ESTABLISHMENT SY

Work shall conform to the relevant provisions of Subsections 765 and 767 of the Standard Specifications and the following:

The work under this item shall consist of seeding, mowing, and other care to establish a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term “grass” shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

QUALIFICATIONS

Seeding shall be done by a company having a minimum of five years of experience with native seed establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

SEEDING SEASON

Seeding seasons for native mixes is April 1 - May 15 and October 1 - December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%.

Seeding season for cover crops shall be grain oats January 1 – July 31 and grain rye August 1 – December 1.

MATERIAL AND SUBMITTALS

Seed Mixes and Submittals shall be per the item(s) for permanent and annual (cover crop) seed mixes.

Compost Blanket, if used, shall meet the material and submittal requirements for that item.

Hydromulch shall be wood fiber or straw applied per the Standard Specifications and at the rates specified below and per the manufacturer.

A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of hydromulch, tackifier, and seed, per 100 gallons of water and as applicable to products used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above.

Fertilizer

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

SEEDING

Seeding shall occur within 72 hours of placement of loam and final grading or the Contractor shall propose a reasonable, alternative schedule that shall be approved by the Engineer.

Surface Preparation

No seeding or soil preparation shall be done if soils are muddy or dry and compacted. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a relatively smooth finish corresponding to the required grades.

When seeding over existing or compacted soil or soil that has sat bare for more than 30 days, surface will be prepared by tilling or raking to a minimum depth of 2 inches prior to seeding and prior to Compost Blanket application (when applied).

Surface preparation shall be compensated for under for loam placement or topsoil rehandled and spread as appropriate to the project.

Jute or coir mesh, when specified in the contract, shall be placed after seeding and per the Standard Specifications and the manufacturer’s instruction.

Surface preparation shall be approved by the Engineer prior to seeding.

Seeding over Various Substrates

Loam: Seeding shall occur within 72 hours of loam placement to prevent loss of topsoil. Seeding shall be hydroseeding or broadcast as specified below.

Compost Blanket: Compost Blanket shall be applied as specified under that item. Seed should be broadcast at the same time as compost application to ensure a thin cover of compost over seed.

When seeding is done after application of Compost Blanket the rate shall be increased by 50%. If the Compost Blanket is applied after December 1, seed shall be broadcast or hydroseeding over the compost in the Spring and the rate increased by 50% specified under Seed Application.

Compost Mulch over Modified Rock: Compost Mulch and seed shall be applied as specified under that item. No hydromulch is required.

Cover Crop

Cover crop shall be used when seeding out of season, when specified with the permanent native seed mix under that item, and as required to prevent erosion until the permanent seed establishes.
A cover crop should not be used with a steep slope mix or other permanent mix which already contains either cereal rye or oats in the composition of the mix. A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Seed Application

All seed shall be mulched as specified herein.

Seed application shall be by broadcast seeding or by hydroseeding as described below.

Broadcast Seeding

Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler to achieve an even distribution. Seed shall not be broadcast when wind velocities are greater than 15 mph.

Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction (horizontally and vertically). To ensure seed to soil contact with broadcasting of seed, seeding shall be followed by rolling or tracking with equipment approved by the Engineer.

Broadcast seed shall be mulched with weed-free straw mulch unless seeding is done as part of Compost Blanket in which case it shall be as specified above under seeding with Compost Blanket application.

Hydroseeding and Hydromulching

Hydromulching shall be per the manufacturer's directions and as follows.

A 2-step process shall be used. Seed shall be applied with 500 lbs/acre of hydromulch in the first pass. A second pass with 1,000 lbs/ acre of hydromulch shall be applied in a second pass. Each pass shall be applied in a different direction.

Tank and hoses shall be cleaned from all previous hydroseeding and hydromulching projects. Seed shall be mixed into the slurry immediately before application and slurry applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

Once the seed has been added to the tank mixture a one-hour time limit is set for spreading the mixture on the soil. Once the one hour has passed the excess mixture must be discarded.

CARE DURING GERMINATION AND ESTABLISHMENT

Contractor shall care for seeded areas as necessary for successful germination. Care will include watering and weed control as necessary to achieve establishment of the specified seeded species after one growing season as specified below.

The contractor shall maintain the stand of grasses to ensure healthy growth of the seeded species. Work shall include mowing or weed-whacking for weed control, watering if necessary, and removal of invasive plants.

Watering shall be sufficient to achieve soil moisture to a depth of 2 inches or more and such moisture is uniform. Method of watering shall not erode or damage soil or grassed surfaces.

General Weed Control: Unless otherwise directed, mowing shall be as specified under Mowing for Weed Control for seed establishment. Weeds shall be mowed prior to weeds setting seed (by the end of July unless otherwise approved).

Control of Invasive and Aggressive Weeds: Invasive and aggressive weeds, including but not limited to mugwort, ragweed, knapweed, foxtail, crabgrass, and chicory must be cut or treated prior to going to seed. Herbicide treatment must be coordinated with MassDOT. Undesired species (such as chicory) introduced due to use of incorrect seed mix shall be removed at the Contractor's expense.

MOWING FOR WEED CONTROL

Mowing for weed control shall be completed after weeds have sprouted and show leaf and bud growth, but prior to setting seed, generally between July 7th and August 1st, unless directed otherwise by the MassDOT Landscape Architect and the Engineer.

Mowing height shall be as needed for weed control, generally to a height of 8 inches and not below 4 inches, unless directed otherwise. Mowing shall be with a brush hog mower or string trimmer other approved equipment. Conventional lawn mowers which cannot achieve the appropriate cut shall not be used.

Contractor shall give 48-hour notice prior to mowing work. Mowing shall only occur in dry sunny weather. Litter pickup should occur prior to mowing in all areas. If required, cut grass shall be raked and removed. Litter pickup and raking and removal of grass shall be incidental to the work.

Mowing equipment shall be approved by the Engineer prior to work.

OVER-SEEDING

Over-seeding rates and methods shall those specified above under Materials and Methods. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact and areas shall be mulched with straw mulch and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.

DETERMINING SATISFACTORY GRASS ESTABLISHMENT

A well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species (not the cover crop) will be visible. Generally:

- A minimum of 75% coverage by the specified permanent seeded species after one growing season. Of that percentage, generally, depending on the mix species:
  - At least 3 types of the permanent seeded grass species shall be visible.
  - At least 3 species of wildflowers shall be visible.
- There will be no significant gaps or bare soil (generally 2-3 feet in diameter or greater).
- There will be no more than 25% coverage by weed species.
- All soil shall be stabilized and there shall be no channeling or erosion.
- There will be no invasive or aggressive species within the stand at the time of acceptance.

Invasive and aggressive weeds (such as mugwort, ragweed, knapweed, and chicory) must be cut or treated prior to going to seed for Interim Acceptance. Herbicide treatment must be coordinated with MassDOT.

A warm-season grass mix with perennials will not have uniform growth. A uniform stand of grass may indicate use of an incorrect mix.

ACCEPTANCE OF SEEDING AND ESTABLISHMENT WORK

Conditional Acceptance shall be based on proper application of seed as specified herein.

Interim Acceptance of Care. Seeding will be inspected by mid-July to assess germination and Establishment conditions as described above. When necessary for Interim Acceptance, areas shall be mowed prior to weed species producing seed and as specified above under Weed Control. ***Areas requiring weed control that are not mowed prior to weed seed dispersal will not be approved for Interim Acceptance.*** Seeding that shows good germination and is determined by the Engineer and Landscape Architect to not require weed control at time of inspection shall be accepted for Interim Acceptance payment.

Final Acceptance of Establishment shall be given upon satisfactory Establishment as described above.

If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1st. All remediation shall be at the contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Native Seeding and Establishment will be measured for payment by the square yard, complete in place.

Native Seeding and Establishment will be paid at the Contract unit price by the square yard at the Contract unit price upon Conditional, Interim, and Final Acceptances as described above. This price shall include all submittals, seeding, rolling to ensure seed-to-soil contact, weed control, water, over-seeding, labor, materials, equipment, and all incidental costs required to complete the work of establishing a satisfactory stand of grass.

Native seed and cover crop mixes shall be compensated under the respective items.

Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated under loam placement or topsoil rehandled and spread as relevant to the project. If used, Compost Blanket shall be compensated under the respective item.

Mowing for weed control will be incidental to this item.

Schedule of payment shall be as follows:

30% upon Conditional Acceptance

20% upon Interim Acceptance of Care, except this amount will be reduced to zero and final payment will be reduced accordingly when areas requiring weed control are not mowed as specified in the Interim Acceptance criteria.

50% upon Final Acceptance of Establishment

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

The work under this item shall conform to the relevant provisions of Sections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment control barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff.

Twelve-inch diameter (after installation) compost filter tubes with biodegradable natural fabric (i.e., cotton, jute, burlap) are intended to be the primary sedimentation control barrier.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods:

- 9-inch compost filter tubes
- Straw bales which shall be trenched

No straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

When required by permits, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, silt fence shall be used in addition to compost filter tubes and straw bales and shall be incidental to the item.

Sediment control barriers shall be installed in the approximate location as shown on the plans and as required so that no excavated or disturbed soil can enter mitigation areas or adjacent wetlands or waterways. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

Compost Filter Tube

Compost material inside the filter tube shall meet M1.06.0, except for the following: no peat, manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

Straw Bales

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales in order to prevent deterioration of the bindings.

The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. The trench must be deep enough to remove all grass and other material which might allow underflow. After the bales are staked and chinked (filled by wedging), the excavated soil should be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

Silt Fence

Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and the following:

Silt fence shall only be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

When used with compost filter tubes, the tube shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

When used with straw bales, an 8-inch deep and 4-inch wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

MAINTENANCE

Maintenance of the sediment control barrier shall be per Section 670.60 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP), whichever is more restrictive.

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Engineer.

Regardless of site context, nonbiodegradable material and components of the sediment barriers, including photo-biodegradable fabric, plastic netting, nylon twine, and silt fence, shall be removed and disposed off-site by the Contractor.

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. In urban, residential, or other locations where aesthetics is a concern, the following shall apply:

- Compost filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (as would be done with a soil amendment or mulch). No more than a 2-inch depth shall be left on soil substrate.
- Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with a seed mix matching adjacent seeding or existing grasses (i.e., lawn or native grass mix).
- Silt fence, stakes, and other debris shall be removed and disposed off-site. Site shall be restored to a neat and clean condition.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.121 will be measured and paid for at the contract unit price per foot of sediment control barrier which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of soil, and all incidental costs required to complete the work.

Silt fence, when used in conjunction with compost filter tubes or straw bales, will be incidental to this item.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damage by construction activities shall be repaired or replaced as directed by the Engineer at the Contractors expense.

ITEM 983.2 RIPRAP CUBIC YARD

The work under this item shall conform to relevant provisions of Section 983 of the Standard Specifications and the following:

The work shall include furnishing and installing stone riprap and geotextile fabric at locations shown on the plans for channel protection in front of proposed abutments and wingwalls. Riprap for this project shall conform to Subsection 983.62 and material specification M2.02.0 and the riprap shall be so graded that when placed the entire mass will be compact.

An underlying Geotextile Fabric shall be placed under the proposed riprap. The geotextile fabric shall conform to the requirements of AASHTO M 288 and shall be selected from the Departments QCML for woven or unwoven used for Permanent Erosion Control (both woven and unwoven are acceptable). Construction and installation shall be in accordance with AASHTO M 288 and the following:

Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days.

Traffic or construction equipment will not be permitted directly on the geotextile. Geotextiles may be joined by either sewing or overlapping. Sewn seams shall be lapped minimum of four inches and double sewn. The thread used to sew the seam shall be nylon or polypropylene. Overlapped seams shall have a minimum overlap of eighteen (18) inches, except where placed under water where the overlap shall be a minimum of three (3) feet. Overlaps shall be in the direction of flow. All seams shall be subject to the approval of the Engineer. Geotextile that becomes torn or damaged shall be replaced or patched. The patch shall extend three (3) feet beyond the perimeter of the tear or damage.

Riprap, stone filling (heavy) or stone filling (medium) shall not be dropped onto the geotextile from a height greater than one (1) foot. Slope protection and smaller sizes of stone filling shall not be dropped onto the geotextile from a height exceeding three (3) feet. The surface upon which the geotextile is to be placed shall be within reasonable conformance to the proposed grade. The geotextile shall be laid loosely, so that placement of the overlying material will not stretch or tear the geotextile.

The work shall include furnishing and placing geotextile fabric for permanent erosion control under and around the riprap as shown on the plans that is in accordance with the standard specifications.

METHOD OF MEASUREMENT AND BASIS FOR PAYMENT

The work under this item shall be measured and paid for by the Cubic Yard of stone riprap actually furnished and placed and shall include all labor, materials and equipment to place the riprap as shown on the plans. The furnishing and placement of geotextile fabric for placement under and around the riprap shall also be included under this item and will not be measured separately for payment.

Excavation for the placement of riprap, crushed stone and geotextile fabric shall be paid for under Bridge Channel Excavation Item 143. Control of water needed to place riprap, crushed stone and geotextile fabric in the dry shall be provided for under the contract bid price for Item 991.1 Control of Water - Structure No. H-01-005.

ITEM 983.521 STREAMBED RESTORATION CUBIC YARD

Work under this item shall conform to the relevant provisions of Section 983 of the Standard Specifications and the following:

Material

The streambed construction material is to be placed under the bridge and the immediate upstream and downstream area as depicted on the plans. The intent of this item is to replicate within the bridge area a stream environment that is similar to the existing stream adjacent to the work area while providing a stabile streambed under extreme flood conditions.

The streambed material shall be comprised of two primary components totaling 1 foot:

A. The top one foot of streambed material shall consist of natural streambed material mixed with a coarse aggregate gradation with a D_{50} stone sufficiently large enough to yield a final (blended) surface layer with a D_{50} stone of 0.25 feet.
B. The bottom two feet of the streambed material shall consist of stone with a D_{50} of 0.5 feet

The streambed stone for this item shall be native material. Angular rock is preferred over round and shall be able to lock tightly together to prevent movement during high flows. Crushed Stone will not be accepted as streambed material. If offsite material is required during construction to complete the streambed restoration, the Contractor shall submit the proposed material specifications to the Engineer for review and approval by MassDOT District 2 Environmental Section.

CONSTRUCTION

Streambed

The placement of streambed material under this item shall not begin until the Engineer approves the rip rap along the footing and the channel subgrade preparation. The Contractor shall submit to the Engineer for approval prior to the start of operations, his/her placement plan and method of placement.

Method of Measurement and Basis of Payment

The quantity for Item 983.521 STREAMBED RESTORATION shall be measured by the CUBIC YARD .of material placed, and will be paid at Contract Bid Price per CUBIC YARD complete and in place, which price shall be the full payment of all labor, tools, equipment, and materials necessary to rebuild the streambed.

ITEM 991.1 CONTROL OF WATER – STRUCTURE NO. H-01-005 LUMP SUM

The work to be done under this item shall conform to the relevant provisions of Section 100 and consists of all equipment, labor and materials, placement of straw bales, cofferdams, sedimentation and de-watering basins, and other water control devices required for the control of water for construction of the proposed piers, removal and replacement of riprap, placement of new riprap and natural streambed material, demolition of existing piers, removal of existing timber piles, and for any other work that may be required to complete the replacement of Bridge No. H-01-005, as shown on the plans, as directed by the Engineer, and as specified herein.

The Contractor shall make his/her own investigations prior to bidding to determine how best to accomplish the control of water during the required work to be done. The cofferdams shown in the proposed plans are conceptual only, and the contractor may propose an alternate method for control of water provided that it meets all existing requirements of these special provisions and relevant contract documents.

The Contractor shall follow the guidelines of this specification for which dewatering is to be accomplished. However, except for payment, all work shall conform to the relevant requirements of Section 140.

This work shall be done within the limits of the Water Quality Plans and their associated impact areas.

The Contractor shall submit complete working drawings and computations of his or her proposed dewatering system with supporting data as necessary to the Engineer for approval in accordance with Subsection 5.02 and the Special Provisions. These drawings shall be accompanied by design calculations. Both shall be certified by a Professional Engineer registered in the Commonwealth of Massachusetts. The Contractor shall make his or her own evaluation of existing conditions and water flow, and of the effects of his/her proposed temporary works and construction methods, and shall provide in his or her design for all loads and construction conditions necessary to permit demolition and construction of the specified structure while maintaining public safety and protecting complete work and all third party property from damage resulting from construction operations.

Measures to control the discharge of pollutants into water resource areas shall include, but not be limited to the following:

- Rigorous management of construction operations involving potentially hazardous materials, such as, refueling and maintenance of construction equipment.

- Formulation of contingency plans to control accidental spillage from potentially hazardous materials.

ITEM 991.1 (Cont.)

- Siting of construction staging areas outside of the riverfront inner riparian area and Wetlands buffer zones, and locating construction staging on relatively flat ground.

- Scheduling of work within the resource areas to avoid periods of high flood (e.g., spring floods) and inclement weather.

- Installation and continuous maintenance of staked straw bales and sedimentation fences to prevent sediment migration into adjacent downstream resource areas. Placement of erosion controls shall be as shown on the plans, as specified herein, or as directed by the Engineer, so as to accomplish maximum control of project related sediment mobilization. Additional erosion control measures shall be employed as necessary to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the contract. Straw bales and sedimentation fences used to prevent sediment migration into adjacent downstream resource areas shall be considered incidental to Item 991.1, and additional compensation shall not be made to the Contractor.

- All discharge resulting from dewatering activities shall be directed to temporary sedimentation/retention basins located as necessary to control turbidity. At no time shall said discharge be directly released into adjacent resource areas. The Contractor is advised that if portable dam type structures are approved and utilized, additional seepage under sealing aprons should be expected. In these situations the Contractor will be required to provide multiple, or oversized, dewatering basins to provide additional detention time needed to properly dewater the work zones. Multiple or oversized dewatering basins shall be considered incidental to Item 991.1, and additional compensation shall not be made to the Contractor.

The Contractor shall provide cofferdams utilizing acceptable methods (see below), sedimentation/retention basins and/or other effective procedures or structures together with all labor, materials, and equipment necessary for controlling water under and around the bridge. Such work shall be subject to the approval of the Engineer, but such approval will not relieve the Contractor of responsibility for the adequacy of construction, maintenance, operation and safety of the water control system.

The Contractor shall utilize no-fill methods for coffer damming activities:

Acceptable cofferdam methods include:

- Sandbags
- Portable dam type systems
- Jersey Barriers
- Sheet piles
- Steel soldier piles and lagging
- Wooden frame/impervious liner

ITEM 991.1 (Cont.)

Unacceptable cofferdam methods (fills):

- Section concrete
- Grout bags

The Contractor is advised that the work to be performed under this item shall be in conformance with the environmental permits associated with this contract.

All work (including all labor, tools, equipment, materials, maintenance and fees) required in order to conform to the above environmental permitting sections, if not included separately under other items, shall be considered incidental to Item 991.1, and no additional compensation shall be made to the Contractor.

Also included shall be all necessary additional permits that may be required in performing the work under this item. The Contractor is advised that the use of sandbags or jersey barriers, for cofferdam control of water on this project, would constitute a temporary fill in waters of the United States, and would require permitting under Section 404 of the Clean Water Act, the Army Corp Permit.

Upon completion of the work, the cofferdams, temporary sheeting, water barriers, and/or other water control items, etc., shall be removed from the site.

METHOD OF MEASUREMENT AND BASIS FOR PAYMENT

Measurement and Payment for Item 991.1 will be made per Lump Sum for Control of Water, which price shall include full compensation for all labor, tools, equipment, materials, permitting, permitting fees, installation, maintenance, and removal of all temporary water barriers and/or other materials as described above, all diverting systems or material, all sedimentation fences, sedimentation/retention basins, pumping operations, and all incidental work necessary to complete the work under this item required for the replacement of Structure No. H-01-005.

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT M

Highway & Bridge Design Plans (Full Set)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	77
PROJECT FILE NO.	608460		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

BAY ROAD (ROUTE 47) OVER FORT RIVER

(BRIDGE NO. H-01-005 (C1H))

IN THE TOWN OF

HADLEY

HAMPSHIRE COUNTY

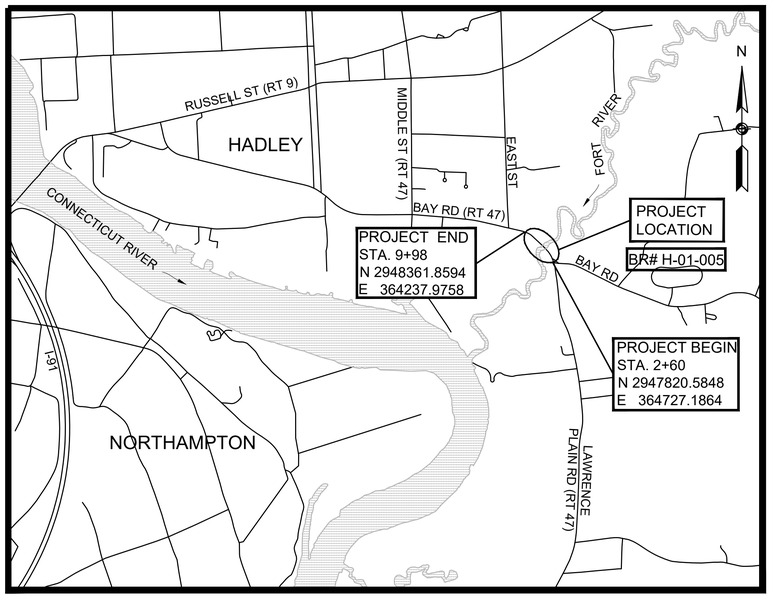
FEDERAL AID PROJECT NO.

PS&E SUBMITTAL

THESE PLANS ARE SUPPLEMENTED BY THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK.

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0 1500 3000 4500 6000

SCALE: 1" = 1500'

LENGTH OF PROJECT = 730.00 FEET = 0.138 MILES

DESIGN DESIGNATION (BAY ROAD - ROUTE 47)

DESIGN SPEED	35 MPH
ADT (2017)	11,732
ADT (2037)	14,350
K	9.4%
D	62%
T (PEAK HOUR)	1.2%
T (AVERAGE DAY)	4.1%
DHV	1,350
DDHV	837
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL (MAP-21 NHS)

DATE	DESCRIPTION	REV #
08/09/2021	PS&E DESIGN SUBMITTAL	3
10/05/2020	100% DESIGN SUBMITTAL	2
12/20/2019	75% DESIGN SUBMITTAL	1
04/25/2018	25% DESIGN SUBMITTAL	0

benesch

massDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER **DATE**

608460_HD01 (TITLE).DWG Plotted on 24-Aug-2021 4:48 PM

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
100 99		CONTOURS (ON-THE-GROUND SURVEY DATA)
100 99		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SILT FENCE
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		EDGE OF PAVEMENT
		LIMIT OF MICROMILLING AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
℄		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR (6' x 6' TYP UNLESS OTHERWISE SPECIFIED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
	*	EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
RRSG	RRSG	RAILROAD SIGNAL
OR		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
	20'	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
	20'	MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE (12" WIDE)
	CW	CROSSWALK (12" WIDE LINES)
	SWL	SOLID WHITE LINE (6" WIDE)
	SYL	SOLID YELLOW LINE (6" WIDE)
	BWL	BROKEN WHITE LINE (6" WIDE, 10' LINE, 30' GAP)
	BYL	BROKEN YELLOW LINE (6" WIDE, 10' LINE, 30' GAP)
	DWL	DOTTED WHITE LINE (6" WIDE, 3' LINE, 9' GAP)
	DYL	DOTTED YELLOW LINE (6" WIDE, 3' LINE, 9' GAP)
	DWLEx	DOTTED WHITE LINE EXTENSION (6" WIDE, 2' LINE, 6' GAP)
	DYLEx	DOTTED YELLOW LINE EXTENSION (6" WIDE, 2' LINE, 6' GAP)
	DBWL	DOUBLE WHITE LINE (6" WIDE LINES)
	DBYL	DOUBLE YELLOW LINE (6" WIDE LINES)

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LB	LEACH BASIN
LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
OHW	OVERHEAD WIRE
OHWL	ORDINARY HIGH WATER LINE
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY

ABBREVIATIONS (cont.)

GENERAL

PVMT	PAVEMENT
PWW	PAVED WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
VW	VEGETATED WETLANDS
WCR	WHEEL CHAIR RAMP
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL ABBREVIATIONS

CAB	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY UPRAISED HAND
FDW	FLASHING UPRAISED HAND
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
FYL	FLASHING YELLOW LEFT ARROW
FYR	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALKING PERSON
Y	STEADY CIRCULAR YELLOW
YL	STEADY YELLOW LEFT ARROW

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	77
PROJECT FILE NO.	608460		

LEGEND & ABBREVIATIONS

608460_HD02-03 (LEGEND).DWG Plotted on 24-Aug-2021 4:49 PM

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	77
PROJECT FILE NO.	608460		

GENERAL NOTES

608460_HD02-03 (LEGEND).DWG Plotted on 24-Aug-2021 4:49 PM

GENERAL NOTES

1. THIS BASE MAP IS COMPILED FROM AN ACTUAL-ON-THE-GROUND INSTUMENT SURVEY PERFORMED BY GREEN INTERNATIONAL AFFILIATES, INC. PERFORMED BETWEEN JUNE 19, 2017 AND SEPTEMBER 15, 2017.

2. HORIZONTAL AND VERTICAL CONTROL WAS ESTABLISHED BY MASSDOT SURVEY, IN MASSDOT DISTRICT 2 FIELD BOOK 41273, PAGE 86, ON JULY 6, 2017. HORIZONTAL DATUM IS BASED ON THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, NAD83 (2011) EPOCH 2010.000, VERTICAL DATUM IS NAVD88 (COMPUTED USING GEOID12B) USING THE FOLLOWING CONTROL POINTS:

POINT	GRID NORTHING	GRID EASTING	ELEVATION	COMBINED GROUND TO GRID SCALE FACTOR
9 YC	2937327.18	358584.75	118.11	1.000035007344
448 H	2959132.00	348529.15	154.41	1.000034373289

MASSDOT ESTABLISHED THE FOLLOWING POINTS FOR THIS PROJECT:

POINT	GRID NORTHING	GRID EASTING	ELEVATION	DESCRIPTION
1933	2947789.42	364780.56	139.35	HUB AND TACK FOUND
1934	2947702.87	365166.90	155.65	IRON ROD FOUND

THE UNIT OF MEASUREMENTS IS US FEET. THE PROJECT COMBINED SCALE FACTOR IS 1.000035399383.

3. THE RIGHT OF WAY LINES SHOWN ON THIS BASE MAP ARE THE DIRECT RESULT OF AN INSTRUMENT SURVEY PERFORMED ON THE GROUND BY GREEN INTERNATIONAL AFFILIATES, INC AND FROM PLANS AND DEEDS OF RECORD. PRIVATE PROPERTY LINES HAVE NOT BEEN SURVEYED, THEY ARE COMPILED FROM GIS & RECORD PLAN INFORMATION AND SHOULD BE CONSIDERED APPROXIMATE.

4. THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS, OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE & RESET" (R & R).

5. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE, UNLESS OTHERWISE PROVIDED FOR UNDER CONTRACT ITEMS.

6. ALL DISTURBED AREAS NOT DESIGNATED TO BE PAVED OR AS PAVEMENT MILLING MULCH SHALL HAVE LOAM BORROW PLACED AND SEEDED. THE LOAM BORROW SHALL HAVE A MINIMUM DEPTH OF 4 INCHES AND SHALL BE PLACED FLUSH WITH THE TOP OF THE ADJACENT CURB, EDGING, BERM OR PAVEMENT SURFACE

7. CATCH BASINS DAMAGED OR FILLED WITH SEDIMENTATION DURING THE CONSTRUCTION PROCESS SHALL BE CLEANED, FLUSHED AND/OR REPLACED AT CONTRACTOR'S EXPENSE.

8. JOINTS IN HOT MIX ASPHALT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR SECTION 450.

9. TOP OF CURB SHALL BE 6 INCHES ABOVE GUTTER GRADE UNLESS OTHERWISE NOTED.

10. BEFORE ANY DRAINAGE STRUCTURES ARE CONSTRUCTED OR CONNECTIONS ARE MADE THE CONTRACTOR SHALL DETERMINE THE ACTUAL LOCATION OF SUBSURFACE STRUCTURES AND DRAINAGE INVERTS TO AVOID CONFLICTS WITH UTILITIES, UNLESS OTHERWISE NOTED ON THE CONSTRUCTION PLANS OR DIRECTED BY THE ENGINEER.

11. ANY ADJUSTMENTS MADE TO MUNICIPALLY OWNED SANITARY AND WATER MANHOLES, HYDRANTS, GATE BOXES, ETC... SHALL MEET APPLICABLE MUNICIPAL STANDARDS AND CRITERIA.

12. TREES AND SHRUBS NOT NOTED TO BE REMOVED, AND TREE AND SHRUBS NOTED "RET" ON THE DRAWINGS, SHALL BE PROTECTED BY THE CONTRACTOR DURING CONSTRUCTION OPERATIONS. TREES OR SHRUBS DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN-KIND BY THE CONTRACTOR AT HIS OR HER OWN EXPENSE.

13. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS NOTED OTHERWISE.

PLAN REFERENCES

1. JULY 7, 1931 PLAN OR ROAD IN THE TOWN OF HADLEY, HAMPSHIRE COUNTY, LAID OUT BY THE COUNTY COMMISSIONERS, RECORDED IN PLAN BOOK 14, PAGE 44 AT HAMPSHIRE COUNTY REGISTRY OF DEEDS.

2. AUGUST 28, 1935 PLAN OF ROAD IN THE TOWN OF HADLEY, HAMPSHIRE COUNTY, LAID OUT BY THE COUNTY COMMISSIONERS, RECORDED IN PLAN BOOK 19, PAGE 78 AT HAMPSHIRE COUNTY REGISTRY OF DEEDS.

3. AUGUST 1967 PLAN OF BAY ROAD-HADLEY AS ALTERED & RELOCATED BY THE COUNTY COMMISSIONERS, RECORDED IN PLAN BOOK 71, PAGE 88 AT HAMPSHIRE COUNTY REGISTRY OF DEEDS.

4. JUNE 28, 1977 LAND OF NELLIE H. FYDENKEVEZ, TOWN OF HADLEY, COUNTY OF HAMPSHIRE, RECORDED IN PLAN BOOK 105, PAGE 39 AT HAMPSHIRE COUNTY REGISTRY OF DEEDS.

5. SEPTEMBER 19, 1988 PLAN OF LAND IN HADLEY, MASSACHUSETTS PREPARED FOR JOHN M. CALLAHAN, RECORDED IN PLAN BOOK 157, PAGE 29 AT HAMPSHIRE COUNTY REGISTRY OF DEEDS.

6. DECEMBER 10, 1990 PLAN OF LAND IN HADLEY, MASSACHUSETTS PREPARED FOR SETH ISMAN & ERIKA HOLLISTER, RECORDED IN PLAN BOOK 169, PAGE 88 AT HAMPSHIRE COUNTY REGISTRY OF DEEDS.

UTILITY NOTES:

1. ALL UNDERGROUND UTILITIES AS SHOWN WERE COMPILED USING FIELD SURVEY INFORMATION AND AVAILABLE RECORD INFORMATION.

2. RECORD UTILITY INFORMATION FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE ONLY AND ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.

3. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS) PRIOR TO DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.

4. THE LOCATION OF EXISTING PIPES OR OTHER UNDERGROUND STRUCTURES OR PROPERTY LINES ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND PIPES OR STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL CALL "DIG SAFE" (1-888-344-7233) 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO ANY EXCAVATION TO OBTAIN ACCURATE UTILITY LOCATIONS.

5. SUBSURFACE UTILITY LOCATIONS HAVE BEEN PLOTTED TO MEET UTILITY QUALITY LEVEL "C" AS DESCRIBED IN ASCE STANDARD 38-02. THE UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS BASED ON ABOVE-GROUND FIELD OBSERVATION AND EXISTING RECORD INFORMATION RECEIVED FROM UTILITY STAKE-HOLDERS. UTILITY RECORD PLANS WERE REQUESTED AND RECEIVED FROM THE FOLLOWING UTILITY COMPANIES/AGENCIES/MUNICIPALITIES:

6. INVERTS SHOWN ON PLAN ARE NOT GUARANTEED TO BE ACCURATE. DUE TO THE LIMITATIONS OF FIELD OBSERVATION AND SURVEY TECHNIQUES THE INVERTS ARE SHOWN AS APPROXIMATE ONLY AND SHALL NOT BE WARRANTED TO BE CORRECT. ADDITIONAL FIELD INVESTIGATION IS NECESSARY WHERE ACCURATE MEASUREMENTS ARE REQUIRED FOR DESIGN OF CRITICAL AREAS.

7. THE EXISTING CONDITIONS PLAN IS TO BE USED FOR THE SPECIFIED PROJECT ONLY AND IS NOT WARRANTED TO BE COMPLETE FOR ANY OTHER FUTURE PROJECTS.

8. ALL PIPES LABELED AS (REC) ARE BASED ON RECORD INFORMATION ONLY AND NOT OBSERVED IN THE FIELD.

9. WHERE AN EXISTING UNDERGROUND UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.

10. ALL EXISTING UTILITY GATE BOXES, MANHOLE FRAMES AND COVERS, CATCH BASIN FRAMES AND GRATES AND OTHER CASTINGS TO BE RETAINED SHALL BE ADJUSTED TO LINE AND/OR GRADE.

11. WORK REQUIRED ON ELECTRIC, GAS, CABLE T.V. OR TELEPHONE STRUCTURES AND LINES SHALL BE CARRIED OUT BY THE OWNER OF THAT UTILITY. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS TO COORDINATE THE ALTERATION AND ADJUSTMENT OF THESE AND ANY OTHER PRIVATE UTILITIES WITH THE UTILITY COMPANIES.

12. PRIOR WRITTEN NOTICE OF AT LEAST 48 HOURS SHALL BE GIVEN BY THE CONTRACTOR TO AFFECTED MUNICIPAL WATER AND FIRE DEPARTMENTS, WITH A COPY OF SUCH NOTICE SUBMITTED TO THE ENGINEER, BEFORE ANY WATER MAIN IS SHUT OFF AND IN NO CASE SHALL A GATE OR HYDRANT BE OPENED OR SHUT WITHOUT PROPER AUTHORIZATION.

13. THE CONTRACTOR SHALL COORDINATE ALL ARRANGEMENTS FOR THE ALTERATION AND/OR ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITY THROUGH THE MASSDOT HIGHWAY DIVISION UTILITY SECTION.

14. WITHIN AREAS OF RESURFACING OR RECONSTRUCTION, ALL EXISTING DRAINAGE MANHOLES, CATCH BASINS, SEWER MANHOLES, AND WATER GATES SHALL BE ADJUSTED TO PROPOSED LINE AND GRADE UNLESS OTHERWISE NOTED ON THE PLANS.

15. SHOP DRAWINGS OF ALL CASTINGS, PRECAST CONCRETE STRUCTURES, PIPE AND OTHER MANUFACTURED ITEMS SHALL BE SUBMITTED FOR APPROVAL BY THE ENGINEER, IN CONFORMANCE WITH CONTRACT SPECIFICATIONS, AND SAID APPROVAL SHALL BE REQUIRED PRIOR TO INITIATING PROCUREMENT OF MATERIALS.

16. ALL DRAINAGE STRUCTURES TO BE ABANDONED SHALL BE FILLED WITH GRAVEL AND ALL CONNECTIONS SHALL BE PLUGGED AT THE PIPE LOCATIONS WITH A CEMENT CONCRETE MASONRY PLUG.

17. THE CONTRACTOR PERFORMING ANY WATER, SANITARY SEWER OR STORM DRAIN WORK WITHIN THE TOWN OF HADLEY MUST BE LICENSED WITH THE TOWN AND HAVE A PERMIT FROM THE TOWN TO PERFORM THE WORK ON THE UTILITIES AS WELL AS ALL OTHER WORK IN THE TOWN RELATED TO THIS PROJECT. THE CONTRACTOR IS REQUIRED TO OBTAIN A STREET OCCUPANCY PERMIT FROM THE TOWN FOR THE DURATION OF THE PROJECT.

18. FINAL LOCATION OF TRAFFIC SIGNS AND SUPPORTS AS SHOWN IN THE PLANS SHALL BE FIELD-CONFIRMED BY THE ENGINEER PRIOR TO INSTALLATION.

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	77
PROJECT FILE NO.	608460		

KEY PLAN

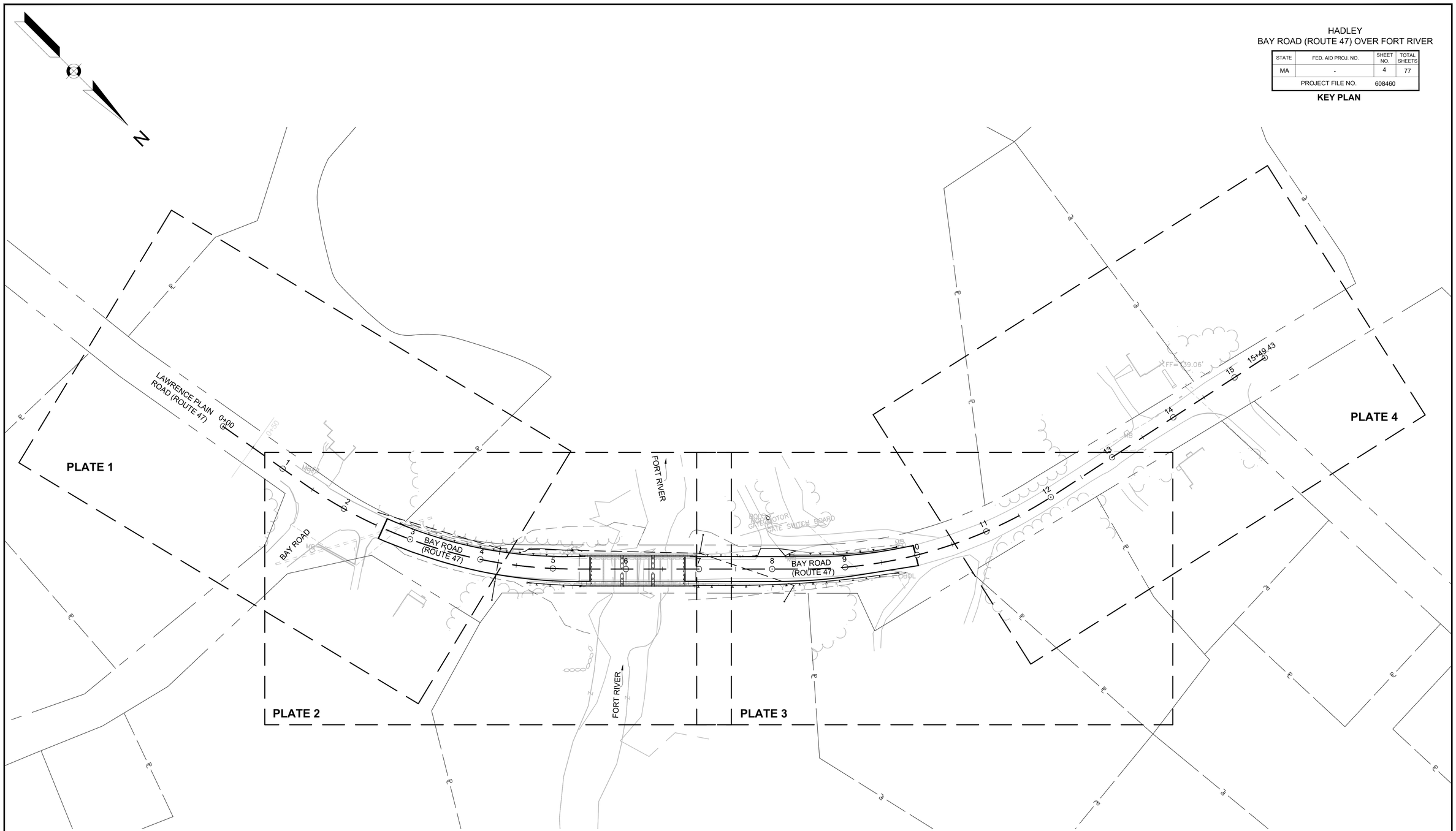


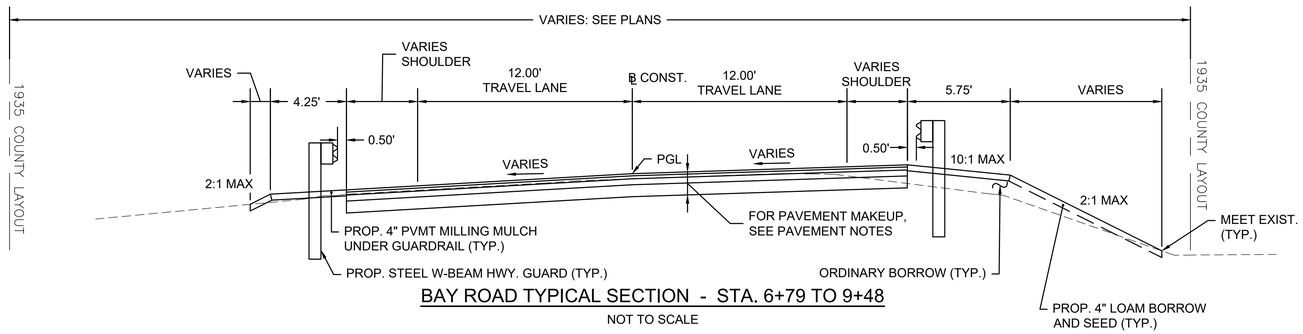
	PLATE 1	PLATE 2	PLATE 3	PLATE 4
SURVEY CONTROL	5	6	7	8
CONSTRUCTION PLANS	-	10	11	-
PROFILES	-	12	13	-
CURB TIE PLANS	-	14	15	-
UTILITY PLANS	-	16	17	-
TRAFFIC SIGN AND PAVEMENT MARKING PLANS	-	24	25	-

608460_HD04 (KEY PLAN).DWG Plotted on 24-Aug-2021 4:49 PM

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

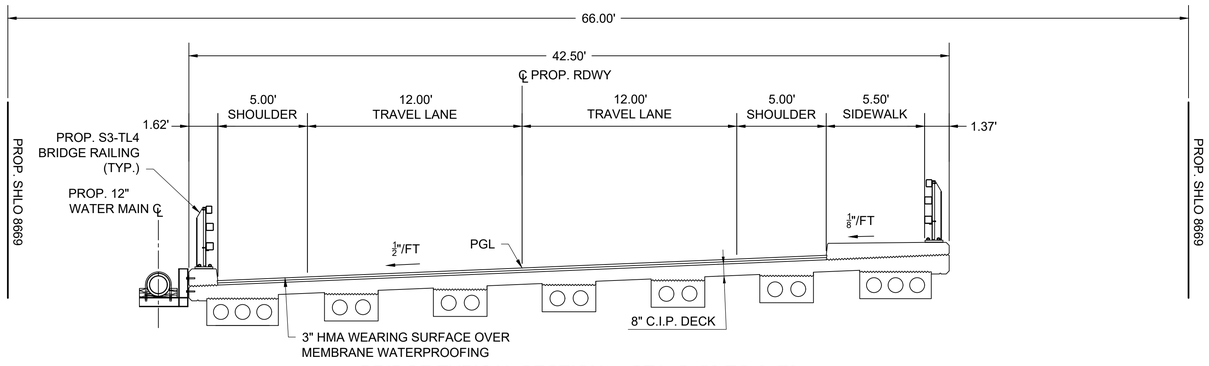
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	77
PROJECT FILE NO.	608460		

TYPICAL SECTIONS



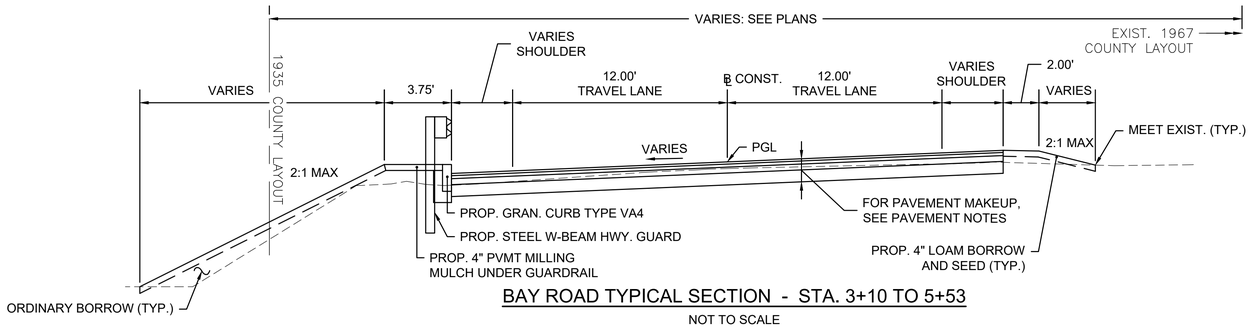
BAY ROAD TYPICAL SECTION - STA. 6+79 TO 9+48

NOT TO SCALE



BRIDGE TYPICAL SECTION - STA. 5+53 TO 6+79

NOT TO SCALE



BAY ROAD TYPICAL SECTION - STA. 3+10 TO 5+53

NOT TO SCALE

PAVEMENT NOTES

GENERAL PAVEMENT NOTES:

1. ALL HMA FOR PATCHING, ASPHALT EMULSION FOR TACK COAT AND HMA JOINT SEALANT SHALL BE IN ACCORDANCE WITH SECTION 450. ALL PERMANENT PAVEMENT REPAIRS TO THE MILLED SURFACE SHALL BE MADE PRIOR TO RESURFACING. ASPHALT EMULSION SHALL BE APPLIED AT THE RATE OF 0.06-0.08 GALLONS PER SQUARE YARD OVER SMOOTH PAVEMENTS AND 0.07-0.09 GALLONS PER SQUARE YARD OVER MILLED SURFACES PRIOR TO PAVING. ALL JOINTS IN THE SURFACE COURSE SHALL BE SEALED WITH HMA JOINT SEALANT.
2. ALL SUPERPAVE HMA SHALL BE PRODUCED WITH A WARM MIX ASPHALT ADDITIVE.
3. PROVIDE TEMPORARY HMA TRANSITIONS IF TRAFFIC IS EXPECTED TO BE WITHIN BOX WIDENED AREAS OR IF BOX WIDENING IS TO LAST OVER THE WINTER MONTHS.

PROPOSED FULL DEPTH CONSTRUCTION WITH RECLAIMED BASE

1 1/2"	SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B-9.5) OVER
2"	SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC-12.5) OVER
4.5"	SUPERPAVE BASE COURSE - 37.5 (SBC-37.5) OVER
VARIES (8" MIN.)	RECLAIMED PAVEMENT SUPPLEMENTED WITH GRAVEL BORROW (TYPE b) AS REQUIRED

PROPOSED MICROMILLING AND OVERLAY

1 1/2"	SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B-9.5) OVER
1 1/2"	PAVEMENT FINE MILLING

PROPOSED HMA WEARING SURFACE FOR BRIDGES

1 1/2"	SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B-9.5) OVER
	RS-1H ASPHALT EMULSION FOR TACK COAT OVER
1 1/2"	SUPERPAVE BRIDGE PROTECTIVE COURSE - 9.5 (SPC-B-9.5) OVER
	POLYMER MODIFIED TACK COAT OVER
	SPRAY APPLIED MEMBRANE WATERPROOFING

PROPOSED HMA FOR DRIVEWAYS

1 1/2"	SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) OVER
2 1/2"	SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER
8"	GRAVEL BORROW - SUBBASE (TYPE b)

PROPOSED CEMENT CONC. SIDEWALKS AND WHEELCHAIR RAMPS

4"	(AIR-ENTRAINED, 4000 PSI, 3/4", 610) CEMENT CONC. POURED IN ONE COURSE
8"	GRAVEL BORROW (TYPE b)

PROPOSED HMA FOR PATCHING PERMANENT TRENCH PAVEMENT

(PRIOR TO FINE MILLING OPERATIONS)

NOTE: THE 1 1/2" SURFACE COURSE SHALL BE TEMPORARY UNTIL MICROMILLING OPERATIONS ARE PERFORMED.

1 1/2"	TEMPORARY HMA (PAID UNDER ITEM 451.) OVER
2"	SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC-12.5) OVER
4.5"	SUPERPAVE BASE COURSE - 37.5 (SBC-37.5) OVER
	TRENCH BACKFILL AS REQUIRED (SEE PLAN DETAILS AND CONTRACT SPECIAL PROVISIONS)
VARIES	GRAVEL BORROW (TYPE b) TO SUPPLEMENT SUITABLE BACKFILL
	(REFER TO UTILITY TRENCH DETAILS)

608460_HD09 (TYP SECTIONS).DWG Plotted on: 2-Sep-2021 8:34 AM

HIGHWAY GUARD DETAILS

RIGHT SIDE:
STA. 4+69 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

LEFT SIDE:
STA. 2+80 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

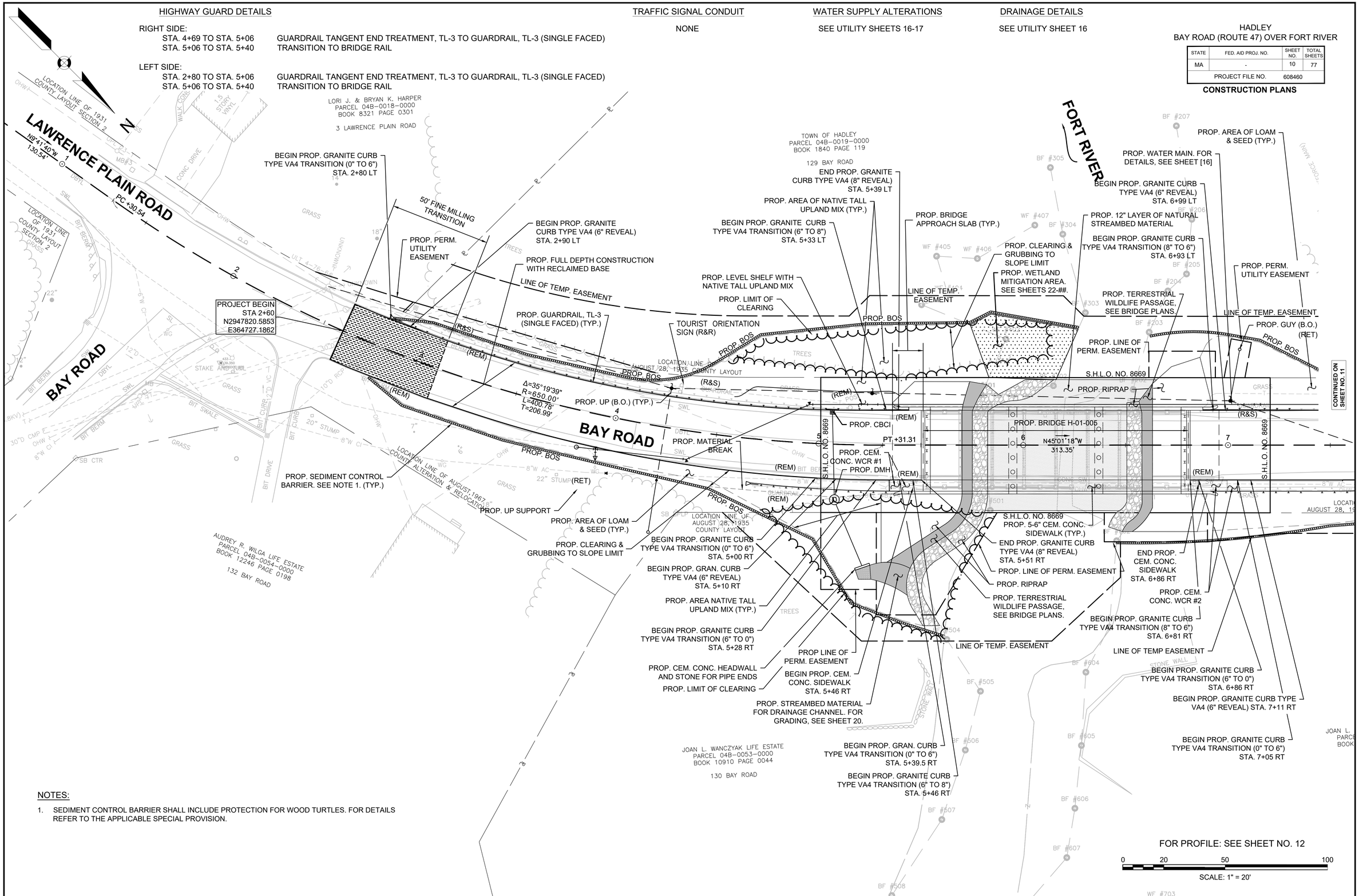
DRAINAGE DETAILS

SEE UTILITY SHEET 16

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS



NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.

FOR PROFILE: SEE SHEET NO. 12

SCALE: 1" = 20'

608460_HD10-11 (CONST).DWG Plotted on 24-Aug-2021 4:51 PM

HIGHWAY GUARD DETAILS

RIGHT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 9+72	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

LEFT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 7+79	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3
STA. 8+26 TO STA. 9+76	GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

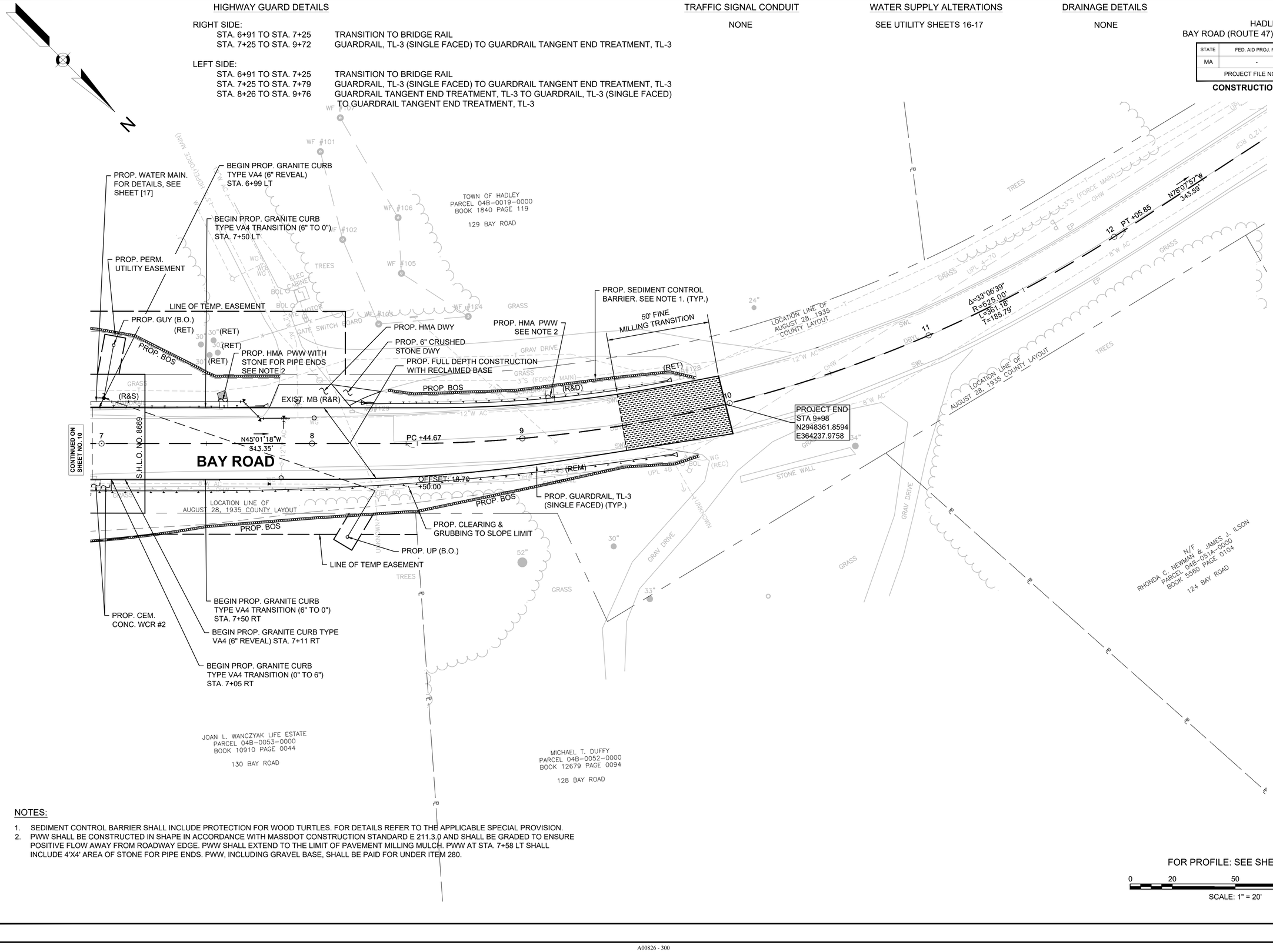
DRAINAGE DETAILS

NONE

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS



NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.
2. PWW SHALL BE CONSTRUCTED IN SHAPE IN ACCORDANCE WITH MASSDOT CONSTRUCTION STANDARD E 211.3.0 AND SHALL BE GRADED TO ENSURE POSITIVE FLOW AWAY FROM ROADWAY EDGE. PWW SHALL EXTEND TO THE LIMIT OF PAVEMENT MILLING MULCH. PWW AT STA. 7+58 LT SHALL INCLUDE 4'X4' AREA OF STONE FOR PIPE ENDS. PWW, INCLUDING GRAVEL BASE, SHALL BE PAID FOR UNDER ITEM 280.

FOR PROFILE: SEE SHEET NO. 13

0 20 50 100

SCALE: 1" = 20'

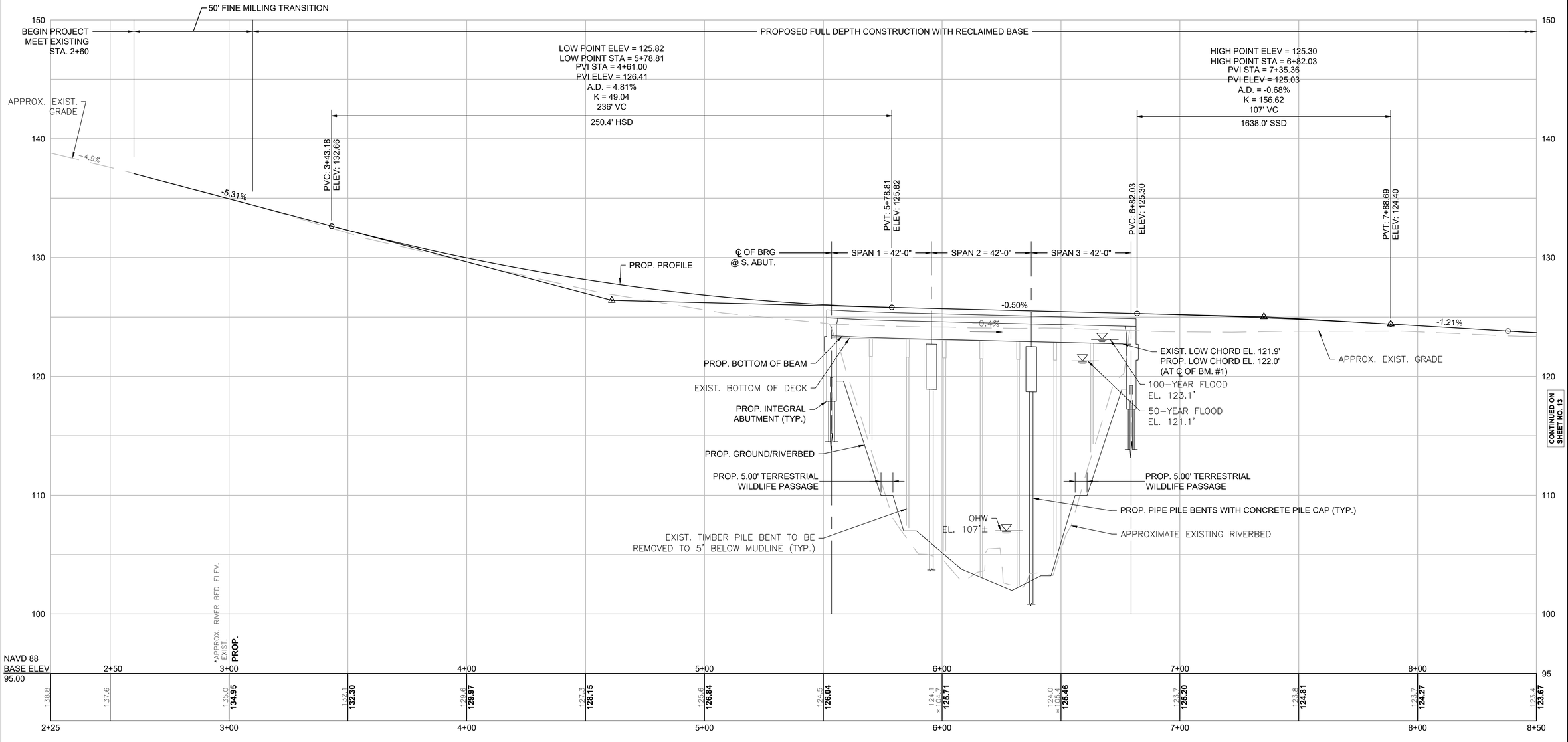
608460_HD10-11 (CONST).DWG Plotted on 24-Aug-2021 4:51 PM

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	77
PROJECT FILE NO.	608460		

PROFILE

608460_HD12-13_PROFILE.DWG Plotted on 24-Aug-2021 4:52 PM



PROFILE - BAY RD

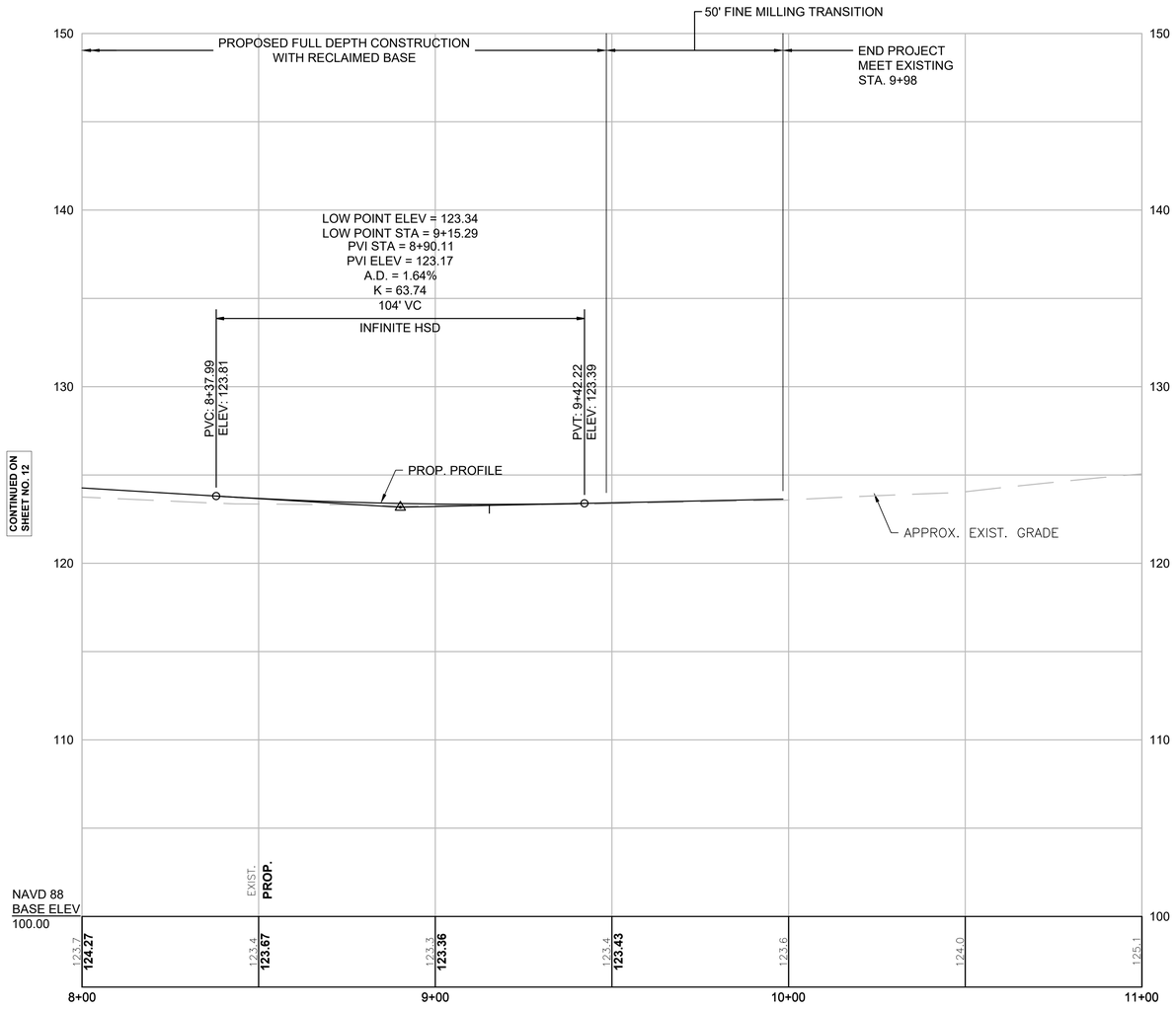
HOR. SCALE IN FEET
20 0 20 40
4 0 4 8
VER. SCALE IN FEET

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	77
PROJECT FILE NO.	608460		

PROFILE

608460_HD12-13_PROFILE.DWG Plotted on 24-Aug-2021 4:52 PM



PROFILE - BAY RD

HOR. SCALE IN FEET
20 0 20 40
4 0 4 8
VER. SCALE IN FEET

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	77
PROJECT FILE NO.	608460		

UTILITY PLANS

608460_HD16-17 (UTILITY).DWG Plotted on 2-Sep-2021 3:15 PM

LOCATION LINE OF 1931 COUNTY LAYOUT SECTION 2
N8°41'40"W 130.54'
LAWRENCE PLAIN ROAD
PC +30.54
LOCATION LINE OF 1931 COUNTY LAYOUT SECTION 2
BAY ROAD
PROJECT BEGIN
STA 2+60
N2947820.5853
E364727.1862
50' FINE MILLING TRANSITION
PROP. LINE OF PERM. UTILITY EASEMENT
PROP. OHW (TYP.)
PROP. RELOCATED UP WITH LIGHT (B.O.) (TYP.)
PROP. VERTICAL 45°-12" BEND & THRUST BLOCK
PROP. DEEP SUMP CBCI-1
STA 5+06.14 OFF 16.63' LT
RIM = 126.02'
INV OUT = 122.52'
PROP. 45°-12" BEND & THRUST BLOCK
PROP. VERTICAL 45°-12" BEND & THRUST BLOCK
(R&S) FRAME & GRATE
(R&D) CI
(REM) CB
PROP. 12" DI WATER MAIN
LOCATION LINE OF AUGUST 28, 1935 COUNTY LAYOUT
Δ=35°19'39"
R=650.00'
L=400.78'
T=206.99'
PROP. 8" TO 12" REDUCER
PROP. 12" DI WATER MAIN
PROP. 45°-12" BEND & THRUST BLOCK
PROP. BOS
PT +31.31
40' - 12" RCP
PROP. BRIDGE H-01-005
S.H.L.O. NO. 8669
N45°01'18"W 313.35'
LOCATION LINE OF AUGUST 1967 COUNTY ALTERATION & RELOCATION
PROP. UP SUPPORT (B.O.)
(R&R B.O.)
PROP. GUY (B.O.)
SB EPLP
LOCATION LINE OF AUGUST 28, 1935 COUNTY LAYOUT
PROP. 12" WATER GATE & GATE BOX
REM. EXISTING REDUCER MEET INTO EXIST 12" WATER MAIN
PROP. 12"x12"x12" TEE & THRUST BLOCK
PROP. 8" CAP & THRUST BLOCK
PROP. DMH-1
STA 5+08.80 OFF 29.5' RT
RIM = 127.00'
INV IN = 121.00'
INV OUT= 120.50'
34' - 12" CMP
PROP. CEM. CONC. HEADWALL WITH STONE FOR PIPE ENDS (STANDARD E 206.4.0)
STA 5+21.53' OFF 60.8' RT
INV OUT = 110.50'
PROP. LINE OF PERM. EASEMENT
PROP. CHECK VALVE AT PIPE END ON HEADWALL
FOR GRADING OF DRAINAGE CHANNEL, SEE UTILITY SHEET 20.
(REM) EXISTING GUY WIRE (B.O.)
LINE OF TEMP. EASEMENT
PROP. GUY (B.O.)
FORT RIVER
STONE WALL
LOCATION LINE OF AUGUST 28, 19
CONTINUED ON SHEET NO. 17

LORI J. & BRYAN K. HARPER
PARCEL 04B-0018-0000
BOOK 8321 PAGE 0301
3 LAWRENCE PLAIN ROAD

TOWN OF HADLEY
PARCEL 04B-0019-0000
BOOK 1840 PAGE 119
129 BAY ROAD

AUDREY R. WILGA LIFE ESTATE
PARCEL 04B-0054-0000
BOOK 12246 PAGE 0198
132 BAY ROAD

JOAN L. WANCZYAK LIFE ESTATE
PARCEL 04B-0053-0000
BOOK 10910 PAGE 0044
130 BAY ROAD

JOAN L.
PARCE
BOOK

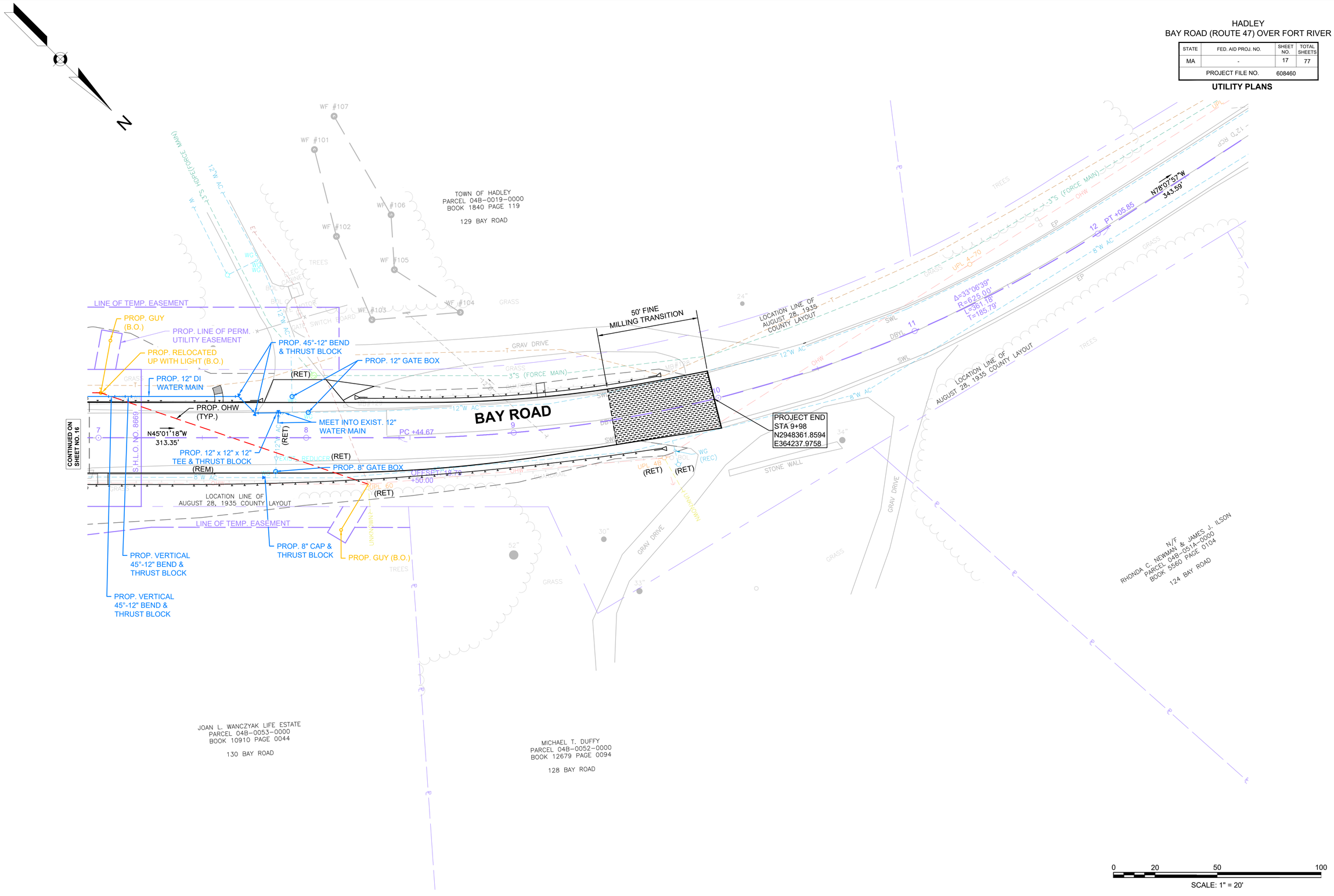
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HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	77
PROJECT FILE NO.	608460		

UTILITY PLANS

608460_HD16-17 (UTILITY).DWG Plotted on 2-Sep-2021 3:17 PM

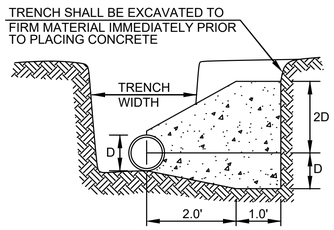


HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	18	77
PROJECT FILE NO.	608460		

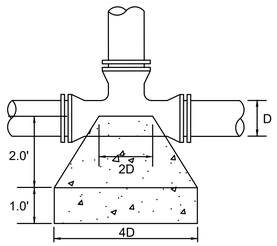
DRAINAGE AND UTILITY DETAILS

608460_HD18-19 (UTILITY DETAILS).DWG Plotted on 24-Aug-2021 4:53 PM



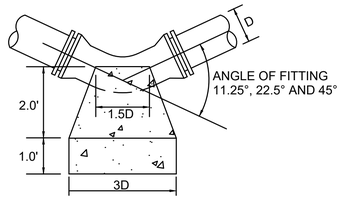
HORIZONTAL TEE & BEND

SECTION



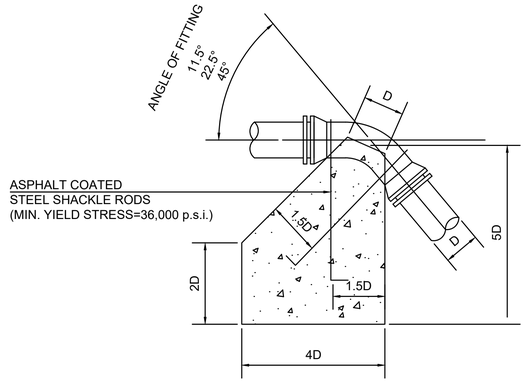
HORIZONTAL TEE

PLAN VIEW



HORIZONTAL BEND

PLAN VIEW



VERTICAL 45° BEND

ELEVATION

CONCRETE THRUST BLOCKS
FOR HORIZONTAL, VERTICAL BENDS AND TEES

NOT TO SCALE

NOTES:

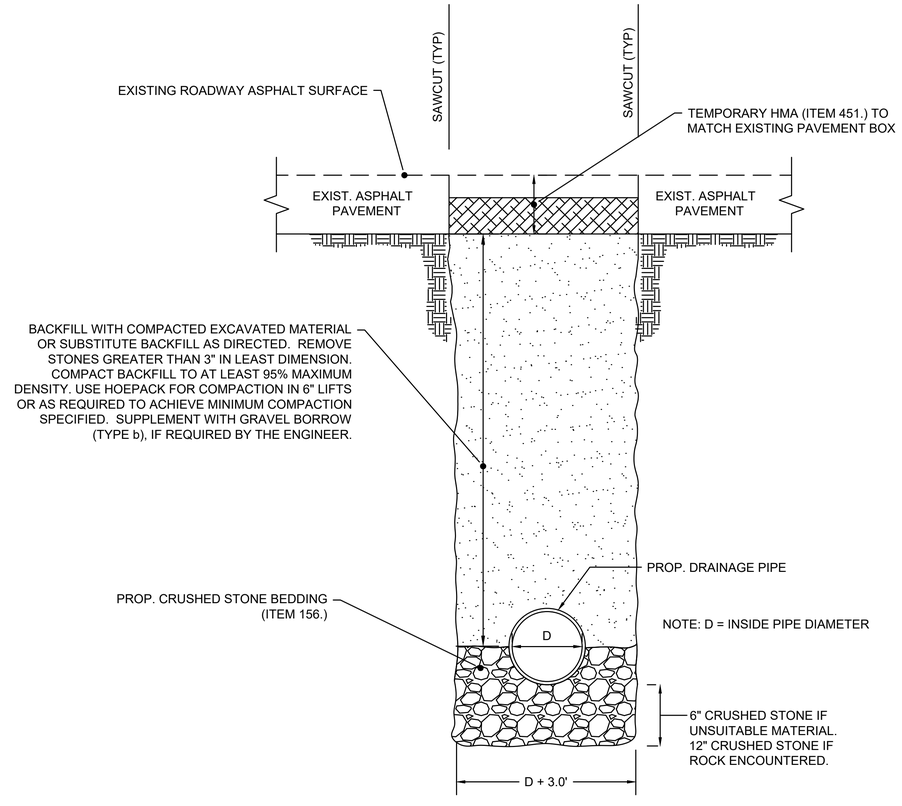
1. THE DIMENSIONS SHOWN ARE MINIMUM.
2. CONCRETE SHALL BE 4000 PSI - 1 $\frac{1}{2}$ IN. 565 CEMENT CONCRETE.
3. CONCRETE THRUST BLOCKS SHALL BE CONSTRUCTED OF CONCRETE POURED AGAINST COMPACTED SOIL.
4. THE WIDTH OF THE THRUST BLOCK , WHERE APPLICABLE, SHALL BE EQUAL TO THE WIDTH OF THE TRENCH.
5. THE HEIGHT OF THE THRUST BLOCK SHOULD BEEN LESS THAN OR EQUAL TO HALF THE DEPTH OF THE TRENCH.
6. POLYETHYLENE SHEETING SHALL BE PLACED OVER MJ FITTINGS TO PREVENT DIRECT CONTACT BETWEEN CONCRETE AND THE FITTING.

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	77
PROJECT FILE NO.	608460		

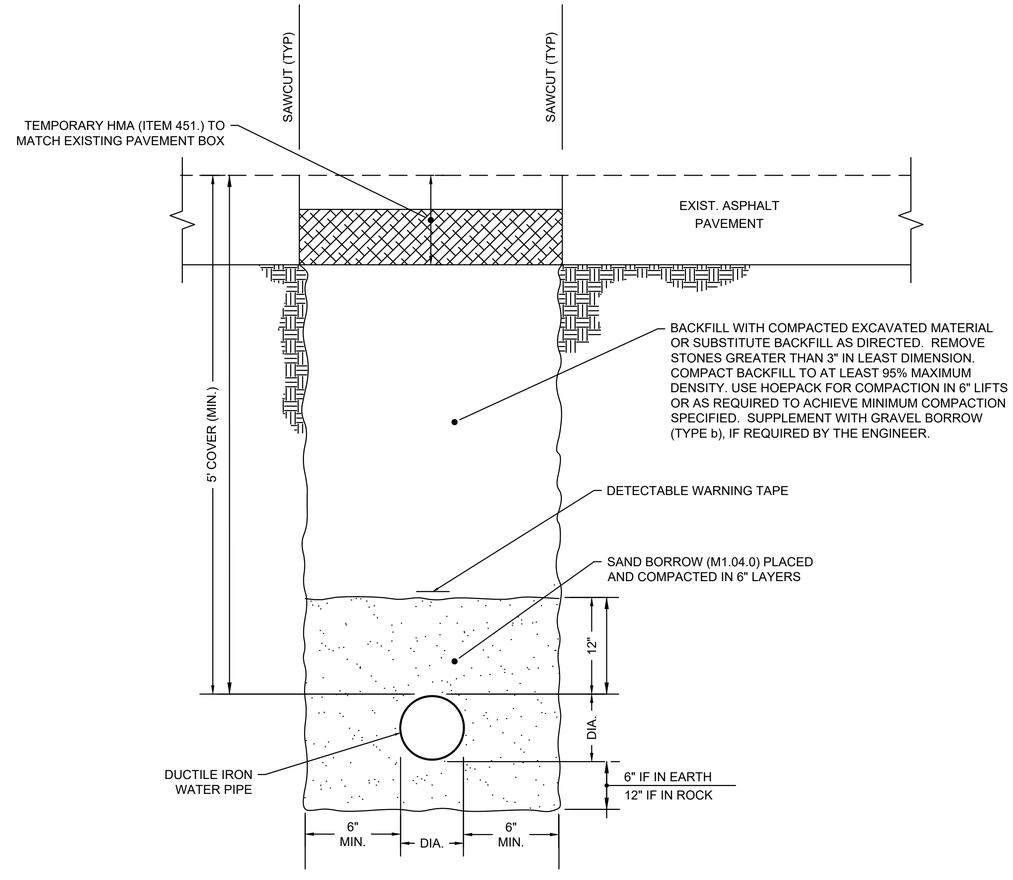
DRAINAGE AND UTILITY DETAILS

608460_HD18-19 (UTILITY DETAILS).DWG Plotted on 24-Aug-2021 4:53 PM



DRAINAGE TRENCH DETAIL IN EXISTING ROADWAY AREAS

NOT TO SCALE



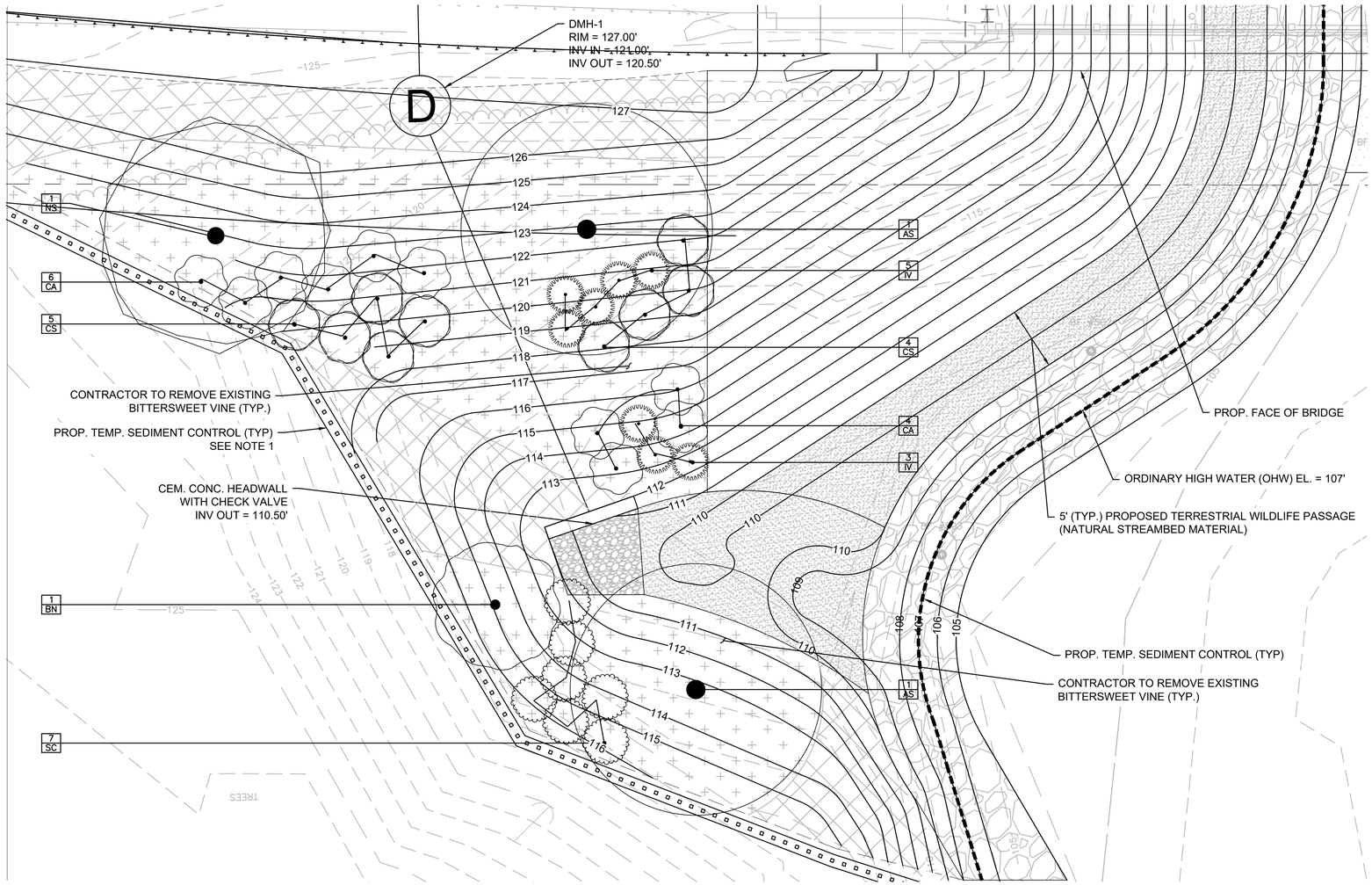
WATER SUPPLY TRENCH DETAIL IN EXISTING ROADWAY AREAS

NOT TO SCALE

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	77
PROJECT FILE NO.	608460		

DRAINAGE CHANNEL GRADING & PLANTING



DRAINAGE CHANNEL GRADING AND PLANTING PLAN

0 5 10 15 20
SCALE: 1" = 5'

LEGEND

- RIPRAP AREA
- WILDLIFE PASSAGE AREA (FILTER FABRIC W/ NATIVE WOOD CHIPS)
- STONE FOR PIPE ENDS
- STREAMBED MATERIAL DRAINAGE CHANNEL AREA
- PROP. NATIVE TALL UPLAND MIX
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER WITHOUT SILT FENCE
- SEDIMENT CONTROL BARRIER WITH SILT FENCE

NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER. REFER TO THE APPLICABLE SPECIAL PROVISION.
2. ORDINARY HIGH WATER IS AT EL. 107'.

PLANTING NOTES

1. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
2. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
3. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
4. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
5. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
6. ALL SHRUB AND PERENNIAL BEDS WILL BE WEEDED AND OTHERWISE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.
7. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

PLANT LIST (THIS PAGE)

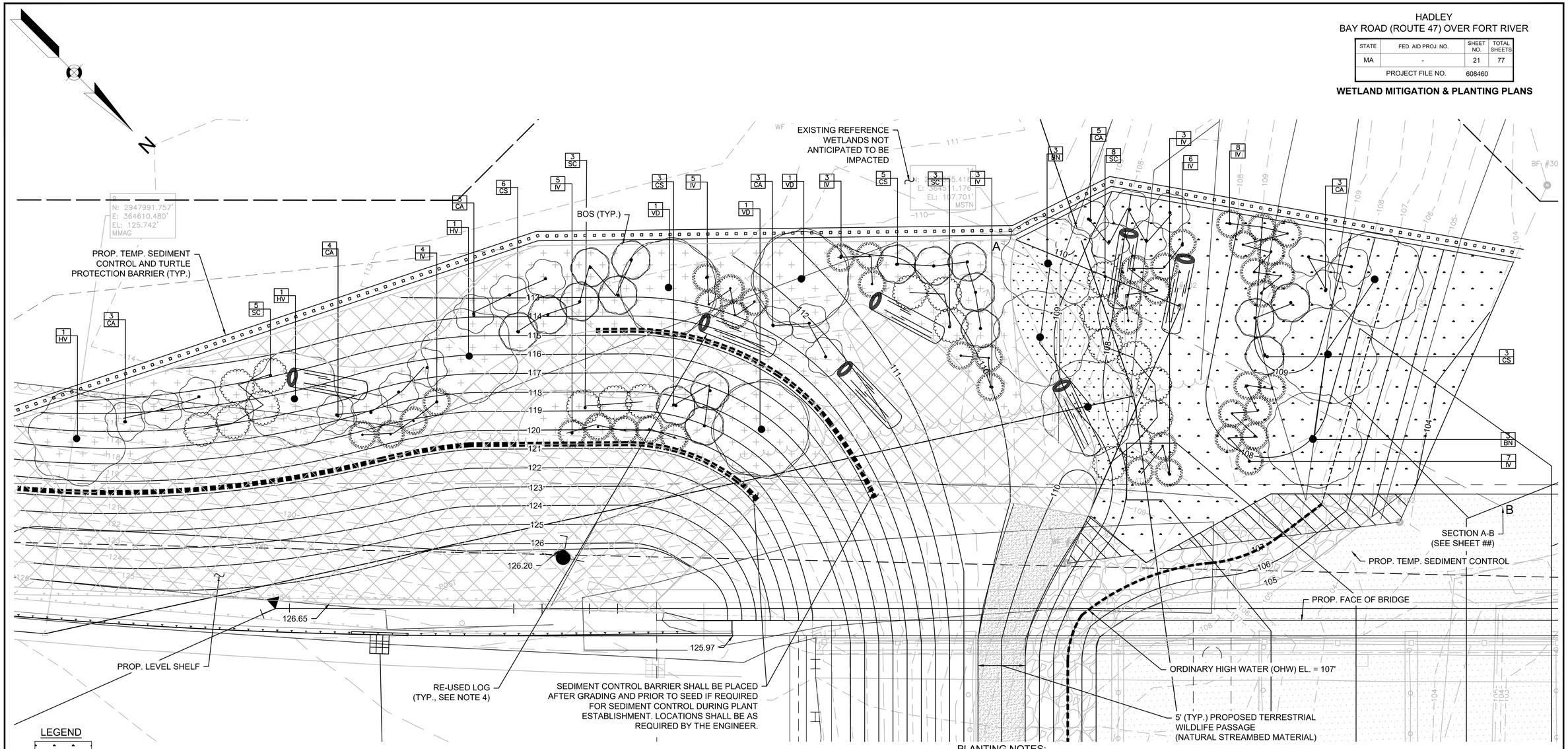
PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHURBS						
	CA	9	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	9	CORNUS SERICEA	REEDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	8	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	7	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
TREES						
	AS	1	ACER SACCHARINUM	SILVER MAPLE	2'-2.5'	
	BN	1	BETULA NIGRA	RIVER BIRCH	2'-2.5'	
	NS	1	NYSSA SYLVATICA	BLACK GUM	2'-2.5'	

608460_HD20-22 (CHANNEL DET.).DWG Plotted on 24-Aug-2021 4:54 PM

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	21	77
PROJECT FILE NO.	608460		

WETLAND MITIGATION & PLANTING PLANS



LEGEND

- EXISTING WETLANDS TO BE RESTORED
- WETLAND REPLICATION (PERMANENT GAIN)
- PROP. NATIVE TALL UPLAND MIX
- WILDLIFE PASSAGE AREA (NATURAL STREAMBED MATERIAL)
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER WITHOUT SILT FENCE
- SEDIMENT CONTROL BARRIER WITH SILT FENCE

PLANT LIST (THIS PAGE)

PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHURBS						
	CA	21	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	17	CORNUS SERICEA	REEDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	44	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	14	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
	HV	3	HAMAMELIS VIRGINIANA	WITCH HAZEL	2'-2.5'	5' TYP.
	VD	3	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-2.5'	5' TYP.
TREES						
	BN	6	BETULA NIGRA	RIVER BIRCH	2'-2.5'	

WETLAND MITIGATION AND GRADING

0 5 10 15 20
SCALE: 1" = 5'

PLANTING NOTES:

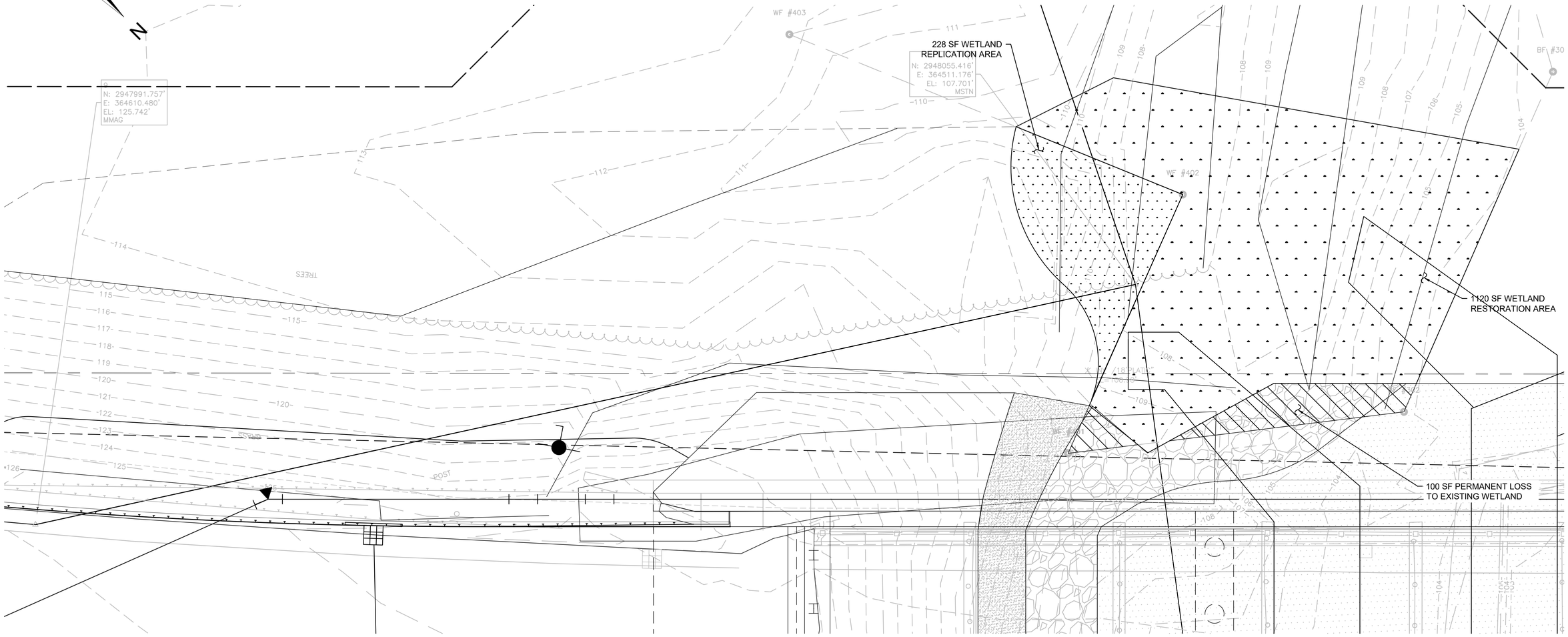
1. FOR WETLAND REPLICATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.35.
2. FOR WETLAND RESTORATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.45.
3. RESTORATION AND REPLICATION WORK SHALL NOT COMMENCE UNTIL ALL WORK IN WATER AND SLOPE RECONSTRUCTION HAS BEEN COMPLETED TO AVOID DAMAGE TO MITIGATED AREA.
4. REFER TO CONSTRUCTION PLANS FOR LIMIT OF CLEARING AND GRUBBING. RETAINING TREES TO RESTORE WOODY DEBRIS (SEE SPECIFICATION). LOGS CAN BE CUT AND LEFT ON-SITE OR ADJACENT TO THE SITE. THE WETLAND SPECIALIST WILL SELECT A MINIMUM OF 3 LARGE TREES TO BE RE-USED ON-SITE TO CREATE HABITAT LOGS PER THE WETLAND SPECIAL PROVISIONS. PLACEMENT OF LOGS AT TIME OF WETLAND CONSTRUCTION SHALL BE PER THE WETLAND SPECIALIST (PLAN LOCATIONS ARE SYMBOLIC ONLY.)
5. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER, UNLESS OTHERWISE NOTED ON THE PLAN. REFER TO THE APPLICABLE SPECIAL PROVISION ORDINARY HIGH WATER IS AT EL. 107'.
6. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
7. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
8. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
9. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
10. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
11. ALL SHRUB AND PERENNIAL BEDS WILL BE WEEDED AND OTHERWISE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.
12. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

608460_HD20-22 (CHANNEL DET.).DWG Plotted on 24-Aug-2021 4:54 PM

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	22	77
PROJECT FILE NO.	608460		

WETLAND IMPACT & MITIGATION AREA PLAN



WETLAND IMPACT DIAGRAM

LEGEND

- EXISTING WETLANDS PERMANENT LOSS
- EXISTING WETLANDS TO BE RESTORED
- WETLAND REPLICATION (PERMANENT GAIN)

0 5 10 15 20
SCALE: 1" = 5'

PLANTING NOTES:

1. FOR WETLAND REPLICATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.35.
2. FOR WETLAND RESTORATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.45.
3. RESTORATION AND REPLICATION WORK SHALL NOT COMMENCE UNTIL ALL WORK IN WATER AND SLOPE RECONSTRUCTION HAS BEEN COMPLETED TO AVOID DAMAGE TO MITIGATED AREA.
4. REFER TO CONSTRUCTION PLANS FOR LIMIT OF CLEARING AND GRUBBING. ALL TREES WITHIN LIMIT OF CLEARING AND GRUBBING SHALL BE REMOVED.
5. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER. REFER TO THE APPLICABLE SPECIAL PROVISION.
6. ORDINARY HIGH WATER IS AT EL. 107'.

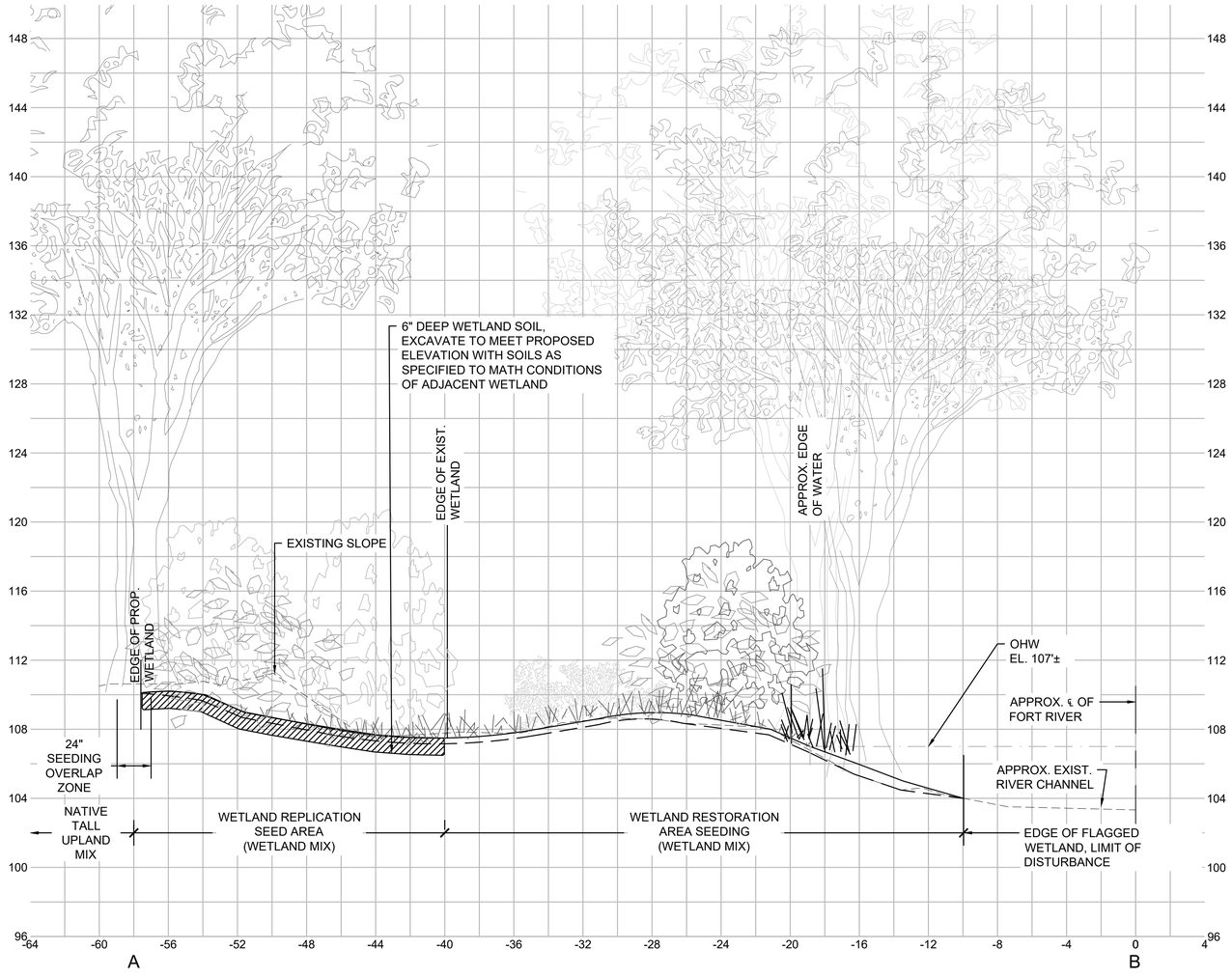
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HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	23	77
PROJECT FILE NO.	608460		

WETLAND MITIGATION SECTION

608460_HD23 (LAND XSECT).DWG Plotted on: 23-Mar-2018 11:21 AM



WETLAND MITIGATION SECTION A-B
(LOOKING WEST)

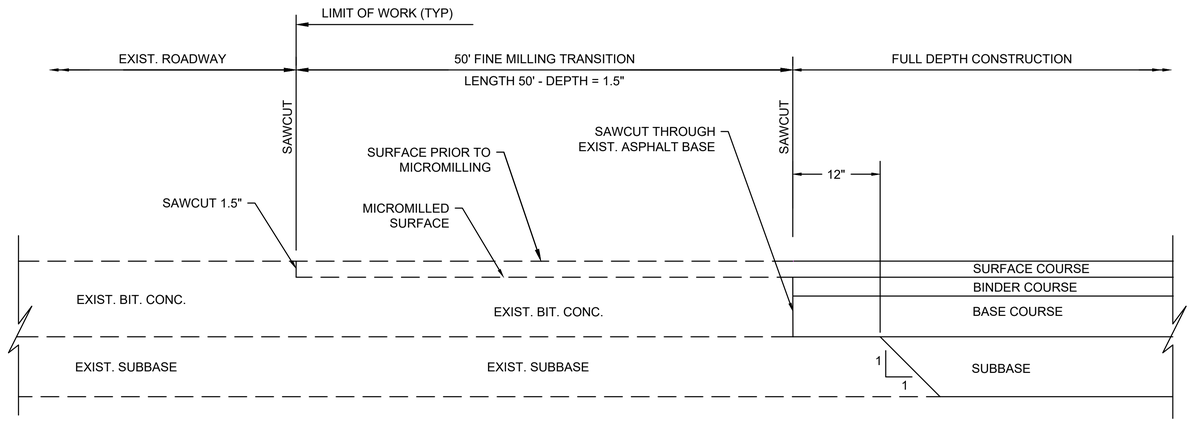
HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	37	77
PROJECT FILE NO.	608460		

MISCELLANEOUS DETAILS

608460_HD37-38 (MISC DETAILS).DWG Plotted on 24-Aug-2021 4:59 PM



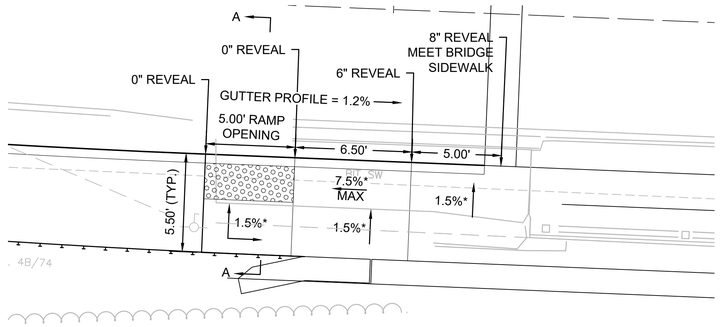
PAVEMENT TRANSITION DETAIL
NOT TO SCALE

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	38	77
PROJECT FILE NO.	608460		

MISCELLANEOUS DETAILS

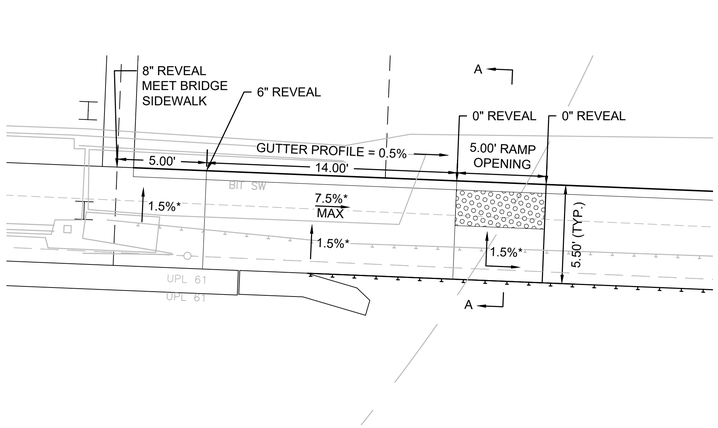
608460_HD37-38 (MISC DETAILS).DWG Plotted on 24-Aug-2021 4:59 PM



WHEELCHAIR RAMP 1

SCALE: 1" = 4'

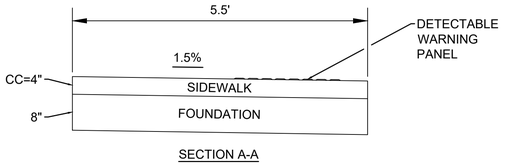
WCR REFERENCE POINT: STA 5+37.08 - OFFSET 17.00' RT
WIDTH OF CURB = 0.5'
* CONSTRUCTION TOLERANCE +/- 0.5%



WHEELCHAIR RAMP 2

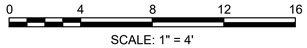
SCALE: 1" = 4'

WCR REFERENCE POINT: STA 7+02.11 - OFFSET 17.00' RT
WIDTH OF CURB = 0.5'
* CONSTRUCTION TOLERANCE +/- 0.5%

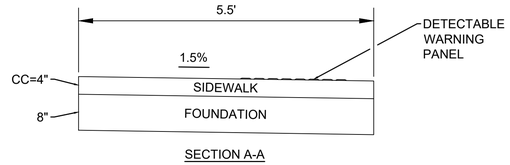


SECTION A-A

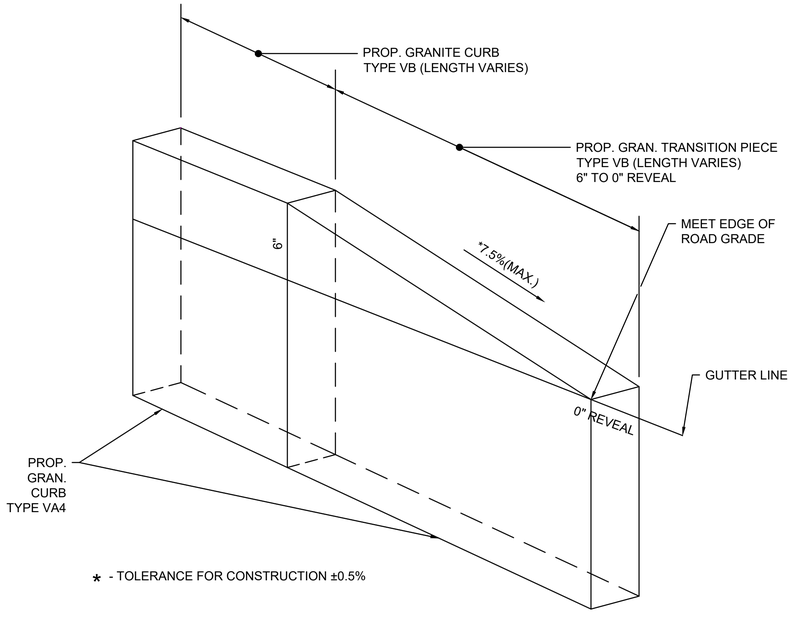
NOTE:
1. THE PERPENDICULAR DIMENSIONS TO THE CURB ALONG THE SIDEWALK INCLUDE 0.5' FOR THE WIDTH OF THE CURB.
2. WHEELCHAIR RAMP REFERENCE POINTS ARE TAKEN FROM THE BAY ROAD BASELINE TO THE GUTTER LINE AT THE CENTER OF RAMP OPENING.
3. DETECTABLE WARNING PANELS ARE REQUIRED ON ON ALL THE PROPOSED WHEELCHAIR RAMPS AND ARE TO BE INSTALLED IN ACCORDANCE WITH MASSDOT CONSTRUCTION STANDARDS.



SCALE: 1" = 4'

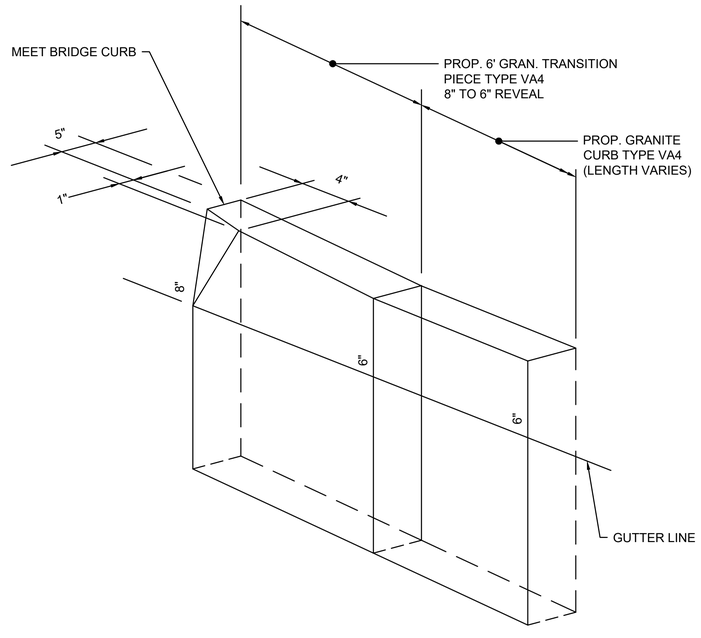


SECTION A-A



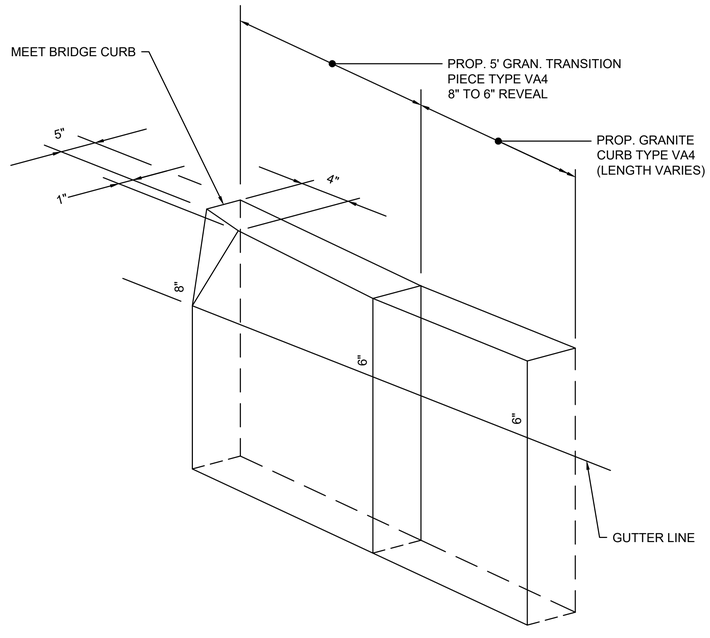
GRANITE CURB TRANSITION (6" TO 0" REVEAL)

NOT TO SCALE



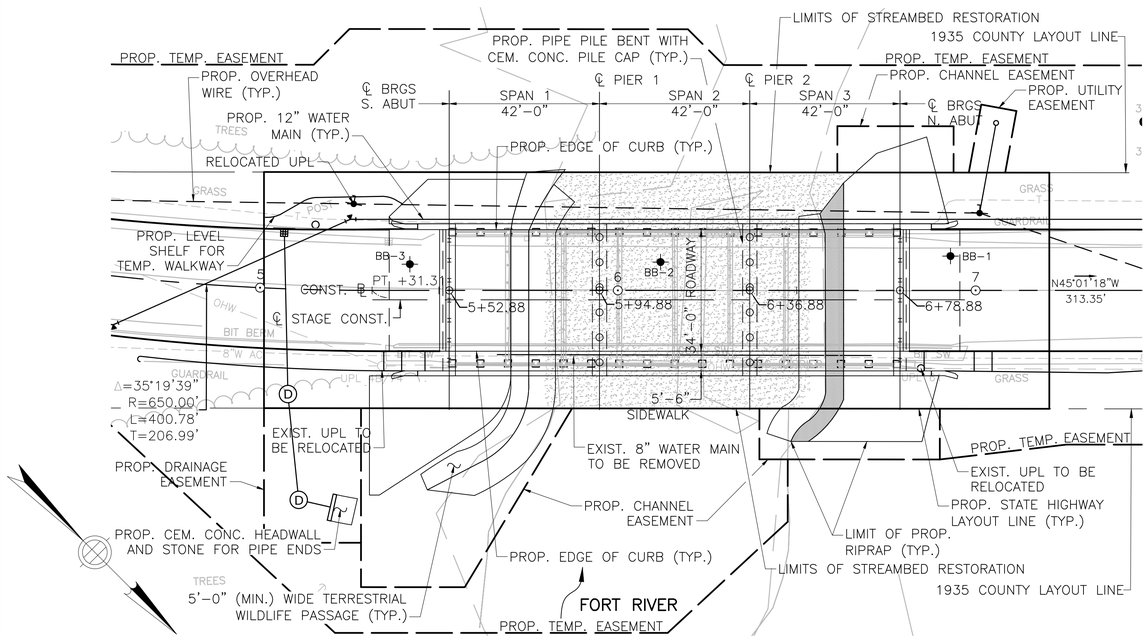
6' GRANITE CURB TRANSITION (8" TO 6" REVEAL)

NOT TO SCALE

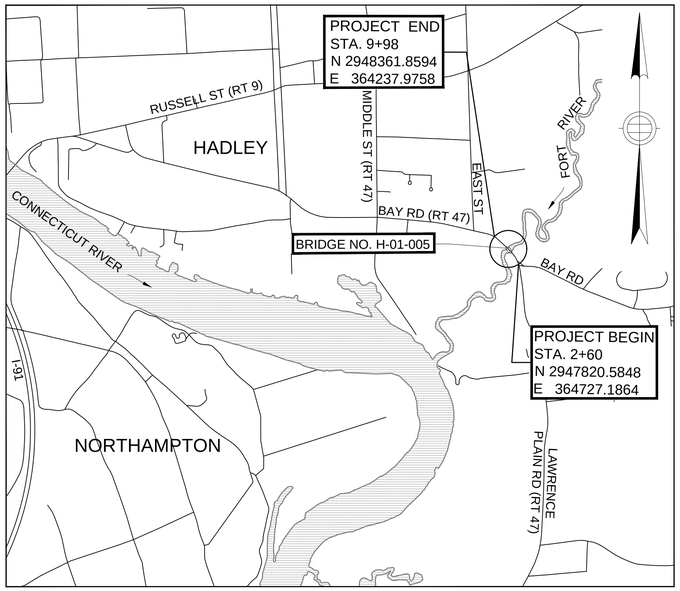


5' GRANITE CURB TRANSITION (8" TO 6" REVEAL)

NOT TO SCALE



KEY PLAN
SCALE: 1"=20'



LOCUS MAP
SCALE: 1"=1500'

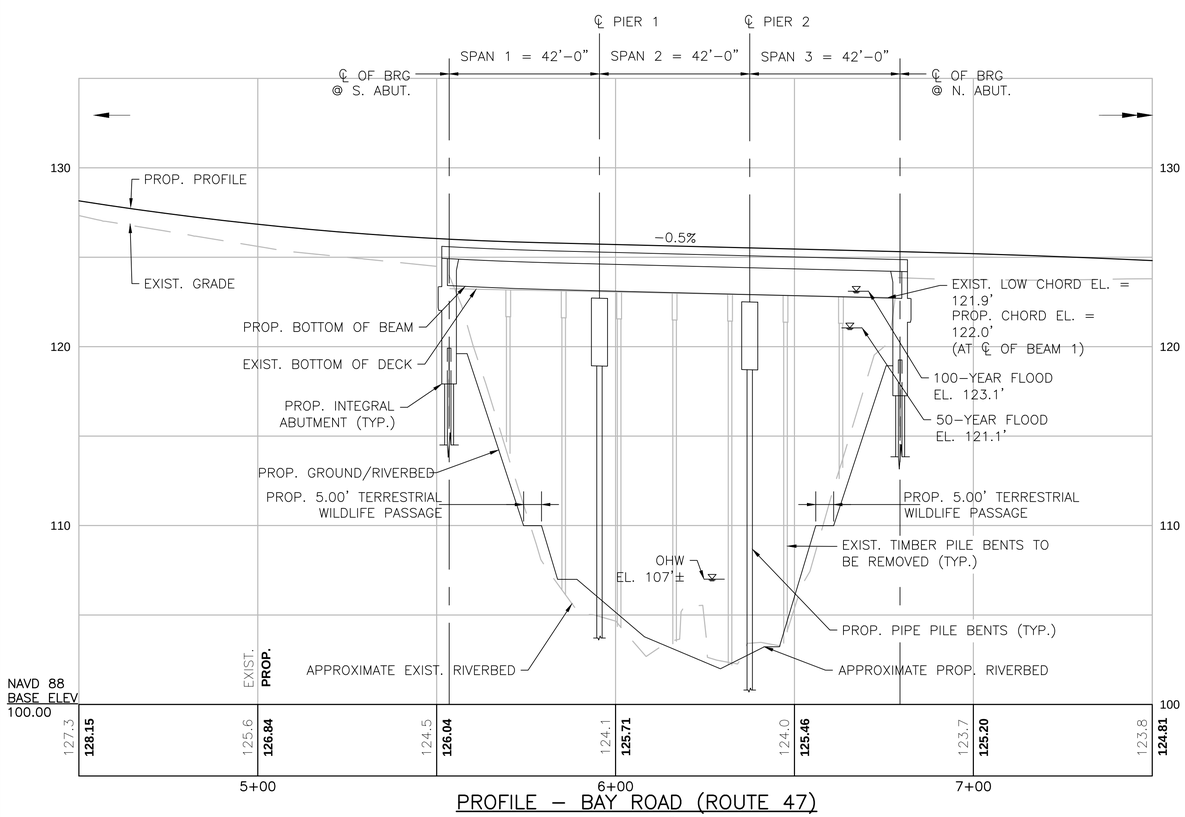
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	39	77
PROJECT FILE NO. 608460			

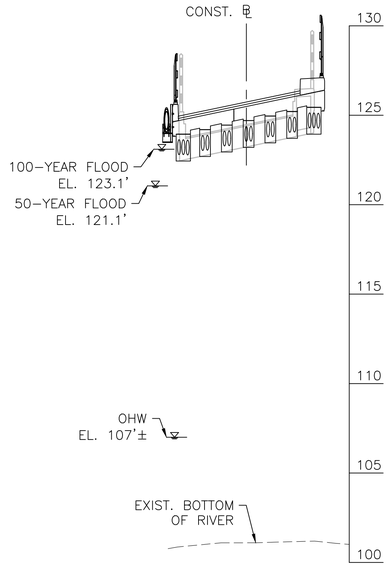
KEY PLAN, PROFILE & INDEX

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PROFILE – BAY ROAD (ROUTE 47)
HORIZONTAL: 1"=20'
VERTICAL: 1"=4'-0"



PROFILE – FORT RIVER
UNDER RTE 47 (BAY ROAD)
HORIZONTAL: 1"=20'
VERTICAL: 1"=4'-0"

P.E. STAMP SIGNATURE

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION

MassDOT Highway Division

PROPOSED BRIDGE
HADLEY
BAY ROAD (ROUTE 47)
OVER FORT RIVER
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

benesch
engineers • scientists • planners
50 REDFIELD STREET
BOSTON, MA 02122

TITLE: CHIEF ENGINEER

SHEET 1 OF 34 SHEETS BRIDGE NO. H-01-005 (C1H)

608460_BR01 (H-01-005)_KEY PLAN_INDEX.DWG Plotted on 24-Aug-2021 1:04 PM

608460 Bridge Sketch Plans 0 XX-April-2018

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	40	77
PROJECT FILE NO. 608460			

GENERAL NOTES
& QUANTITIES

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2017 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION FOR HL–93 LOADING.

EXISTING BRIDGE PLANS:

PLANS FOR EXISTING BRIDGE MAY BE SEEN AT THE OFFICE OF THE BRIDGE ENGINEER, MASSDOT, 10 PARK PLAZA, BOSTON, MASSACHUSSETTS.

EXISTING CONDITIONS:

DIMENSIONS SHOWN ON EXISTING DETAILS ARE TAKEN FROM ORIGINAL DESIGN DRAWINGS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND EXISTING DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENTS AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND ACCURACY, THEREOF.

MASSDOT BENCH MARK AND ELEVATIONS:

HORIZONTAL AND VERTICAL CONTROL WAS ESTABLISHED BY MASSDOT SURVEY, IN MASSDOT DISTRICT 2 FIELD BOOK 41273, PAGE 86, ON JULY 6, 2017. HORIZONTAL DATUM IS BASED ON THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, NAD83 (2011) EPOCH 2010.0000, VERTICAL DATUM IS NAVD 88 (COMPUTED USING GEOID12B) USING THE FOLLOWING CONTROL POINTS:

POINT	GRID NORTHING	GRID EASTING	ELEVATION	COMBINED GROUND TO GRID SCALE FACTOR
9 YC	2937327.18	358584.75	118.11	1.000035007344
448 H	2959132.00	348529.15	154.41	1.000034373289

MASSDOT ESTABLISHED THE FOLLOWING POINTS FOR THIS PROJECT:

POINT	GRID NORTHING	GRID EASTING	ELEVATION	DESCRIPTION
1933	2947789.42	364780.56	139.35	HUB AND TACK FOUND
1934	2947702.87	365166.90	155.65	IRON ROD FOUND

DATE:

TO BE PLACED ON THE INSIDE FACE OF THE NORTHWEST AND SOUTHEAST HIGHWAY GUARDRAIL TRANSITIONS. A SHEET SHOWING SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HIGHWAY GUARDRAIL TRANSITION IS CONSTRUCTED. ALL HIGHWAY GUARDRAIL TRANSITIONS SHALL FEATURE THE SAME DATE.

SURVEY:

FIELD SURVEY WAS PERFORMED BY GREEN INTERNATIONAL AFFILIATES, INC. AND WAS ELECTRONICALLY RECORDED. SEE FIELD NOTES IN MASSDOT DISTRICT 2 FIELD BOOKS 26994 AND 41263.

THE BASE MAP WAS COMPILED FROM AN ACTUAL–ON–THE–GROUND TOPOGRAPHIC SURVEY PERFORMED BETWEEN JUNE 19, 2017 AND SEPTEMBER 15, 2017.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF–SIZED PRINTS (A3).

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

SEISMIC GROUND SHAKING HAZARD:

DESIGN RETURN PERIOD: 1,000–YEAR
DESIGN SPECTRA: A_S = 0.094
S_{DS} = 0.209
S_{D1} = 0.093
SITE CLASS = D
SEISMIC DESIGN CATEGORY (SDC) = A

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL REPORT, DATED JULY 28, 2020, PREPARED BY GZA GEOENVIRONMENTAL, INC.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31, GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS
1. NONE	21"	26"
2. 12" OF CONCRETE BELOW BAR	29"	36"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING <$6d_b$	31"	39"
4. COATED BARS, ALL OTHER CASES	25"	31"
5. CONDITION 2. AND 3.	35"	44"
6. CONDITION 2. AND 4.	34"	43"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

EPOXY COATED BARS:

ALL REINFORCING BARS AND SUPPORTING DEVICES SHALL BE EPOXY COATED UNLESS NOTED OTHERWISE.

WELDING:

ALL WELDING AND THE PREPARATION AND ASSEMBLY OF MATERIAL FOR WELDING SHALL CONFORM TO THE STANDARD SPECIFICATION FOR HIGHWAYS AND BRIDGES, THE BRIDGE WELDING CODE (ANSI/AASHTO/AWS D1.5) AND ALL INTERIM REVISIONS PUBLISHED BY AASHTO AS OF BID OPENING DATE.

UTILITIES:

ALL EXISTING UTILITIES SHALL BE LOCATED AND PROTECTED BY THE CONTRACTOR.

TRAFFIC:

ONE LANE OF ALTERNATING TRAFFIC IS TO BE MAINTAINED DURING CONSTRUCTION OF BRIDGE NO. H–01–005 (C1H) AS SHOWN ON HIGHWAY TEMPORARY TRAFFIC CONTROL PLANS.

TEMPORARY OVERNIGHT CLOSURES OF THE BRIDGE FOR BEAM ERECTION AND OTHER CONSTRUCTION ACTIVITIES MAY BE PERMITTED BY THE ENGINEER. CONTRACTOR SHALL REFER TO DETOUR PLAN IN HIGHWAY DRAWINGS.

CONSTRUCTION NOTES:

NO DEBRIS OR CONSTRUCTION MATERIAL SHALL BE SPILLED OR DUMPED INTO THE FORT RIVER DURING CONSTRUCTION.

CONCRETE MIXES:

A. PRECAST HIGHWAY GUARDRAIL TRANSITION, SAFETYWALK AND SIDEWALK SHALL BE 5000 P.S.I–3/4"–685 LBS. HP CEMENT CONCRETE.
B. DECK, END DIAPHRAGM ENCASEMENTS AND PIER CAPS SHALL BE 4000 P.S.I.–3/4"–585 LBS. HP CEMENT CONCRETE.
C. APPROACH SLAB, ABUTMENT, WINGWALLS, PIER KEEPER BLOCKS AND TEMPORARY WALKWAY FOOTING SHALL BE 4000 PSI–1½"–565 CEMENT CONCRETE
D. ABUTMENT BEAM PEDESTALS AND PIER PIPE PILE INFILL SHALL BE 4000 PSI–3/4"–610 CEMENT CONCRETE

HYDRAULIC DESIGN DATA

DRAINAGE AREA: 54.6 SQUARE MILES
DESIGN FLOOD DISCHARGE: 3,460 CUBIC FEET PER SECOND
DESIGN FLOOD FREQUENCY: 50 YEARS
DESIGN FLOOD VELOCITY: 2.27 FEET PER SECOND
DESIGN FLOOD ELEVATION: 121.11 FEET, NAVD

BASE (100–YEAR) FLOOD DATA

BASE FLOOD DISCHARGE: 4,080 CUBIC FEET PER SECOND
BASE FLOOD ELEVATION: 123.10 FEET, NAVD

DESIGN AND CHECK SCOUR DATA

DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY: 100–YEAR
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY: 200–YEAR

FLOOD OF RECORD

DISCHARGE: NOT AVAILABLE
FREQUENCY (IF KNOWN): NOT AVAILABLE
MAXIMUM ELEVATION: NOT AVAILABLE
DATE: MARCH 1936
HISTORY OF ICE FLOES: NONE DOCUMENTED IN NBIS DATABASE.
EVIDENCE OF SCOUR AND EROSION: AT THE UPSTREAM ENDS OF BENTS 3, 4 & 5 SHOWN IN UNDERWATER INSPECTION REPORT, MINOR SCOUR HAS EXPOSED THE TIMBER PILES BELOW THE STEEL JACKET.

ESTIMATE OF BRIDGE QUANTITIES
(NOT GUARANTEED)

DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. H–01–005	1	LS
REINFORCED CONCRETE EXCAVATION	15	CY
TIMBER PILE REMOVE AND DISCARD	81	EA
BRIDGE EXCAVATION	515	CY
CHANNEL EXCAVATION	1,500	CY
CLASS B ROCK EXCAVATION	150	CY
GRAVEL BORROW FOR BRIDGE FOUNDATION	235	CY
CRUSHED STONE	450	TON
SUPERPAVE BRIDGE SURFACE COURSE–9.5(SSC–B–9.5)	45	TON
SUPERPAVE BRIDGE PROTECTIVE COURSE–9.5(SPC–B–9.5)	45	TON
STEEL PILE HP 12 X 84	900	FT
STEEL PIPE PILE 24 INCH OUTSIDE DIAMETER	730	FT
SHORT DURATION LOAD TEST	1	EA
DYNAMIC LOAD TEST PREPARATION	5	EA
DYNAMIC LOAD TEST BY CONTRACTOR	5	EA
PILE SHOES	26	EA
TEMPORARY EARTH SUPPORT SYSTEMS	800	SF
RIPRAP	750	CY
STREAMBED RESTORATION	175	CY
CONTROL OF WATER – STRUCTURE NO. H–01–005	1	LS
TEMPORARY WALKWAY STRUCTURE	1	LS
BRIDGE STRUCTURE, BRIDGE NO. H–01–005	1	LS

DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

608460_BR02 (H-01-005)_GENERAL NOTES.DWG Plotted on 24-Aug-2021 1:04 PM

608460 Bridge Sketch Plans 0 XX-April-2018

BB–1

TEST BORING LOG

GZA GeoEnvironmental, Inc. *Engineers and Scientists*

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-1
SHEET: 1 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Drilling Co.: Seaboard Drilling
Foreman: Jeff Nitsch
Logged By: Max Rolandi

Type of Rig: Truck Mounted
Rig Model: Mobile B-47
Drilling Method: Drive & Wash

Boring Location: N: 2948153.8, E: 364459.1
Ground Surface Elev. (ft.): 125
Final Boring Depth (ft.): 66
Date Start - Finish: 10/31/2017 - 11/1/2017

H. Datum: NAD 88
V. Datum: NAVD 88

Auger/Casing Type: HW
I.D/O.D.(in): 4.25/4.5
Hammer Weight (lb.): 300
Hammer Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D/O.D. (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other: Automatic Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
11/1/17	0844	16.5	41	18 hrs.

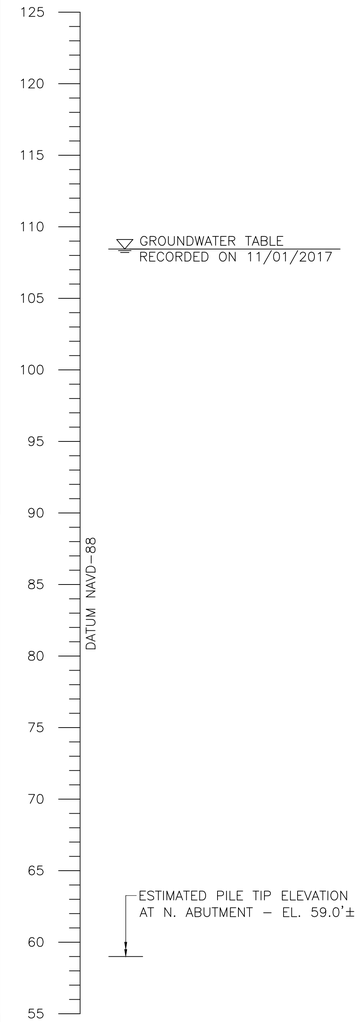
Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											0.75'	PAVEMENT	124.3'
		S-1	0.8-2.8	24	12	10 11 8 8	19	S-1: Medium dense, brown, fine SAND, little Silt.	1				
		S-2	2.8-4.8	24	12	6 4 4 3	8	S-2: Loose, light brown, fine to medium SAND, some Silt, trace fine Gravel.	2				
5		S-3	5-7	24	7	6 5 9 9	14	S-3: Medium dense, brown, fine to medium SAND, little Silt, trace Gravel.					
		S-4	7-9	24	6	8 9 9 11	18	S-4: Medium dense, brown/gray, fine SAND, little Silt.				FILL	
10		S-5	9-11	24	6	6 3 2 3	5	S-5: Loose, light brown, fine SAND, some Silt.					
		S-6	11-13	24	5	4 4 3 5	7	S-6: Loose, light brown/gray, fine SAND, some Silt.					
15		S-7	14-16	24	9	3 1 1 3	2	S-7: Very loose, gray/brown, fine to medium SAND and SILT.			16'		109.0'
		S-8	16-18	24	11	4 5 11 12	16	S-8: Medium dense, gray, fine to medium SAND, little fine Gravel, trace Silt.			16'	SAND	107.0'
20									3			GRAVEL	
											22.5'		102.5'
25		S-9	24-26	24	10	7 8 7 7	15	S-9: Medium dense, reddish brown, fine to coarse SAND, little fine Gravel, trace Silt.				SAND	
											28'		97.0'
30		S-10	29-31	24	10	10 9 10 11	19	S-10: Medium dense, gray/red, fine to medium SAND, trace Silt, trace Gravel.	4		29'	GRAVEL	96.0'
												SAND	
35		S-11	34-36	24	9	9 9 9 11	18	S-11: Medium dense, gray/red, fine to medium SAND, trace Silt.					
												SAND	
											38'		87.0'
40		S-12	39-41	24	6	10 8 8 5	16	S-12: Medium dense, light brown/gray, fine to medium SAND, someSilt, trace fine Gravel.	5		39'	GRAVEL	86.0'
45		S-13	44-46	24	6	6 10 13 12	23	S-13: Medium dense, gray, fine to coarse SAND and GRAVEL, trace Silt.				SAND	
50		S-14	49-51	24	10	13 11 14 16	25	S-14: Medium dense, gray, fine to coarse SAND, little Silt.	6				
									7		53'		72.0'
55		S-15	54-56	24	10	30 21 19 25	40	S-15: Dense, gray, fine to coarse SAND and GRAVEL, little Silt.					
60		S-16	59-61	24	9	21 21 20 23	41	S-16: Dense, gray, fine to coarse SAND, some fine Gravel, little Silt.				SAND AND GRAVEL	
65		S-17	64-66	24	9	24 21 29 20	50	S-17: Very dense, gray, fine to coarse SAND and GRAVEL, trace Silt.			66'		59.0'
								Bottom of boring at 66 feet.	8				
70													

REMARKS

1. Ground surface elevation estimated based on available GIS data from a drawing entitled " Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA" dated August 24, 2017.
2. Boring offsets: 6.5 feet northeast and 14 feet north of the northeast bridge guard rail inside edge.
3. Rig bouncing/chattering at 18 to 22.5 ft bgs during borehole washout indicating probable gravel layer.
4. Rig bouncing/grinding at 28 to 29 ft bgs during borehole washout indicating a probable gravel layer.
5. Rig bouncing/grinding at 38 to 39 ft bgs during borehole washout indicating a probable gravel layer.
6. Two inches of silt and sand in spoon tip of sample S-14.
7. Rig bouncing/grinding at 53 ft bgs during borehole washout indicating probable gravel layer.
8. Upon completion, borehole backfilled with cuttings.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-1



BB–2

TEST BORING LOG

GZA GeoEnvironmental, Inc. *Engineers and Scientists*

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-2
SHEET: 1 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Drilling Co.: Seaboard Drilling
Foreman: Doug Feeley
Logged By: Max Rolandi

Type of Rig: Truck Mounted
Rig Model: Mobile B-47
Drilling Method: Drive & Wash

Boring Location: N: 2948097.7, E: 364517.6
Ground Surface Elev. (ft.): 105.2
Final Boring Depth (ft.): 46
Date Start - Finish: 11/8/2017 - 11/8/2017

H. Datum: NAD 88
V. Datum: NAVD 88

Auger/Casing Type: HW
I.D/O.D.(in): 4.25/4.5
Hammer Weight (lb.): 300
Hammer Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D/O.D. (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other: Automatic Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
	See	Note	7	

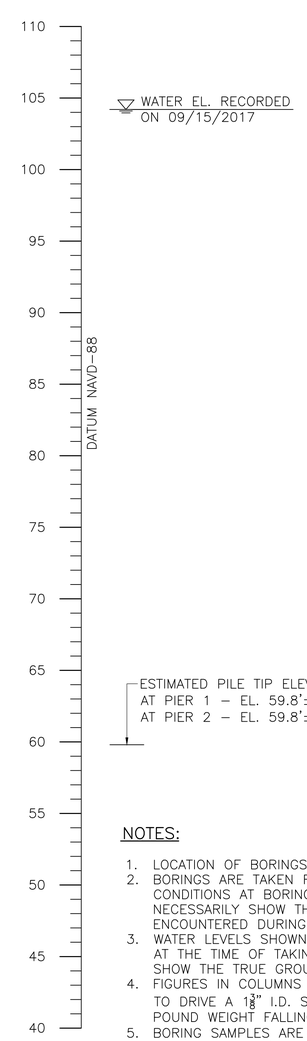
Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	8	6 1 1 2	2	S-1: Very loose, brown, fine to coarse SAND, some fine Gravel, little Silt.	1				
									2				
									3			SAND	
5		S-2	4-6	24	4	3 4 5 6	9	S-2: Loose, red/brown, fine to coarse SAND, little fine Gravel, trace Silt.			7"		98.2'
									4		8'	GRAVEL	97.2'
		S-3	8-10	24	5	3 6 5 7	11	S-3: Medium dense, brown, fine to coarse SAND, little fine Gravel, trace Silt.					
10													
15		S-4	14-16	24	4	3 3 4 4	7	S-4: Loose, brown, fine to coarse SAND, little Silt, trace fine Gravel.					
20		S-5	19-21	24	10	3 6 7 9	13	S-5: Medium dense, reddish brown, fine to medium SAND, little Silt.				SAND	
25		S-6	24-26	24	12	5 6 10 10	16	S-6: Top 4" gray, fine to coarse SAND, little Silt. Middle 3" gray, fine SAND and SILT. Bottom 5" gray, fine to coarse SAND, little Silt.	5				
30		S-7	29-31	24	10	7 7 16 20	23	S-7: Medium dense, gray, fine SAND and SILT.			30'		75.2'
												SAND AND SILT	
											33'		72.2'
35		S-8	34-36	24	7	14 16 20 16	36	S-8: Dense, brown, fine to coarse SAND and fine to GRAVEL, trace Silt.	6 7			SAND AND GRAVEL	
40		S-9	39-41	24	7	10 16 13 17	29	S-9: Medium dense, gray, fine to coarse SAND and GRAVEL, little Silt.				SAND AND GRAVEL	
45		S-10	44-46	24	2	61 44 29 10	73	S-10: Very dense, red, fine GRAVEL and fine to coarse SAND, trace Silt.			46'		59.2'
								Bottom of boring at 46 feet.	8				
50													

REMARKS

1. Ground surface elevation estimated based on available GIS data from a drawing entitled " Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA" dated August 24, 2017.
2. Driller cored through bridge deck prior to starting. Cored deck included 2 inches of asphalt plus 15 inches of reinforced concrete. Mudline was measured 20.3 feet below top of bridge deck. Sample depths are intended to be below the mudline.
3. Boring offsets: 70.5 feet north and 7 feet east of the south west bridge guard rail inside edge.
4. Rig bouncing from 7 to 8 feet below mudline indicating probable gravel layer.
5. 3-inch thick silt layer interbedded in S-6 between approximately 25.5 and 25.75 feet below mudline.
6. Rig bouncing/grinding at 33 feet below mudline. Fine sand and silt in wash water from 25 to 33 feet below mudline.
7. Boring drilled through the bridge deck, water in casing was approximately at the river level at the end of drilling.
8. Upon completion, borehole backfilled with cuttings.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-2



BORING DATA

SCALE: 1" = 5'–0"

NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLANS THUS: BB–1
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A $1\frac{3}{8}$" I.D. SPLIT SPOON SAMPLER 6" WITH A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. BORINGS BB–1 THROUGH BB–3 WERE MADE IN OCTOBER AND NOVEMBER 2017.
7. BORINGS WERE MADE BY SEABOARD DRILLING, INC., P.O. BOX 3026, SPRINGFIELD, MA 01101.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

DATE	DESCRIPTION
	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	41	77

PROJECT FILE NO. 608460

BORING DATA I

SHEET 3 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

608460_BR03-04 (H-01-005)_BORINGS.DWG Plotted on 24-Aug-2021 1:05 PM

608460 Bridge Sketch Plans () XX-April-2018

BB–3

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

MassDOT/Benesch
Bay Road (Route 47) over Fort River
Hadley, Massachusetts

BORING NO.: BB-3
SHEET: 1 of 2
PROJECT NO: 01.0173284.00
REVIEWED BY: STS

Drilling Co.: Seaboard Drilling
Foreman: Jeff Nitsch
Logged By: Max Rolandi

Type of Rig: Truck Mounted
Rig Model: Mobile B-47
Drilling Method: Drive & Wash

Boring Location: N: 2948048.6, E: 364567.6
Ground Surface Elev. (ft.): 126
Final Boring Depth (ft.): 60
Date Start - Finish: 10/30/2017 - 10/31/2017

H. Datum: NAD 88
V. Datum: NAVD 88

Auger/Casing Type: HW
I.D/O.D.(in): 4.25/4.5
Hammer Weight (lb.): 300
Hammer Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D./O.D. (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other: Automatic Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
11/1/17	0830	15	50	20 hrs.

Depth (ft)	Casing Blows/ Core Rate (min/ft)	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
											1'	ASPHALT AND BASE	125.0'
		S-1	1-3	24	3	37 77 38 30	R	S-1: Very dense, brown, fine to medium SAND, some Gravel, trace Silt.	1				
		S-2	3-5	24	4	22 20 18 14	38	S-2: Dense, fine to medium SAND, little Silt, trace fine Gravel.	2				
5													
		S-3	7-9	24	0	3 3 2 2	5	S-3: No recovery. (Gravel in tip of splitspoon)	3				
		S-4	9-11	24	6	3 2 3 3	5	S-4: Loose, brown, fine SAND, little Silt, trace fine Gravel.				FILL	
10		S-5	11-13	24	6	3 4 4 4	8	S-5: Loose, brown, fine SAND, little Silt, trace fine Gravel.					
		S-6	13-15	24	8	4 4 5 6	9	S-6: Loose, brown, fine SAND, little Silt, trace fine Gravel.					
15		S-7	15-17	24	8	5 8 12 20	20	S-7: Medium dense, brown, fine SAND, little Silt, little fine Gravel.	5		16.9'		109.1'
		S-8	17-19	24	6	12 11 17 30	28	S-8: Medium dense, brown/gray, fine to coarse SAND and GRAVEL, trace Sit.					
20									6				
25		S-9	24-26	24	2	19 15 15 12	30	S-9: Dense, brown/gray, fine to coarse GRAVEL, some fine to coarse Sand, trace Silt.	7			SAND AND GRAVEL	
		S-10	28-30	24	8	37 10 9 9	19	S-10: Medium dense, gray/brown, fine to coarse SAND and fine GRAVEL, trace Silt.					
30											33'		93.0'
		S-11	33-35	24	2	5 4 7 8	11	S-11: Medium dense, gray, fine to medium SAND, some Silt.				SAND	
35													
40		S-12	38-40	24	11	14 11 13 14	24	S-12: Medium dense, reddish gray, fine to medium SAND, trace Silt.				SAND	
		S-13	43-45	24	13	21 25 27 24	52	S-13: Top 6": reddish gray, fine SAND and SILT. Bottom 7": reddish gray, fine to coarse SAND and GRAVEL, little Silt.			43'		83.0'
45												SAND AND GRAVEL	
											47'		79.0'
		S-14	48-50	24	10	51 24 22 21	46	S-14: Dense, reddish gray, fine to coarse SAND and GRAVEL, little Silt.	8		48'	GRAVEL	78.0'
50									9				
		S-15	53-55	24	3	39 19 19 20	38	S-15: Dense, brown/gray, fine to coarse GRAVEL and SAND, trace Silt.				SAND AND GRAVEL	
55													
		S-16	58-60	24	7	32 30 18 10	48	S-16: Dense, red, fine to medium SAND, some fine Gravel, little Silt.					
60											60'		66.0'
								Bottom of boring at 60 feet.	10				
65													

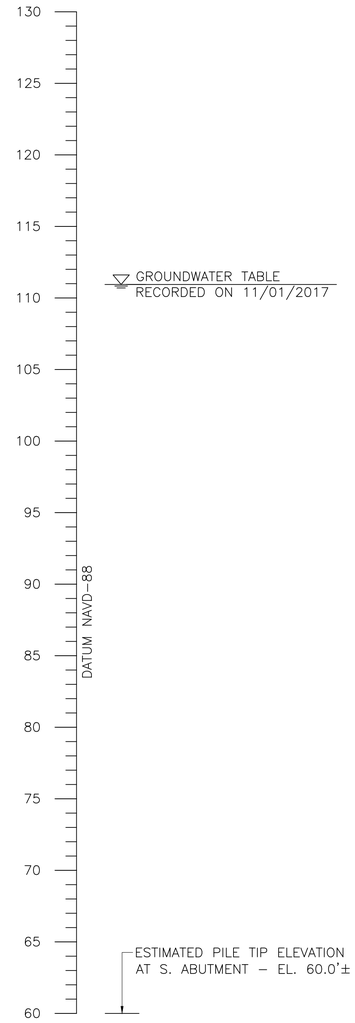
REMARKS

1. Ground surface elevation estimated based on available GIS data from a drawing entitled " Exploration Location Plan for Proposed Bridge Replacement in Hadley, MA" dated August 24, 2017.
2. Boring offsets: 7.9 feet east and 10.5 feet southeast of the south west bridge guardrail inside edge.
3. Piece of gravel caught between casing and rollerbit. Casing spinning during boring cleanout. Driller cleaned borehole down to 7 feet below ground surface (ft bgs) to clear the stuck gravel particles.
5. Bottom two inches of S-7 was sand and gravel.
6. Rig bouncing/grinding during wash from 20 to 24 ft bgs indicating a probable gravel layer.
7. Rig bouncing/grinding during wash from 24 to 28 ft bgs indicating a probable gravel layer.
8. Rig bouncing/grinding during wash from 47 to 48 ft bgs indicating a probable gravel layer.
9. Driller stopped on 10/30/17 at 50 ft bgs. Casing driving flush with ground surface. Drilling resumed on 10/31/17.
10. Upon completion, borehole backfilled with cuttings.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: BB-3

BORING DATA
SCALE: 1" = 5'–0"



NOTES:

1. FOR BORING NOTES, SEE SHEET 3.

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	42	77
PROJECT FILE NO. 608460			

BORING DATA II

DATE	DESCRIPTION
	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

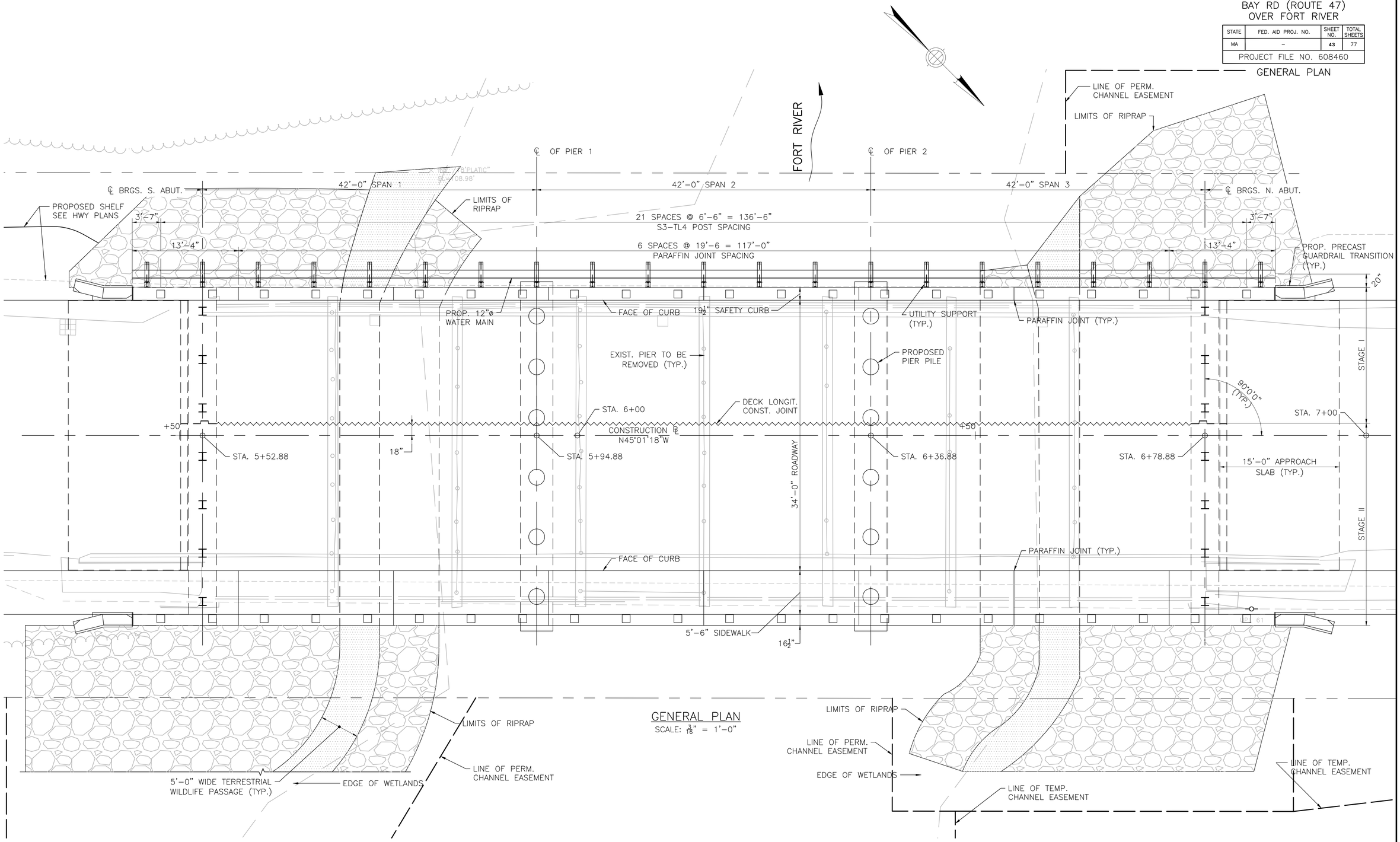
608460_BR03-04 (H-01-005)_BORINGS.DWG Plotted on 24-Aug-2021 1:05 PM

608460 Bridge Sketch Plans () XX-April-2018

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	43	77
PROJECT FILE NO. 608460			

GENERAL PLAN



GENERAL PLAN
SCALE: $\frac{3}{16}$" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 5 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

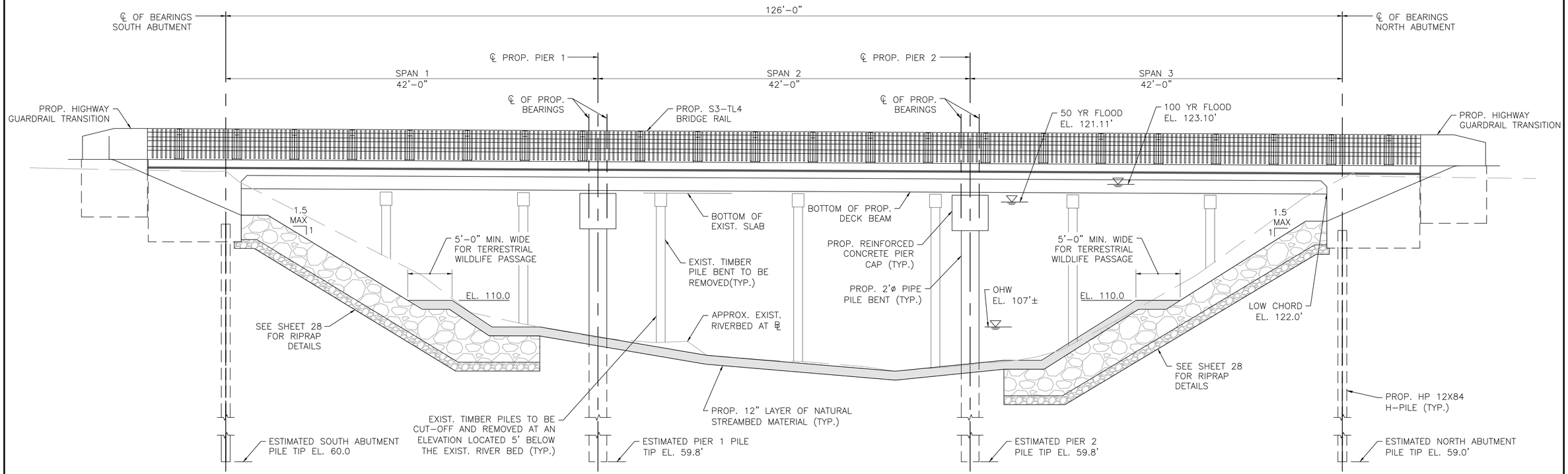
608460_BR05 (H-01-005)_GENERAL PLAN.DWG Plotted on 24-Aug-2021 1:07 PM

608460 Bridge Sketch Plans () XX-April-2018

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	44	77
PROJECT FILE NO. 608460			

GENERAL ELEVATION



EAST ELEVATION
SCALE: $\frac{3}{16}$" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 6 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

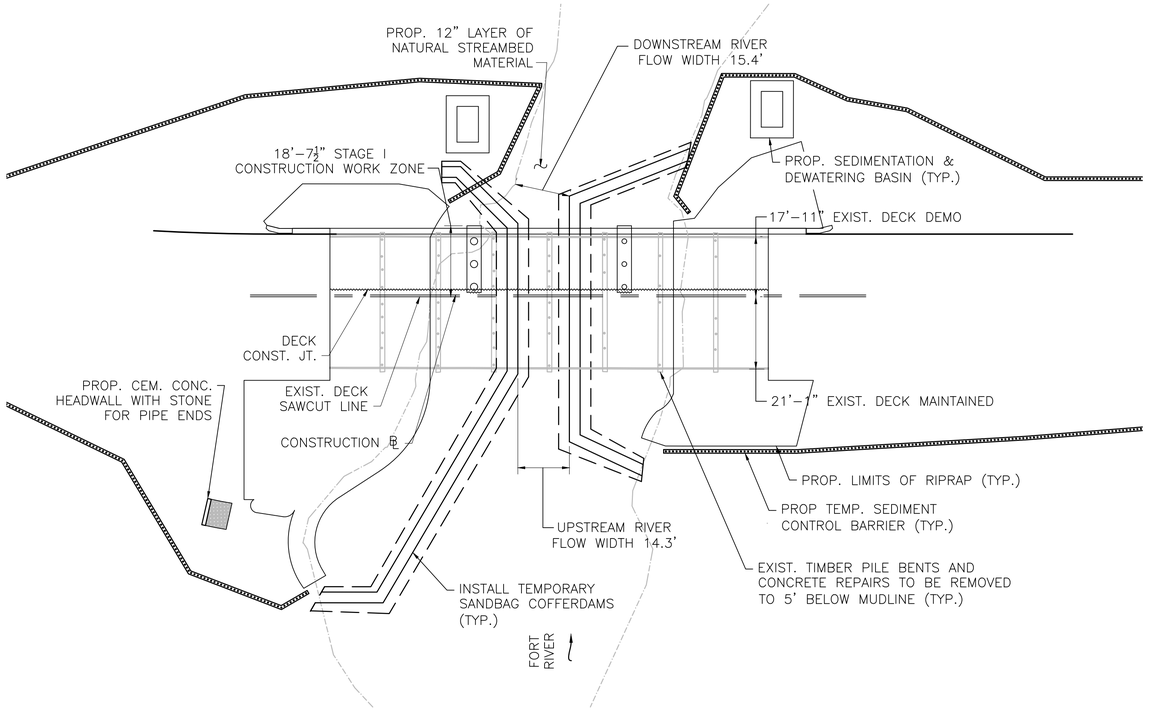
608460_BR06 (H-01-005)_GENERAL ELEVATION.DWG Plotted on 24-Aug-2021 1:08 PM

608460 Bridge Sketch Plans () XX-April-2018

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

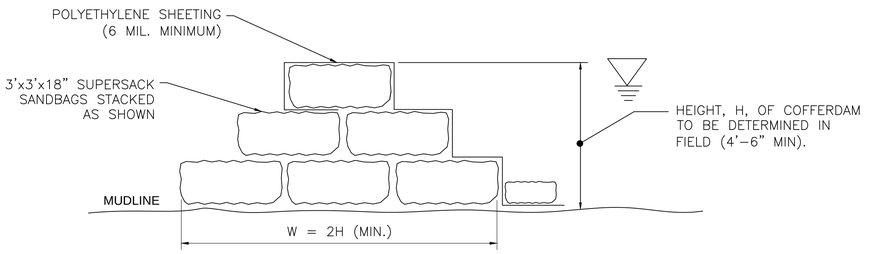
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	47	77
PROJECT FILE NO. 608460			

WORK–IN–WATER STAGE I



WORK–IN–WATER STAGE I

SCALE: 20' = 1'–0"

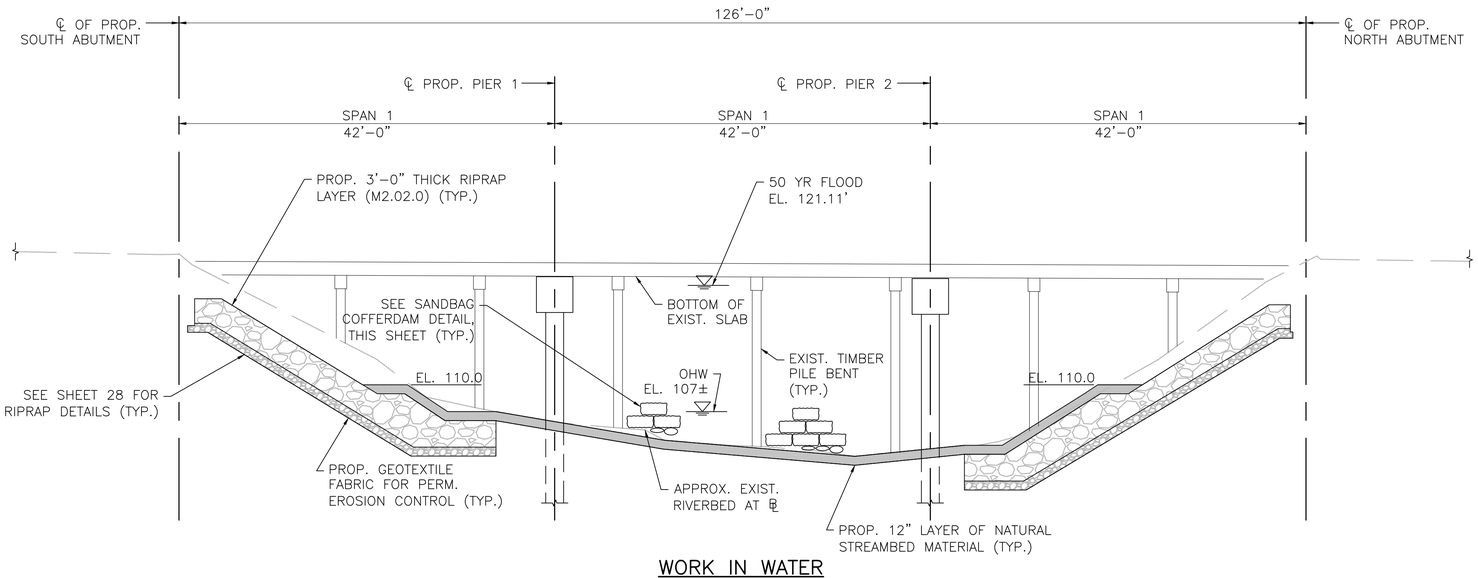


SANDBAG NOTES:

1. SANDBAG COFFERDAM IS TO BE CONSTRUCTED IN A PYRAMID SHAPE BASED ON THE REQUIRED HEIGHT AND NUMBER OF BAGS REQUIRED.
2. THE SANDBAGS ARE TO BE PLACED OVERLAPPING ALONG THE LENGTH OF THE COFFERDAM.

SANDBAG COFFERDAM DETAIL

NOT TO SCALE



WORK IN WATER
LONGITUDINAL SECTION – STAGE I

SCALE: ⅛" = 1'–0"

WORK-IN-WATER - STAGE I NOTES:

1. THIS WORK IN WATER PLAN IS TO BE IN PLACE DURING THE STAGE I AND STAGE II SEQUENCES OF CONSTRUCTION OF THE BRIDGE.
2. COFFERDAMS SHOWN ARE CONCEPTUAL ONLY. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, INSTALLATION, AND REMOVAL OF WATER CONTROL METHODS FOR THE CONSTRUCTION OF THE PROPOSED PIERS AND THE REMOVAL OF THE EXISTING PIERS THAT ARE IN ACCORDANCE WITH THE PERMITTING REQUIREMENTS.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

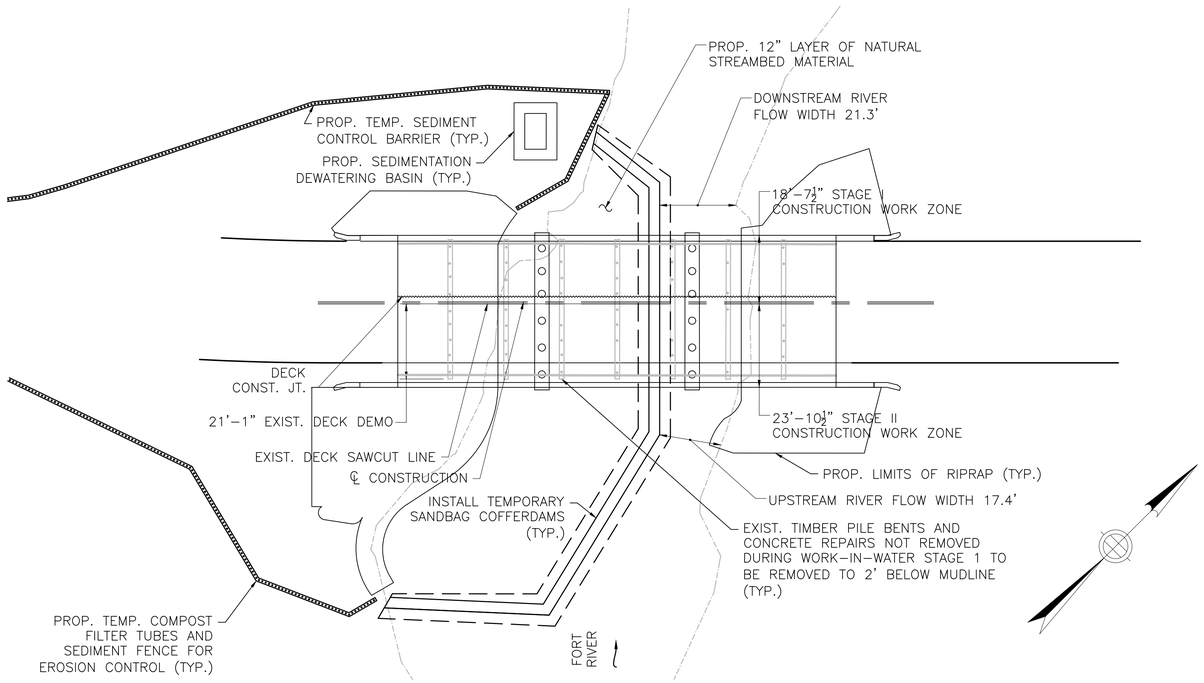
608460_BR09-10 (H-01-005)_WORK IN WATER.DWG Plotted on 24-Aug-2021 1:09 PM

608460 Bridge Sketch Plans () XX-April-2018

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	48	77
PROJECT FILE NO. 608460			

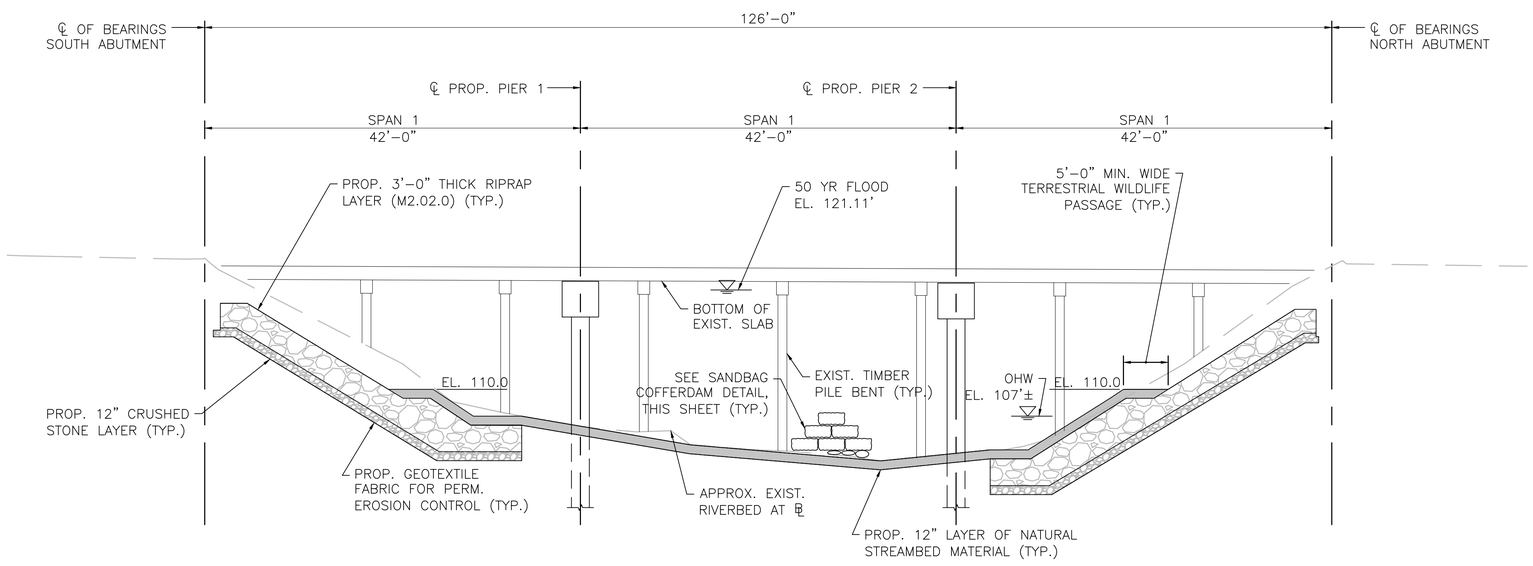
WORK–IN–WATER STAGE II



WORK–IN–WATER STAGE II
SCALE: 20' = 1'–0"

WORK-IN-WATER - STAGE II NOTES:

1. THIS WORK IN WATER PLAN IS TO BE IN PLACE DURING THE COMPLETION OF STREAMBED RESTORATION NOT COMPLETED DURING WORK–IN–WATER STAGE I.
2. COFFERDAMS SHOWN ARE CONCEPTUAL ONLY. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, INSTALLATION, AND REMOVAL OF WATER CONTROL METHODS FOR THE CONSTRUCTION OF THE PROPOSED PIERS AND THE REMOVAL OF THE EXISTING PIERS THAT ARE IN ACCORDANCE WITH THE PERMITTING REQUIREMENTS.



WORK IN WATER
ELEVATION – STAGE II
SCALE: ⅛" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 10 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

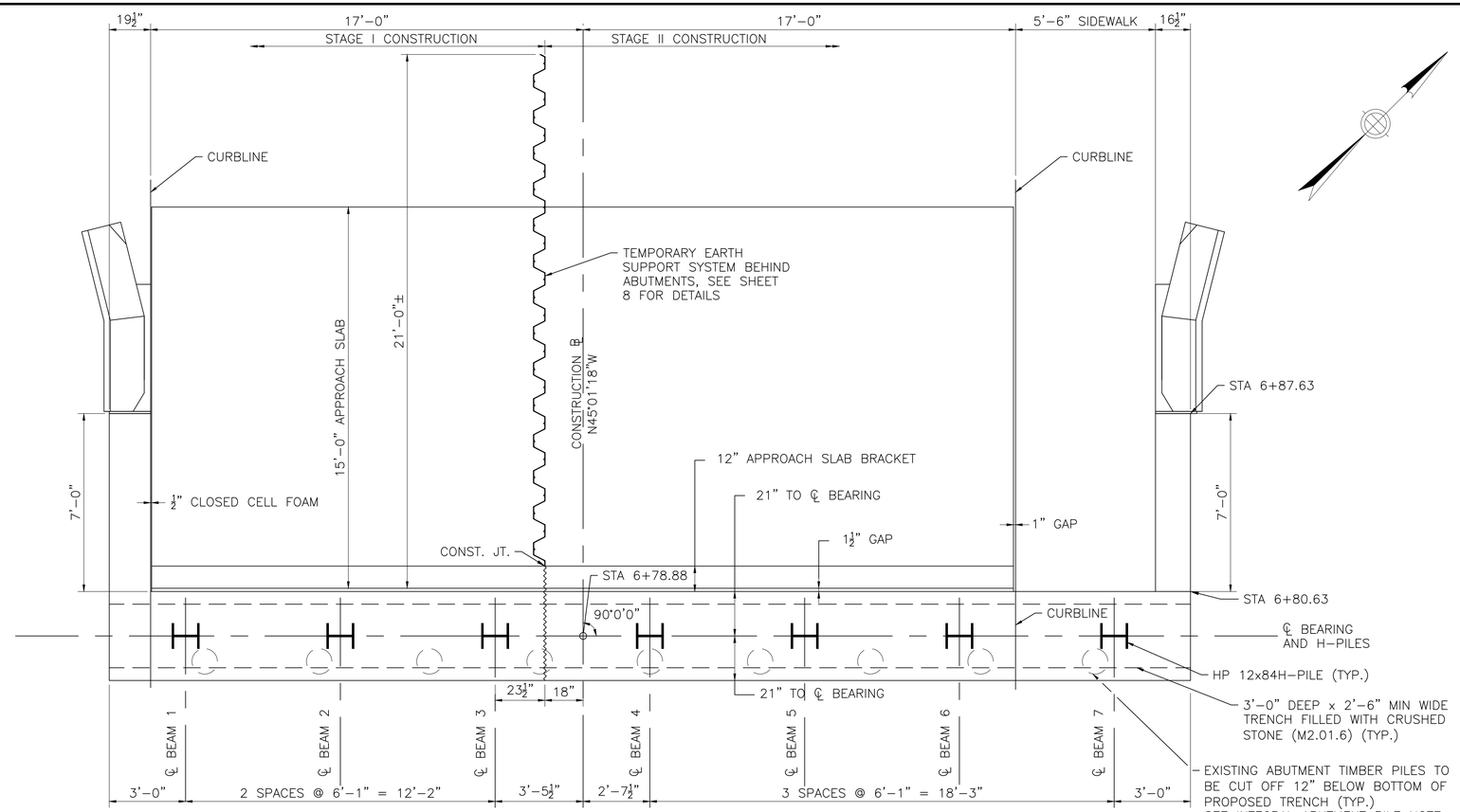
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608460 Bridge Sketch Plans () XX-April-2018

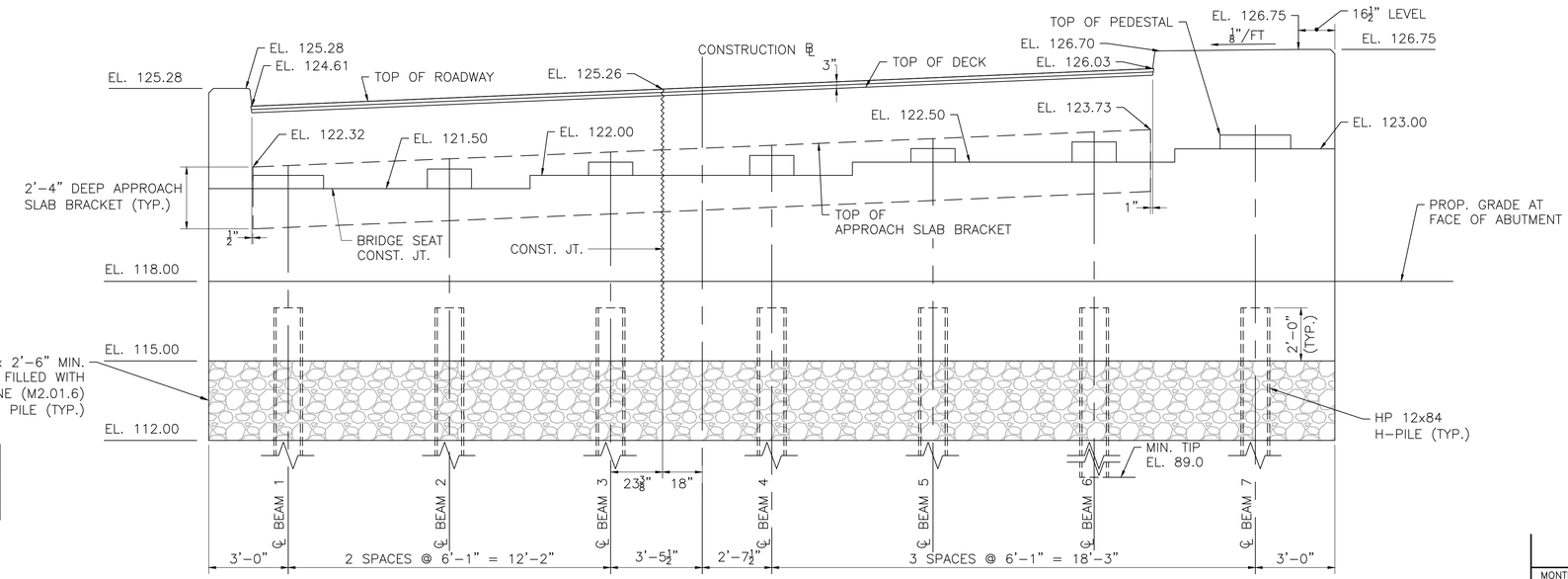
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	49	77
PROJECT FILE NO. 608460			

NORTH ABUTMENT
PLAN AND ELEVATION



NORTH ABUTMENT PLAN
SCALE: ⅜" = 1'–0"



NORTH ABUTMENT ELEVATION
SCALE: ⅜" = 1'–0"

TOP OF PEDESTAL ELEVATIONS			
BM. #1	122.00	BM. #5	123.01
BM. #2	122.24	BM. #6	123.26
BM. #3	122.50	BM. #7	123.52
BM. #4	122.75		

NOTE:

ELEVATIONS DO NOT INCLUDE ERECTION PAD THICKNESS.

NOTES:

1. ALL ELEVATIONS ARE SHOWN AT ABUTMENT CENTERLINE
2. DETAILS ABOVE DECK LEVEL AND INDEPENDENT WINGWALLS OMITTED FOR CLARITY

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 11 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

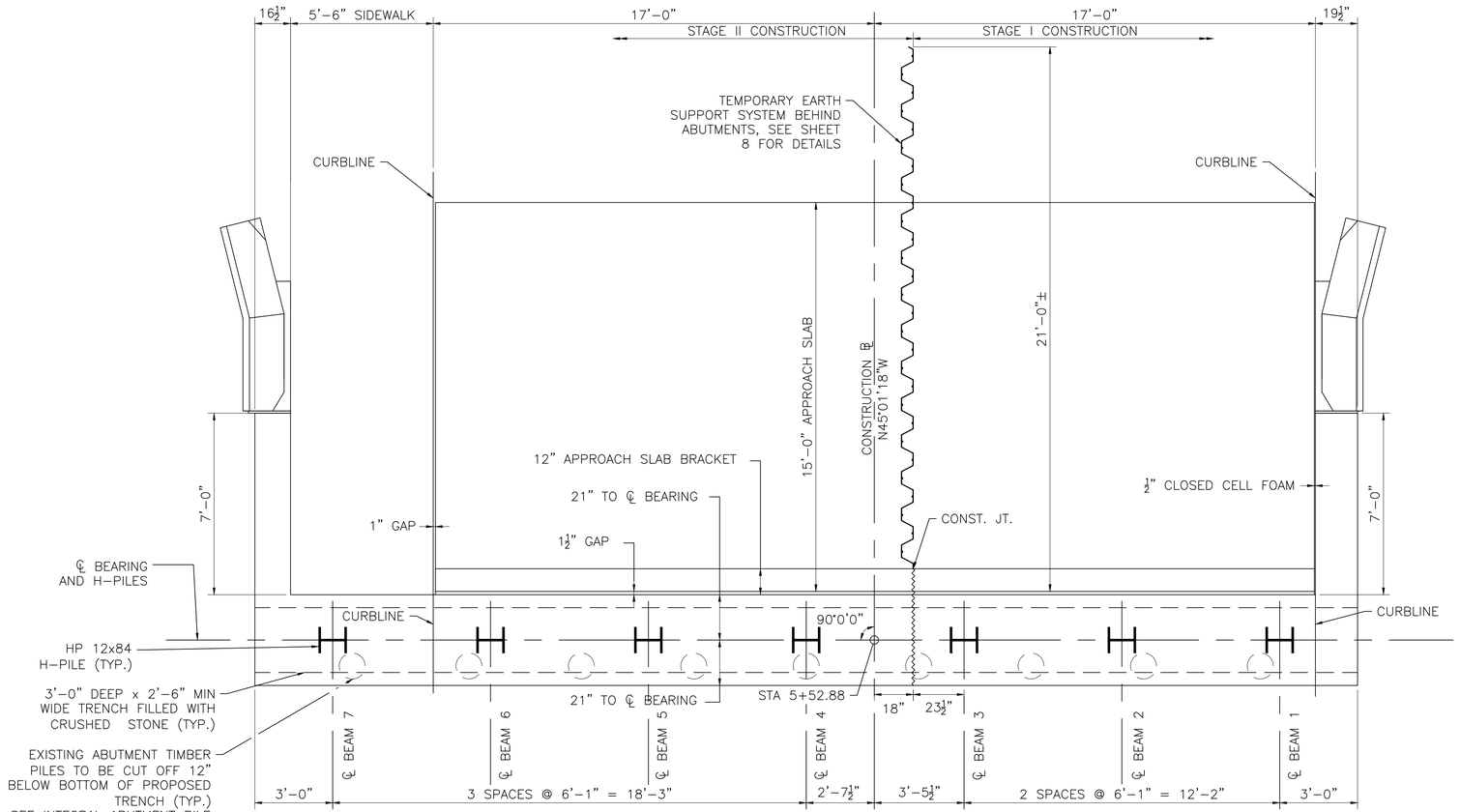
608460_BR11-14 (H-01-005)_ABUTMENTS.DWG Plotted on 24-Aug-2021 1:11 PM

608460 Bridge Sketch Plans 0 XX-April-2018

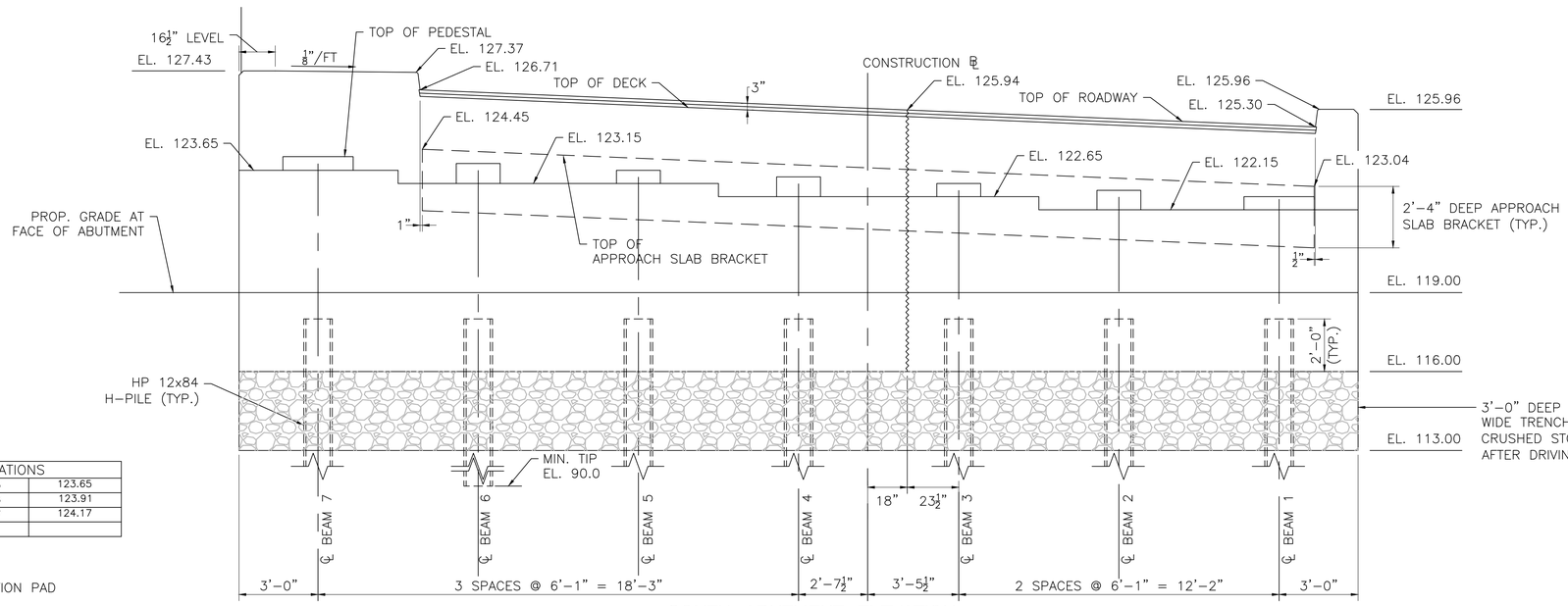
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	50	77
PROJECT FILE NO. 608460			

SOUTH ABUTMENT
PLAN AND ELEVATION



SOUTH ABUTMENT PLAN
SCALE: ⅜" = 1'–0"



SOUTH ABUTMENT ELEVATION
SCALE: ⅜" = 1'–0"

TOP OF PEDESTAL ELEVATIONS			
BM. #1	122.65	BM. #5	123.65
BM. #2	122.89	BM. #6	123.91
BM. #3	123.15	BM. #7	124.17
BM. #4	123.40		

NOTE:

ELEVATIONS DO NOT INCLUDE ERECTION PAD THICKNESS.

NOTES:

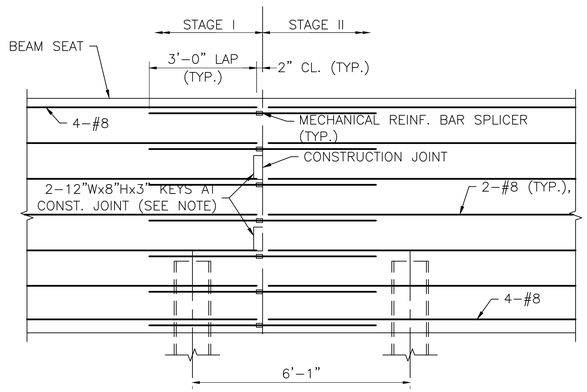
1. ALL ELEVATIONS ARE SHOWN AT ABUTMENT CENTERLINE
2. DETAILS ABOVE DECK LEVEL AND INDEPENDENT WINGWALLS OMITTED FOR CLARITY

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 12 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

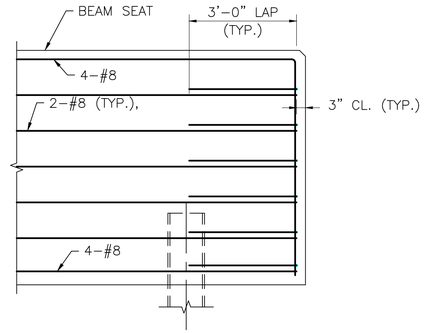
608460_BR11-14 (H-01-005)_ABUTMENTS.DWG Plotted on 24-Aug-2021 1:12 PM

608460 Bridge Sketch Plans () XX-April-2018



ELEVATION – ABUTMENT REINFORCING DETAIL AT CONSTRUCTION JOINT

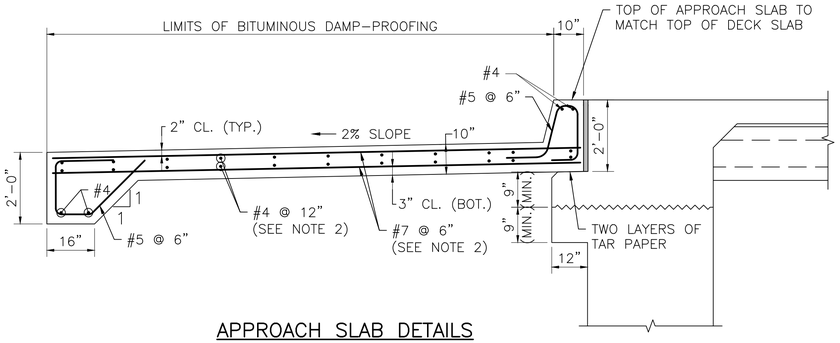
SCALE: $\frac{1}{2}$" = 1'–0"



ELEVATION – END OF ABUTMENT REINFORCING DETAIL

SCALE: $\frac{1}{2}$" = 1'–0"

NOTES:
KEY TO BE SLIGHTLY TAPERED.



APPROACH SLAB DETAILS

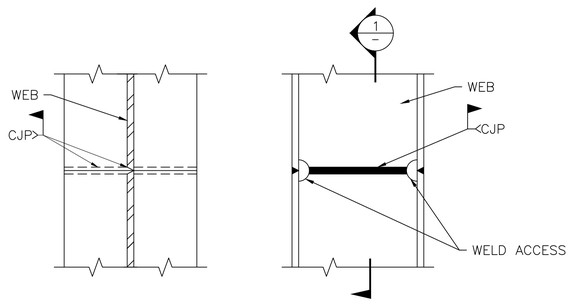
SCALE: $\frac{1}{2}$" = 1'–0"

NOTES:

1. APPROACH SLAB TO BE 4000 PSI, 1 1/2 IN, 565 CEMENT CONCRETE.
2. PLACE LONGITUDINAL REINFORCEMENT PARALLEL TO CENTERLINE OF CONSTRUCTION. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO ABUTMENT.

INTEGRAL ABUTMENT PILE NOTES:

1. A TRENCH WITH A DEPTH OF 3'–0" AND A MINIMUM WIDTH OF 2'–6" SHALL BE CONSTRUCTED DIRECTLY BELOW THE BOTTOM OF THE PILE CAP ELEVATION. AFTER THE PILES ARE DRIVEN. THE TRENCH SHALL BE FILLED WITH CRUSHED STONE (M2.01.6).
2. ALL SPLICES SHALL HAVE COMPLETE PENETRATION BUTT WELDS. THERE SHALL BE NO SPLICES WITHIN THE TOP 20 FEET OF PILE. SPLICE WELDS SHALL BE 100% UT.
3. THE FACTORED AXIAL DESIGN LOAD PER PILE IS 153 KIPS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
4. THE FACTORED STRUCTURAL RESISTANCE PER PILE IS 704 KIPS AND IS THE PRODUCT OF THE NOMINAL STRUCTURAL RESISTANCE OF 1006 KIPS AND A RESISTANCE FACTOR OF 0.70
5. THE FACTORED GEOTECHNICAL PILE RESISTANCE IS 154 KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF 192 KIPS AND A RESISTANCE FACTOR OF 0.80.
6. DETERMINATION OF THE DRIVEN PILE RESISTANCE, PILE DRIVING CRITERIA, AND THE PILE INTEGRITY SHALL BE BASED ON SUCCESSFUL STATIC PILE LOAD TESTING ON ONE SACRIFICIAL PILE AND DYNAMIC TESTING USING THE PILE DRIVING ANALYZER (PDA) TESTING METHOD WITH A RESISTANCE FACTOR OF 0.80. DYNAMIC TESTING SHALL BE PERFORMED ON THE SACRIFICIAL TEST PILE AND ONE PRODUCTION PILE PER ABUTMENT (THREE PDA TESTS TOTAL). PILES SHALL BE INSTALLED TO ACHIEVE A FACTORED GEOTECHNICAL RESISTANCE EQUAL TO OR GREATER THAN THE FACTORED AXIAL DESIGN LOAD. THE SACRIFICIAL LOAD TEST PILE SHALL BE LOCATED AT THE NORTH ABUTMENT AT A LOCATION AS AGREED TO BY THE CONTRACTOR AND ENGINEER.
7. THE CONTRACTOR SHALL SUBMIT A PILE SCHEDULE, PILE INSTALLATION, AND PILE DRIVING/TESTING PLAN FOR REVIEW AND APPROVAL OF THE ENGINEER.
8. PILES SHALL CONFORM TO AASHTO M270 GRADE 50.
9. HEAVY DUTY PILE SHOES SHALL BE INSTALLED ON THE TIPS OF ALL PILES. PREFABRICATED PILE SHOES MAY BE USED IF APPROVED BY THE ENGINEER.
10. UPON EXCAVATION AND DEMOLITION OF THE EXISTING ABUTMENT, CONTRACTOR SHALL CONFIRM LOCATION OF EXISTING TIMBER PILES. EXISTING TIMBER PILES IN CONFLICT SHALL BE EXTRACTED BY THE CONTRACTOR. ANY VOID LEFT IN THE GROUND AFTER EXTRACTING THE PILE SHALL BE FILLED WITH $\frac{3}{8}$" CRUSHED STONE (M2.01.6). EXISTING PILES NOT IN CONFLICT WITH THE NEW ABUTMENT PILES SHALL BE CUT OFF.
11. PILES SHALL BE DRIVEN TO A MINIMUM TIP ELEVATION OF 90.0' AT THE SOUTH ABUTMENT AND 89.0' AT THE NORTH ABUTMENT FOR LATERAL FIXITY. PILES SHALL BE DRIVEN DEEPER IF REQUIRED TO ACHIEVE THE MINIMUM REQUIRED NOMINAL GEOTECHNICAL RESISTANCE OF 192 KIPS.
12. REFER TO SPECIAL PROVISIONS FOR ADDITIONAL PILE INFORMATION.



SECTION 1 ELEVATION

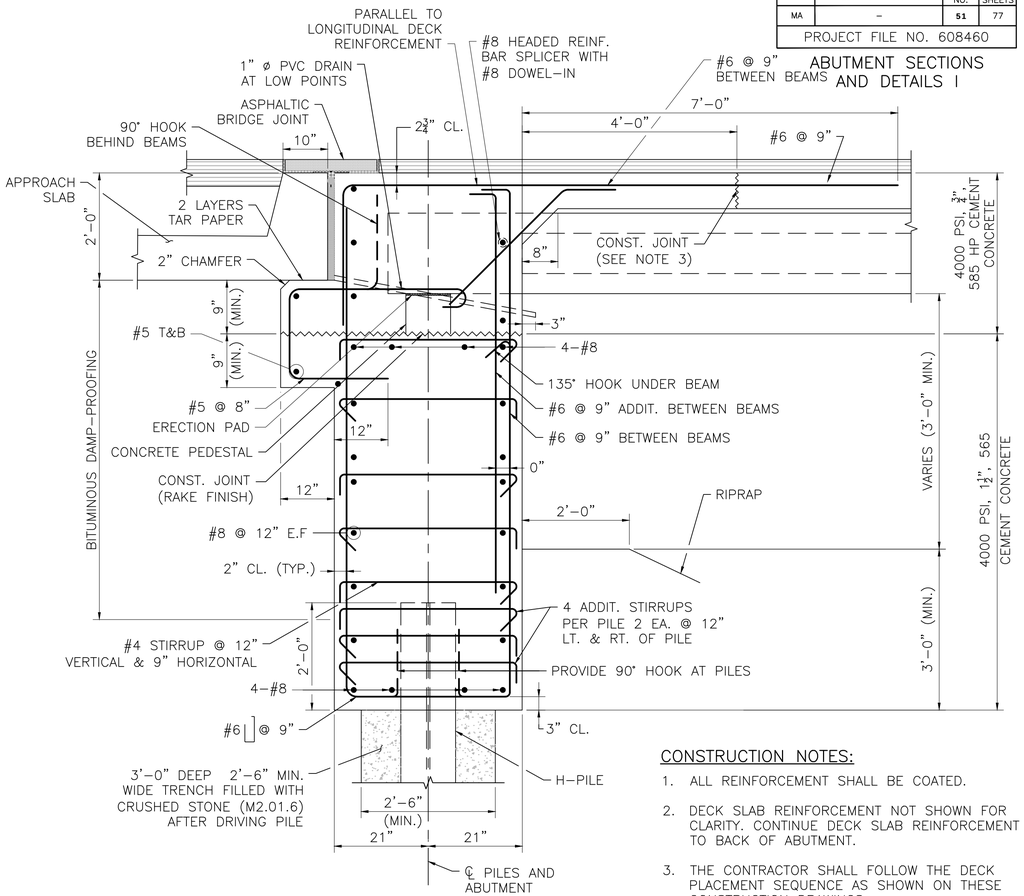
REQUIRED PILE LOCATION TOLERANCES:

1. CONFORMANCE TO THE FOLLOWING TOLERANCES IS OF EXTREME IMPORTANCE TO FOUNDATIONS OF THIS TYPE.
2. PRIOR TO DRIVING, EACH ABUTMENT PILE SHALL BE HELD BY TEMPLATE TO WITHIN 1" OF PLAN LOCATION.
3. AFTER EACH ABUTMENT PILE IS DRIVEN, THE TOP OF THE PILE SHALL BE WITHIN 3" OF PLAN LOCATION.

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	51	77
PROJECT FILE NO. 608460			

ABUTMENT SECTIONS AND DETAILS I



TYPICAL ABUTMENT SECTION

SCALE: $\frac{3}{4}$" = 1'–0"

NOTES:

1. ALL WELDS SHALL BE COMPLETE PENETRATION AND SHALL CONFORM TO THE ANSI/AASHTO/AWS BRIDGE WELDING CODE, D1.5.
2. WELDING PROCEDURE SPECIFICATIONS MUST BE APPROVED BY THE ENGINEER PRIOR TO WELDING.
3. WHENEVER POSSIBLE ALL PILES SHALL BE SPLICED ON THE GROUND IN THE FLAT POSITION.
4. WEB SHALL BE COPED TO ALLOW FOR COMPLETE PENETRATION WELDING OF FLANGES.
5. WELDING MECHANICAL PILE SPLICERS MAY BE USED PROVIDED THAT COMPLETE DETAILS AND WELDING PROCEDURES HAVE BEEN REVIEWED AND APPROVED BY THE ENGINEER.

CONSTRUCTION NOTES:

1. ALL REINFORCEMENT SHALL BE COATED.
2. DECK SLAB REINFORCEMENT NOT SHOWN FOR CLARITY. CONTINUE DECK SLAB REINFORCEMENT TO BACK OF ABUTMENT.
3. THE CONTRACTOR SHALL FOLLOW THE DECK PLACEMENT SEQUENCE AS SHOWN ON THESE CONSTRUCTION DRAWINGS.
4. ALL CONCRETE SHALL CONTAIN SUPERPLASTICIZER TO ENSURE ADEQUATE CONSOLIDATION.
5. BOTH ABUTMENTS SHALL BE BACKFILLED SIMULTANEOUSLY. NO MORE THAN TWO (2) FEET OF DIFFERENTIAL BACKFILL HEIGHT SHALL BE PERMITTED. BACKFILLING SHALL NOT BEGIN UNTIL THE ABUTMENT AND DECK CONSTRUCTION IS COMPLETE.
6. THE CONTRACTOR MAY USE MECHANICAL REINFORCING BAR SPLICERS IN LIEU OF TENSION LAP SPLICES TO FACILITATE CONSTRUCTION. HOWEVER, NO ADDITIONAL COMPENSATION WILL BE PROVIDED FOR THE USE OF MECHANICAL REINFORCING BAR SPLICERS.
7. MECHANICAL REINFORCING BAR SPLICERS SHALL BE INSTALLED AT STAGE CONSTRUCTION JOINTS FOR ALL TRANSVERSE REINFORCEMENT.
8. THE TOP OF THE APPROACH SLAB SHALL MATCH THE TOP OF THE CONCRETE DECK SLAB.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

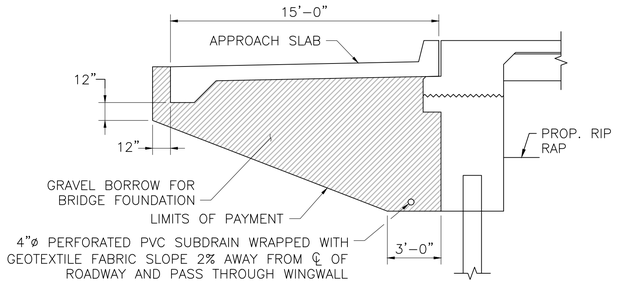
608460_BR11-14 (H-01-005)_ABUTMENTS.DWG Plotted on 24-Aug-2021 1:14 PM

608460 Bridge Sketch Plans () XX-April-2018

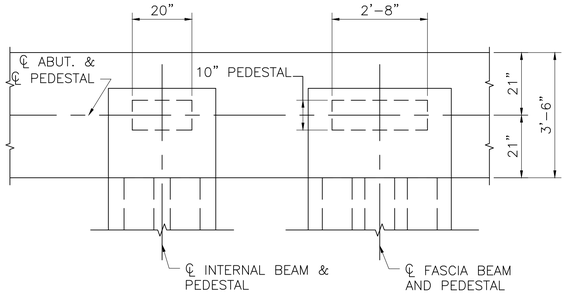
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	52	77
PROJECT FILE NO. 608460			

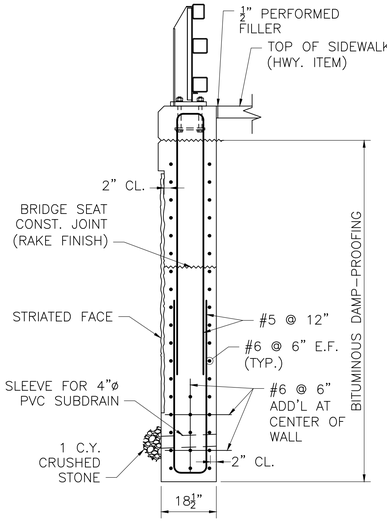
ABUTMENT SECTIONS AND DETAILS II



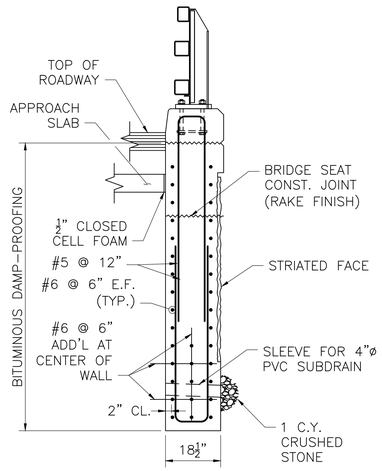
INTEGRAL ABUTMENT BACKFILL
SCALE: ¼" = 1'–0"



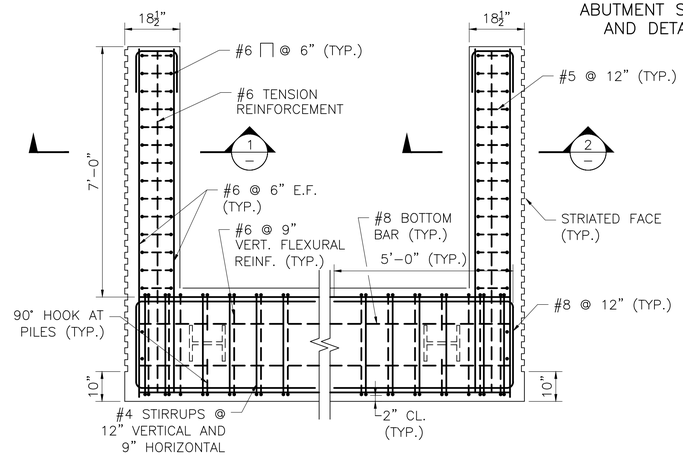
ABUTMENT PEDESTAL PLAN
SCALE: ½" = 1'–0"



WINGWALL WITH SIDEWALK
SECTION 1
SCALE: ½" = 1'–0"

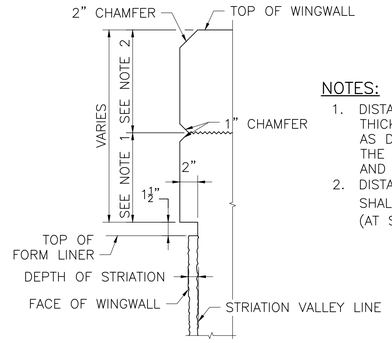


WINGWALL WITH SAFETY CURB
SECTION 2
SCALE: ½" = 1'–0"



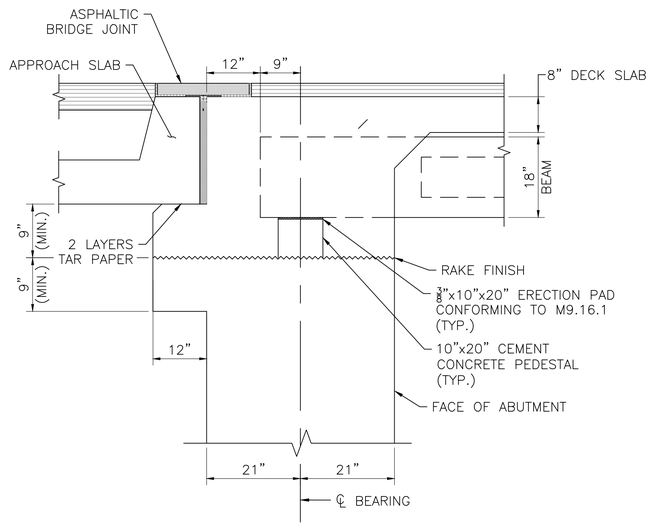
NOTE:
1. SECTION IS TAKEN BELOW CAP TOP LONGITUDINAL REINFORCEMENT AT BRIDGE SEAT CONSTRUCTION JOINT.

TYPICAL ABUTMENT HORIZONTAL SECTION
(SOUTH ABUTMENT SHOWN, NORTH ABUTMENT SIMILAR, OPPOSITE HAND)
SCALE: ½" = 1'–0"

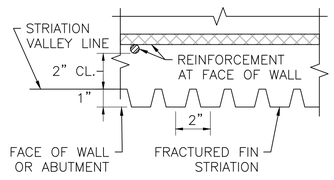


NOTES:
1. DISTANCE TO BE THE SUM OF THE DECK THICKNESS AND THE ACTUAL HAUNCH DEPTH AS DETERMINED BY THE DIFFERENCE BETWEEN THE TOP OF FORM ELEVATIONS ON SHEET 27 AND TOP OF FASCIA BEAM.
2. DISTANCE ON WEST FASCIA (AT SAFETYWALK) SHALL BE 11$\frac{13}{16}$", DISTANCE ON EAST FASCIA (AT SIDEWALK) SHALL BE 8¼".

DETAIL AT TOP OF WINGWALL
SCALE: 1½" = 1'–0"

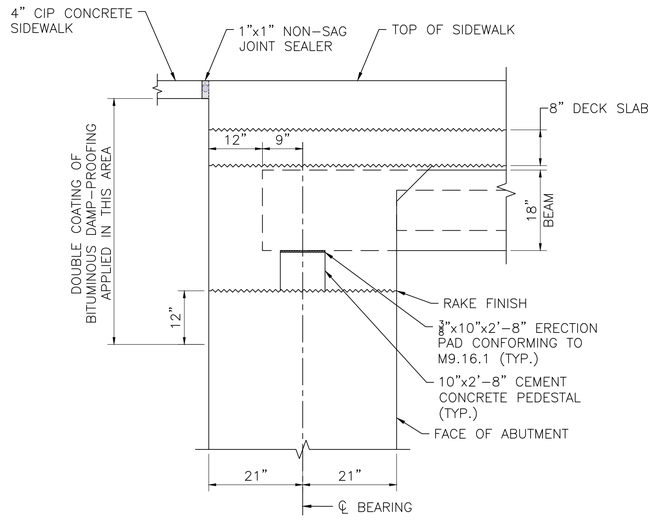


INTEGRAL DETAILS AT ABUTMENT
(AT INTERIOR BEAMS)
SCALE: ¾" = 1'–0"



TYPICAL STRIATION DETAIL
SCALE: 3" = 1'–0"

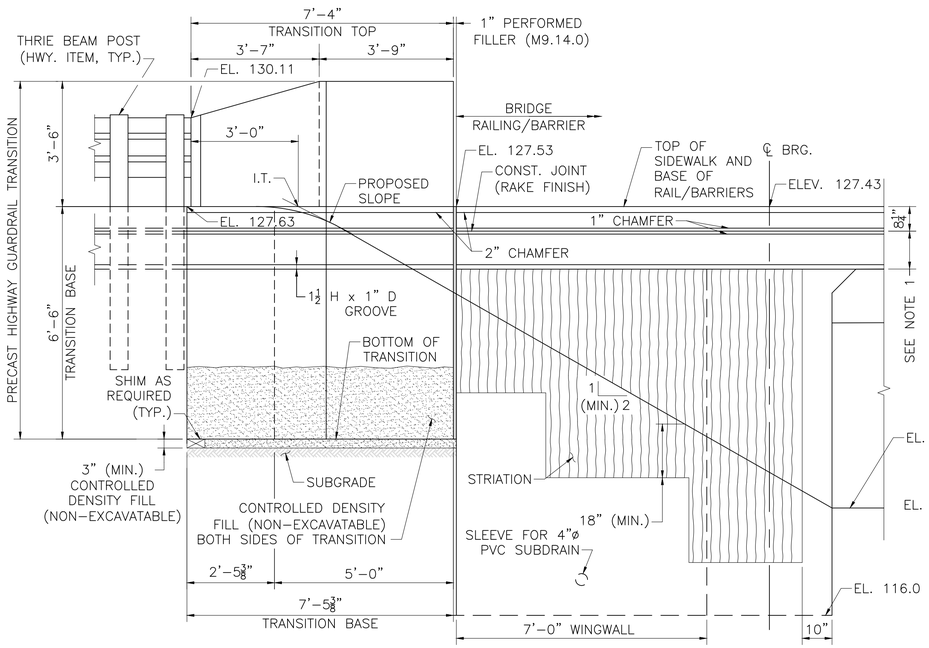
NOTES:
1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.



INTEGRAL DETAILS AT ABUTMENT
(BEAM 7)
SCALE: ¾" = 1'–0"

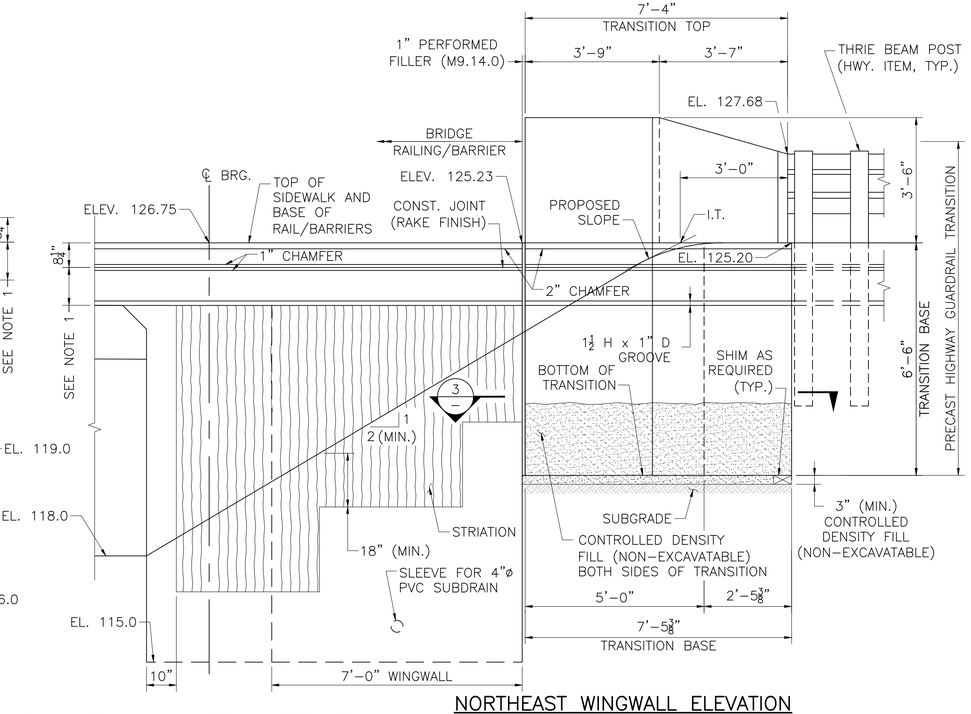
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

608460_BR11-14 (H-01-005)_ABUTMENTS.DWG Plotted on 24-Aug-2021 1:16 PM
608460 Bridge Sketch Plans () XX-April-2018



SOUTHEAST WINGWALL ELEVATION

SCALE: ½" = 1'-0"



NORTHEAST WINGWALL ELEVATION

SCALE: ½" = 1'-0"

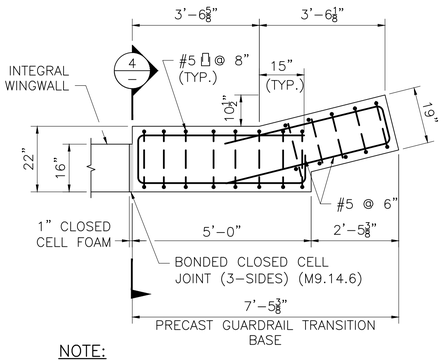
NOTES:

1. DISTANCE TO BE THE SUM OF THE DECK THICKNESS AND THE ACTUAL HAUNCH DEPTH AS DETERMINED BY THE DIFFERENCE BETWEEN THE TOP OF FORM ELEVATIONS ON SHEET 27 AND TOP OF FASCIA BEAM.
2. PRECAST GUARDRAIL TRANSITION SHALL BE 5000 PSI, ¾ IN, 685 HP CEMENT CONCRETE.
3. GRAVEL BORROW SHALL BE PLACED AND THOROUGHLY COMPACTED TO THE GRADE OF 3" (MIN.) BELOW THE INTENDED BOTTOM OF THE PRECAST GUARDRAIL TRANSITION BASE AND TO A HEIGHT OF 2'-0" (MIN.) ON ALL SIDES OF THE TRANSITION BASE TO FORM A TRENCH IN WHICH TO SET THE TRANSITION. WHERE NO GRAVEL BORROW IS REQUIRED BELOW THE BASE, IT SHALL BE PLACED ON UNDISTURBED SOIL.
4. CONTRACTOR SHALL SET THE PRECAST GUARDRAIL TRANSITION TO THE REQUIRED ELEVATION AND ALIGNMENT, AND BACKFILL PRECAST GUARDRAIL TRANSITION WITH CONTROLLED DENSITY FILL (NON-EXCAVATABLE) TO THE ELEVATION SHOWN.

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	53	77
PROJECT FILE NO. 608460			

WINGWALL ELEVATIONS AND DETAILS

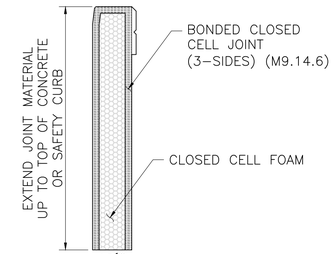


NOTE:

WINGWALL REINFORCEMENT AND STRIATIONS NOT SHOWN FOR CLARITY.

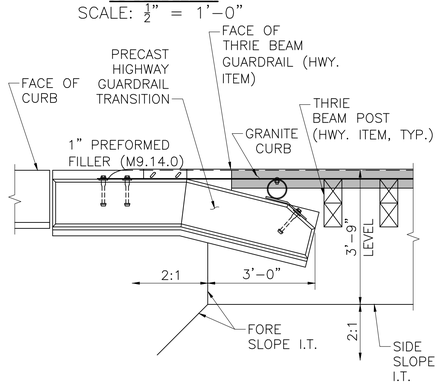
SECTION 3

SCALE: ½" = 1'-0"



SECTION 4

SCALE: ½" = 1'-0"



GRADING REQUIREMENTS PLAN

SCALE: ½" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

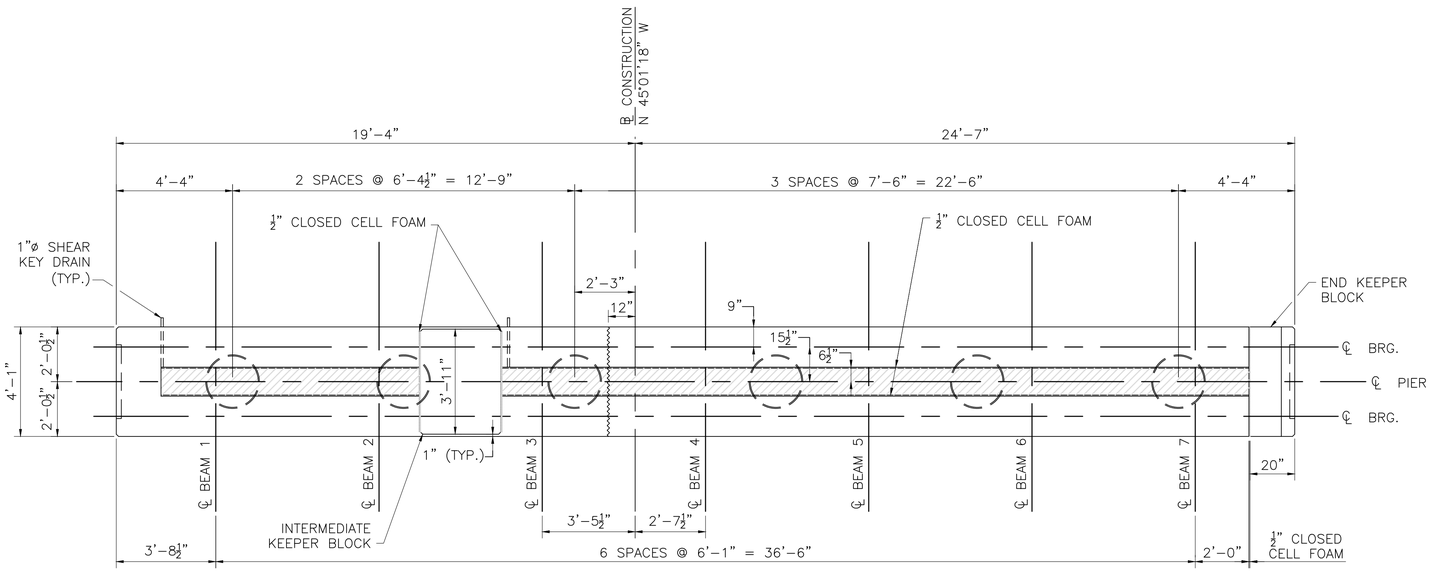
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608460 Bridge Sketch Plans () XX-April-2018

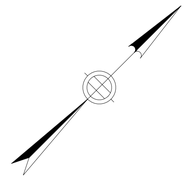
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	54	77
PROJECT FILE NO. 608460			

PIER I PLAN AND ELEVATION

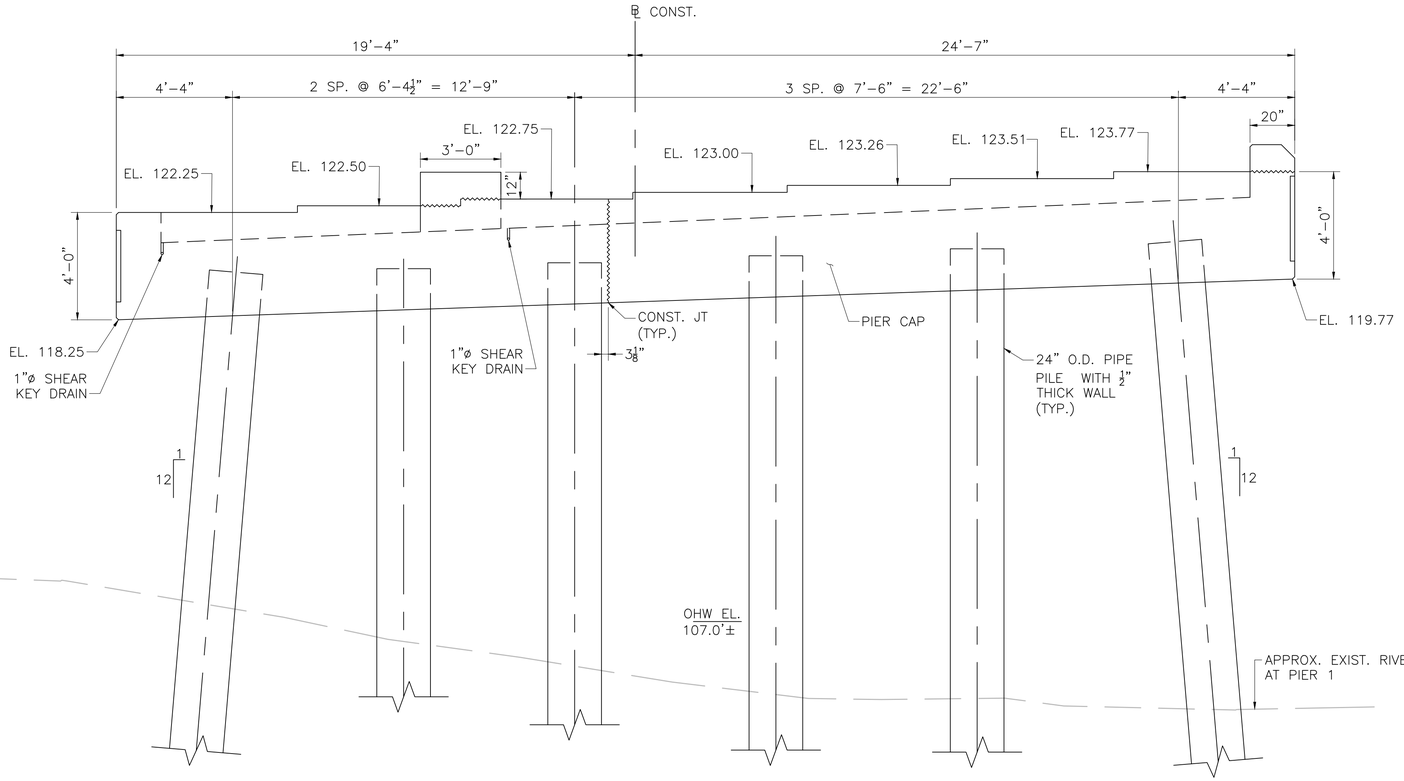


PIER 1 PLAN
SCALE: ⅜" = 1'–0"

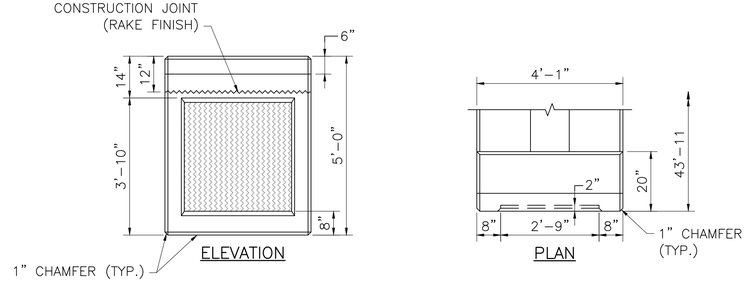


NOTES:

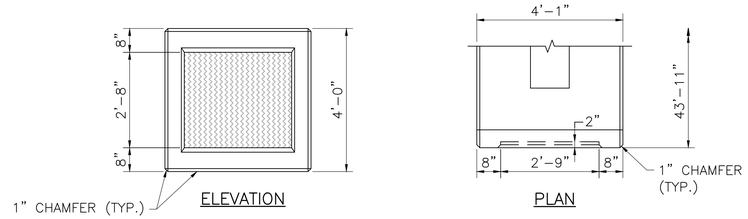
1. ▨ DENOTES LIMITS OF 13" BY 12" MIN. DEEP SHEAR KEY.
2. ALL SURFACES OF THE SHEAR KEY SHALL BE LINED WITH ½" THICK CLOSED CELL FOAM.
3. FOR PIER CAP DETAILS, SEE SHEET 18. FOR PILE DETAILS, SEE SHEET 19.
4. CONCRETE PIER CAP SHALL BE 4000 PSI, ¾ IN. 585 HP CEMENT CONCRETE



PROPOSED PIER 1 ELEVATION
(LOOKING NORTH)
SCALE: ⅜" = 1'–0"



PIER CAP END WITH END KEEPER BLOCK
SCALE: ½" = 1'–0"



PIER CAP END WITHOUT END KEEPER BLOCK
SCALE: ½" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 16 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

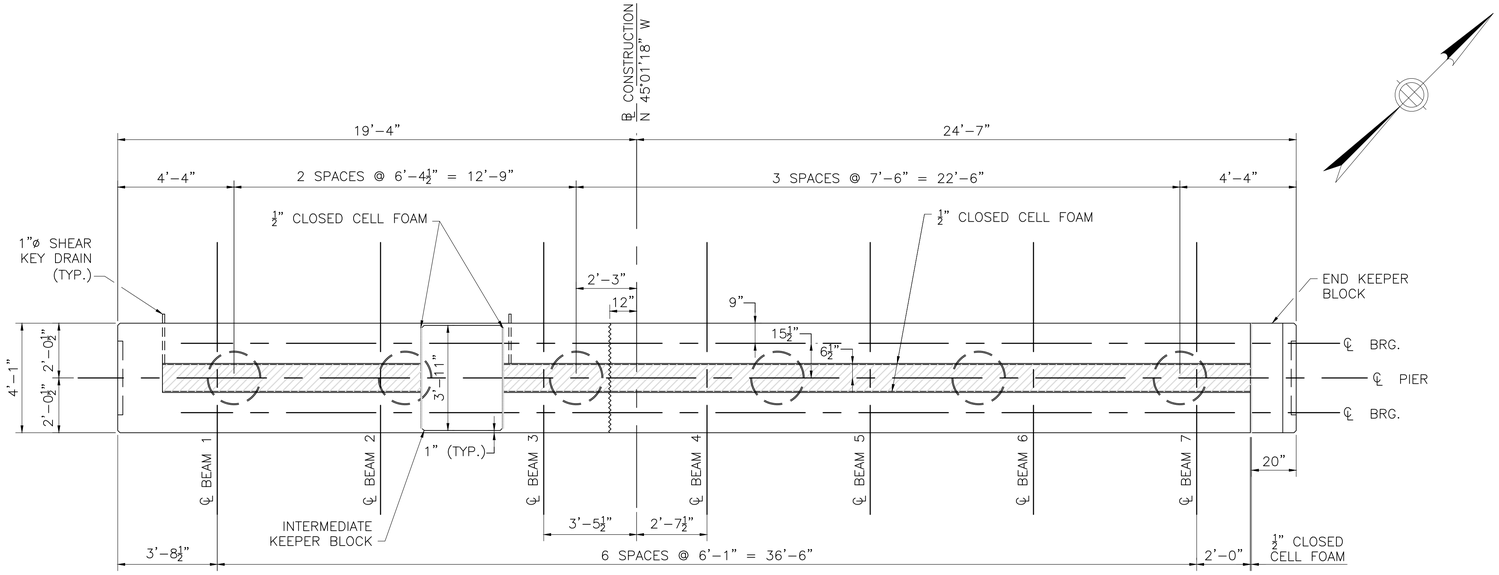
608460_BR22 (H-01-005)_PIERS PLAN.DWG Plotted on 24-Aug-2021 1:17 PM

608460 Bridge Sketch Plans () XX-April-2018

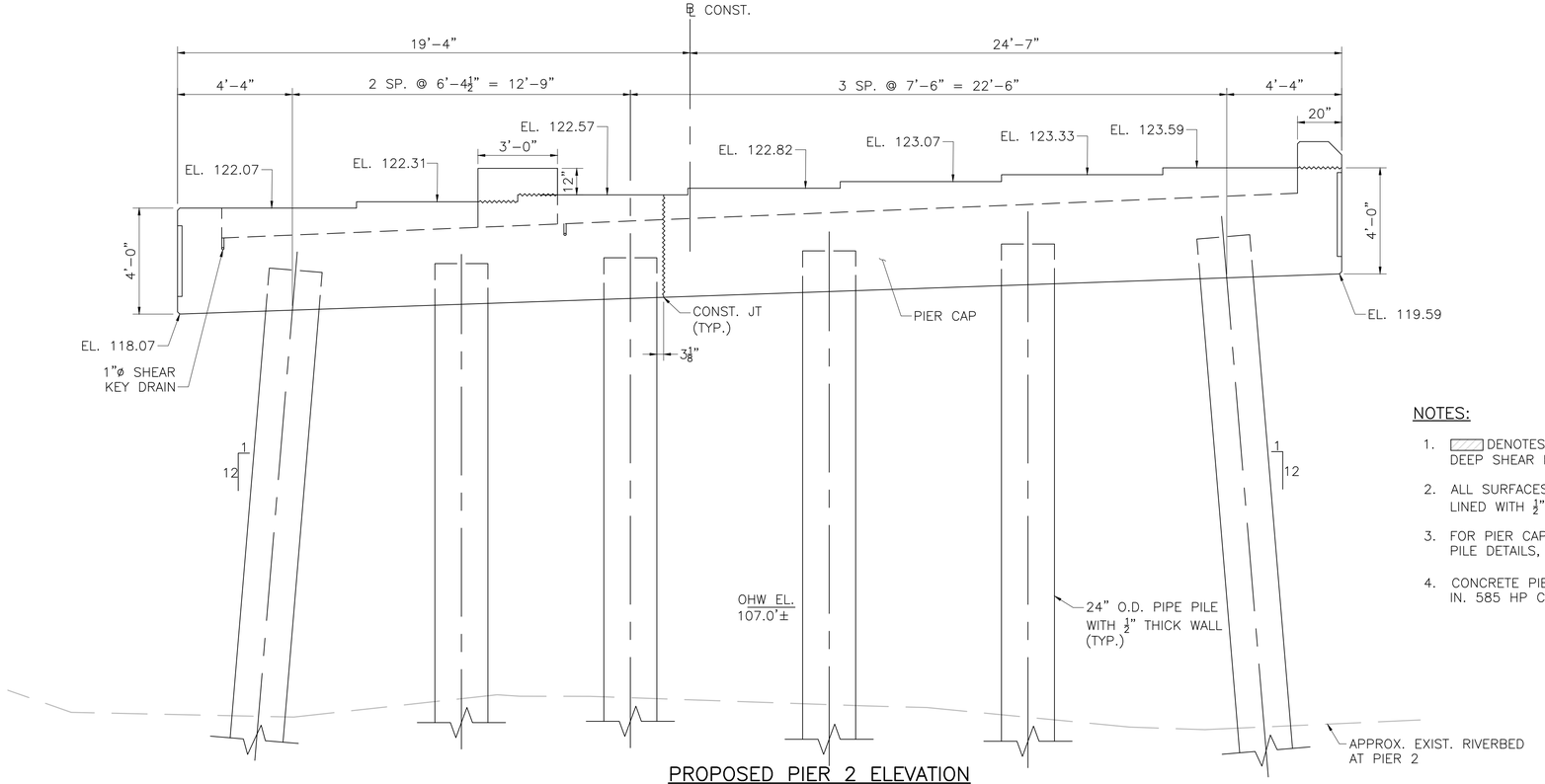
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	55	77
PROJECT FILE NO. 608460			

PIER II PLAN AND ELEVATION



PIER 2 PLAN
SCALE: ⅜" = 1'-0"



PROPOSED PIER 2 ELEVATION
(LOOKING NORTH)
SCALE: ⅜" = 1'-0"

NOTES:

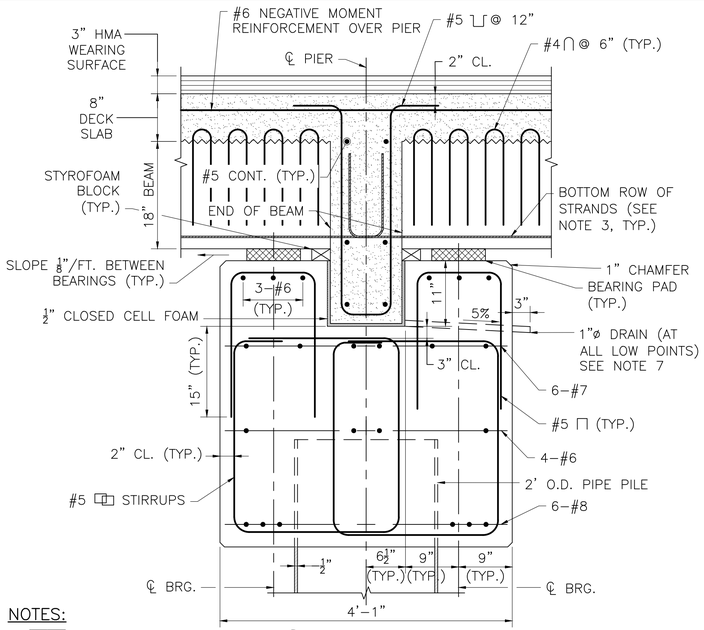
1. ▨ DENOTES LIMITS OF 13" BY 12" MIN. DEEP SHEAR KEY.
2. ALL SURFACES OF THE SHEAR KEY SHALL BE LINED WITH ½" THICK CLOSED CELL FOAM.
3. FOR PIER CAP DETAILS, SEE SHEET 18. FOR PILE DETAILS, SEE SHEET 19.
4. CONCRETE PIER CAP SHALL BE 4000 PSI, ¾ IN. 585 HP CEMENT CONCRETE

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 17 OF 34 SHEETS BRIDGE NO. H-01-005 (C1H)

608460_BR22 (H-01-005)_PIERS PLAN.DWG Plotted on 24-Aug-2021 1:18 PM

608460 Bridge Sketch Plans () XX-April-2018

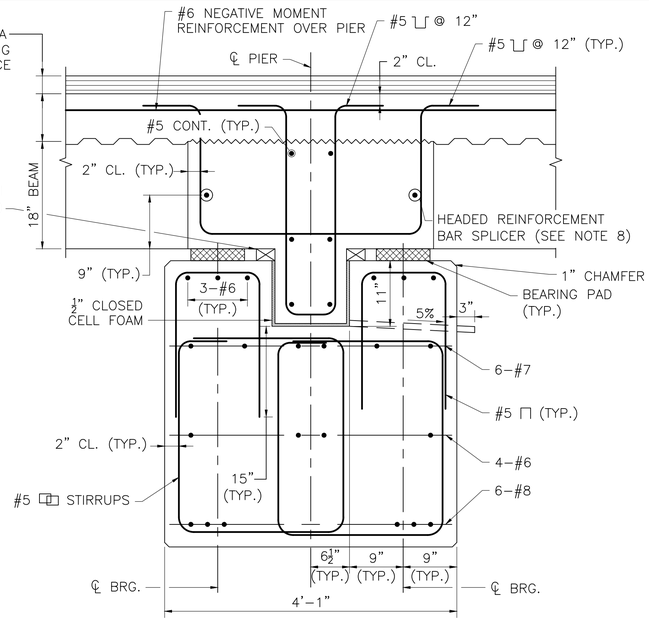


NOTES:

1. ▭ DENOTES LIMITS OF 4000 PSI, ¾ IN., 585 HP CEMENT CONCRETE.
2. FOR BEAM REINFORCEMENT, SEE LONGITUDINAL SECTION OF BEAMS, SHEETS 22 AND 23.
3. DECK SLAB AND THE REMAINDER OF STRANDS IN BEAMS NOT SHOWN FOR CLARITY.

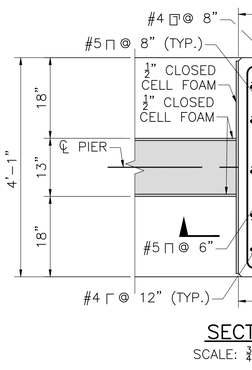
DETAILS OVER PIER AT BEAM

SCALE: 1" = 1'-0"



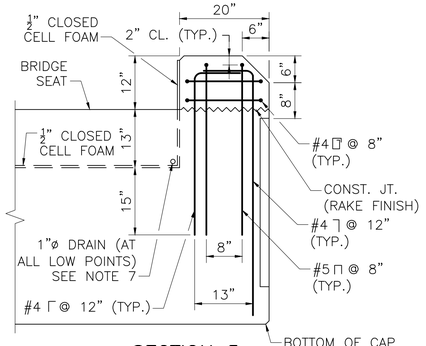
DETAILS OVER PIER AT DIAPHRAGM

SCALE: 1" = 1'-0"



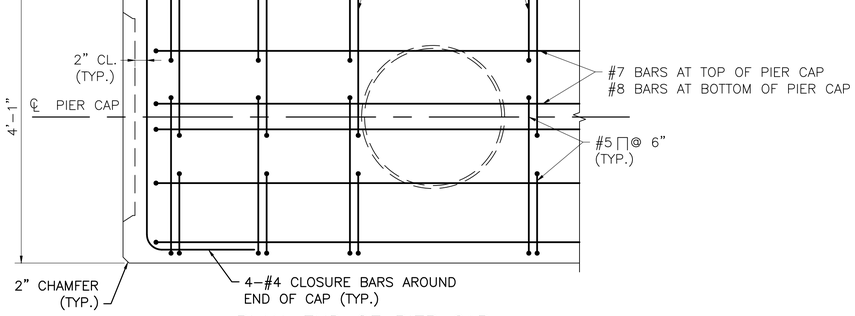
SECTION 4

SCALE: ¾" = 1'-0"



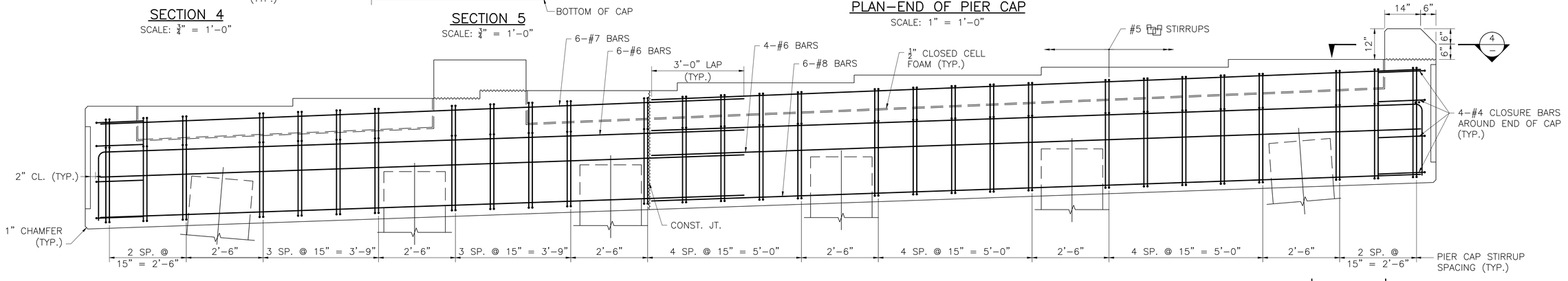
SECTION 5

SCALE: ¾" = 1'-0"



PLAN-END OF PIER CAP

SCALE: 1" = 1'-0"



SECTION THROUGH PIER CAP

SCALE: ⅝" = 1'-0"

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	56	77
PROJECT FILE NO. 608460			

PIER CAP & COLUMN DETAILS I

DETAILS OVER PIER NOTES:

1. ALL REINFORCEMENT SHOWN IN THESE DETAILS SHALL BE COATED.
2. ALL PIER DIAPHRAGM CONCRETE SHALL BE 4000 PSI, ¾", 585 HP CEMENT CONCRETE.
3. END KEEPER BLOCKS SHALL BE CAST AFTER THE BEAMS ARE ERECTED AND THE PIER DIAPHRAGM HAS BEEN CAST. ATTACH CLOSED CELL FOAM TO THE BEAMS AND DIAPHRAGM PRIOR TO PLACING END KEEPER BLOCK CONCRETE.
4. CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE PIER DIAPHRAGM.
5. PLACE EXPANDED POLYSTYRENE FILLER UNDER THE BOTTOM FLANGE AT THE EDGE OF THE SHEAR KEY.
6. PRIOR TO PLACING PIER DIAPHRAGM CONCRETE, LINE ALL SURFACES OF THE SHEAR KEY WITH CLOSED CELL FOAM AS SHOWN. PIER DIAPHRAGM CONCRETE MAY NOT COME IN DIRECT CONTACT WITH THE PIER CAP CONCRETE MASONRY.
7. SLOPE SHEAR KEY DRAIN 5% MIN. TOWARDS FACE OF PIER CAP.
8. ¾"ø THREADED DOWEL BAR SPLICERS SHALL BE CAST-IN-PLACE BY THE FABRICATOR AND SHALL BE EMBEDDED AS REQUIRED TO PROVIDE A MINIMUM ULTIMATE TENSILE CAPACITY OF 17 KIPS AS SPECIFIED BY THE MANUFACTURER.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

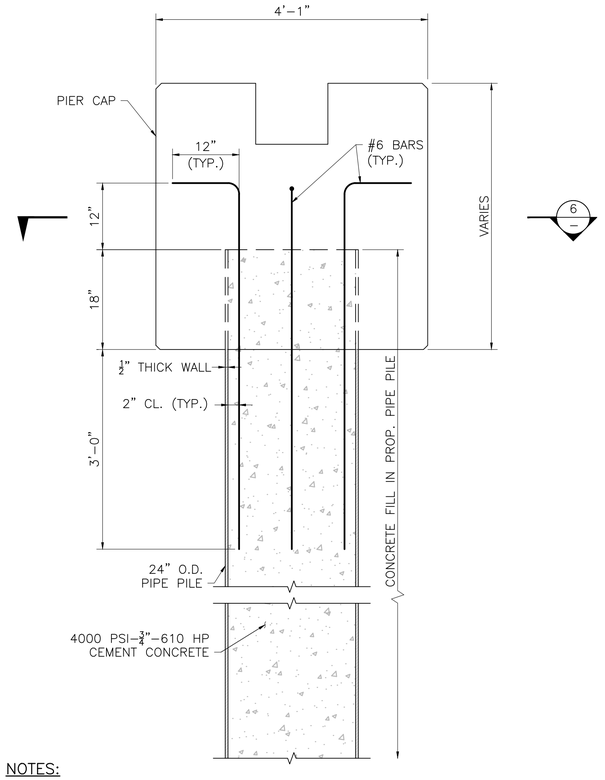
608460_BR22 (H-01-005)_PIERS DETAILS.DWG Plotted on 24-Aug-2021 1:18 PM

608460 Bridge Sketch Plans () XX-April-2018

HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

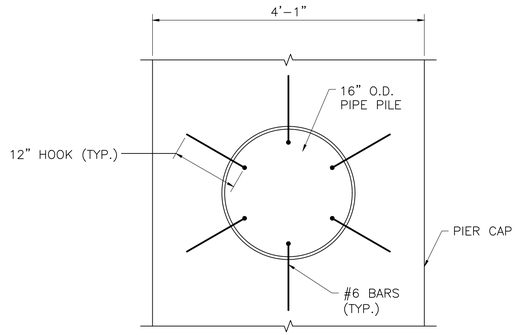
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	57	77
PROJECT FILE NO. 608460			

PIER CAP & COLUMN DETAILS II



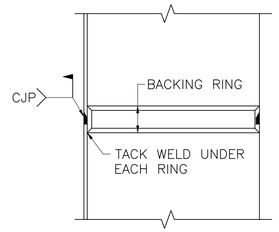
NOTES:
1. PIER CAP REINFORCEMENT NOT SHOWN FOR CLARITY, SEE SHEET 18 FOR DETAILS

PIER COLUMN EMBEDMENT DETAIL
SCALE: 1" = 1'–0"



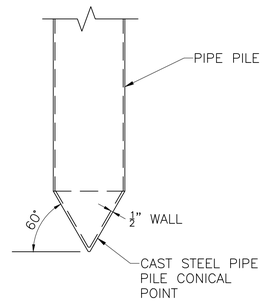
SECTION 6
SCALE: 1" = 1'–0"

PIER PILE NOTES:
1. ALL PIPE PILES SHALL BE 24" DIAMETER X ½" THICK AND CONSIST OF AASHTO M270 GRADE 50 STEEL WITH A COAL TAR EPOXY COATING THAT EXTENDS TO A DEPTH OF AT LEAST 10 FEET BELOW MUD LINE. PILES SHALL BE DRIVEN CLOSE–ENDED. REFER TO THE SPECIAL PROVISIONS FOR COAL TAR EPOXY COATING SPECIFICATIONS.
2. THE FACTORED AXIAL DESIGN LOAD PER PILE IS 305 KIPS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
3. THE FACTORED STRUCTURAL RESISTANCE PER PILE IS 981 KIPS AND IS THE PRODUCT OF THE NOMINAL STRUCTURAL RESISTANCE OF 1402 KIPS AND A RESISTANCE FACTOR OF 0.7.
4. THE FACTORED GEOTECHNICAL PILE RESISTANCE IS 306 KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF 471 KIPS AND A RESISTANCE FACTOR OF 0.65.
5. DETERMINATION OF THE DRIVEN PILE RESISTANCE, PILE DRIVING CRITERIA AND THE PILE INTEGRITY SHALL BE PERFORMED USING THE PILE DRIVING ANALYZER (PDA) TESTING METHOD WITH A RESISTANCE FACTOR OF 0.65. DYNAMIC TESTING SHALL BE PERFORMED ON THE FIRST PRODUCTION PILE AT EACH PIER LOCATION (TWO PDA TESTS). PILES SHALL BE INSTALLED TO ACHIEVE A FACTORED GEOTECHNICAL RESISTANCE EQUAL TO OR GREATER THAN THE FACTORED AXIAL DESIGN LOAD.
6. THE CONTRACTOR SHALL SUBMIT A PILE SCHEDULE, PILE INSTALLATION, AND PILE DRIVING AND TESTING PLAN FOR REVIEW AND APPROVAL BY THE ENGINEER
7. REFER TO SPECIAL PROVISIONS FOR ADDITIONAL PILE INFORMATION.
8. ALL SPLICES SHALL HAVE COMPLETE PENETRATION BUTT WELDS. THERE SHALL BE NO SPLICES WITHIN THE TOP 20 FEET OF PILE. SPLICE WELDS SHALL BE 100% UT.
9. PILES SHALL BE DRIVEN TO A MINIMUM TIP ELEVATION OF 59.8' AT PIER 1 AND ELEVATION 59.8' AT PIER 2 FOR LATERAL FIXITY. PILES SHALL BE DRIVEN DEEPER IF REQUIRED TO ACHIEVE THE MINIMUM REQUIRED NOMINAL GEOTECHNICAL RESISTANCE OF 471 KIPS.



NOTES:
1. BACKING RING DETAILS SHALL BE CONSISTENT WITH APPROVED WELDING PROCEDURE SPECIFICATIONS.
2. ROOT BASE SHALL BE DEPOSITED TO WITHIN 1" OF BACKING RING SPACER PINS. SPACER PINS SHALL THEN BE REMOVED AND PASS COMPLETED.
3. ALL WELDS SHALL BE SMOOTH. REINFORCEMENT SHALL NOT EXCEED ⅛".
4. WELDING SHALL CONFORM TO THE AWS D1.1 STRUCTURAL WELDING CODE – STEEL.
5. ALL WELDS SHALL BE INSPECTED USING ULTRASONIC TESTING IN ACCORDANCE WITH THE BRIDGE WELDING CODE, ANSI/AASHTO/AWS D1.1. WELDS SHALL BE CONSIDERED TO BE IN TENSION.

PILE SPLICE DETAIL
SCALE: 1" = 1'–0"



PILE POINT DETAIL
SCALE: ¾" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 19 OF 34 SHEETS BRIDGE NO. H–01–005 (C1H)

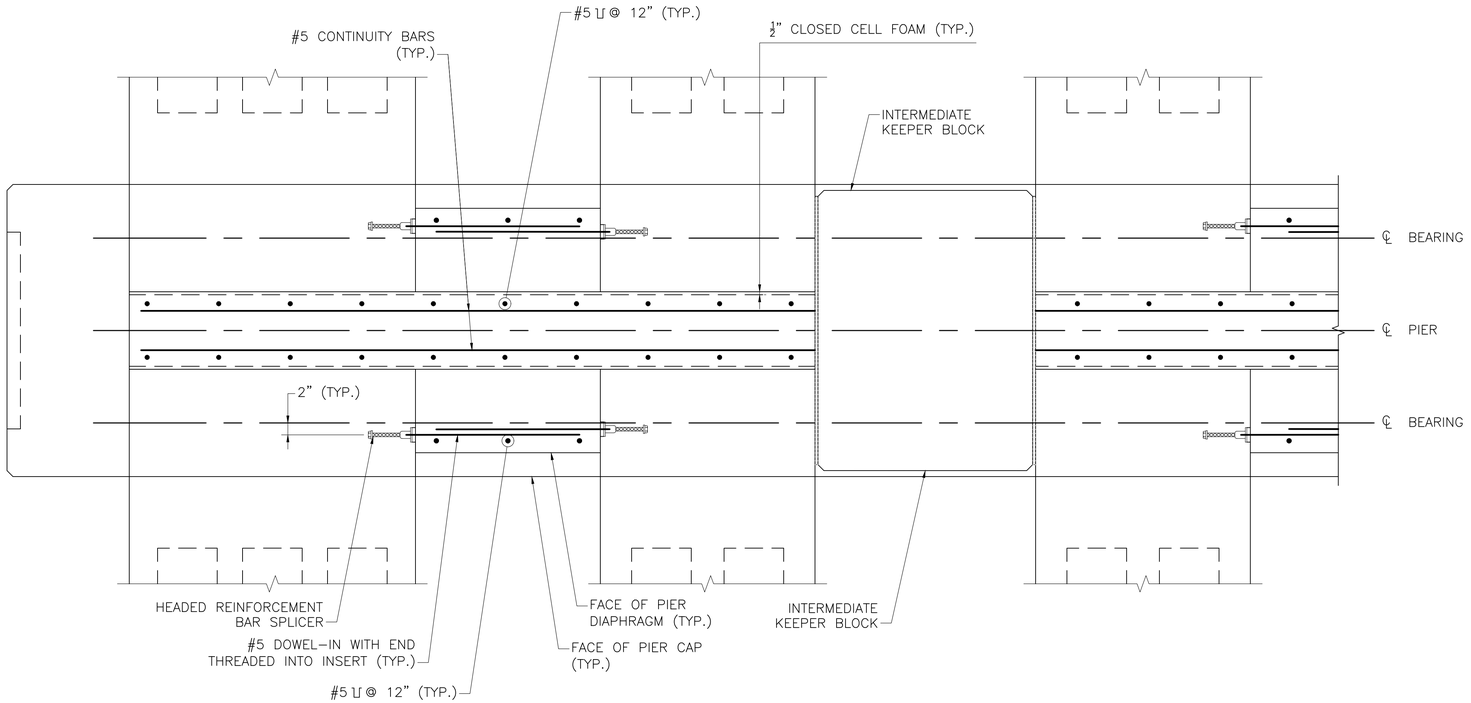
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608460 Bridge Sketch Plans () XX-April-2018

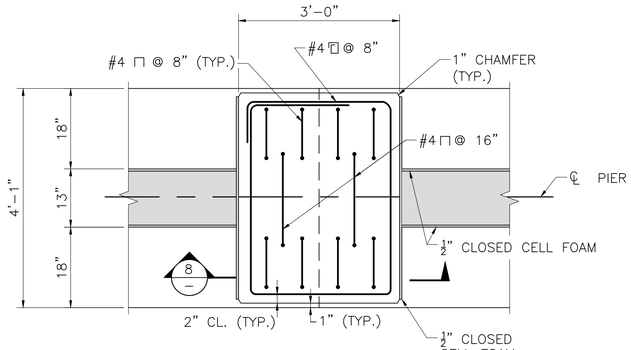
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	58	77
PROJECT FILE NO. 608460			

PIER DIAPHRAGM DETAILS

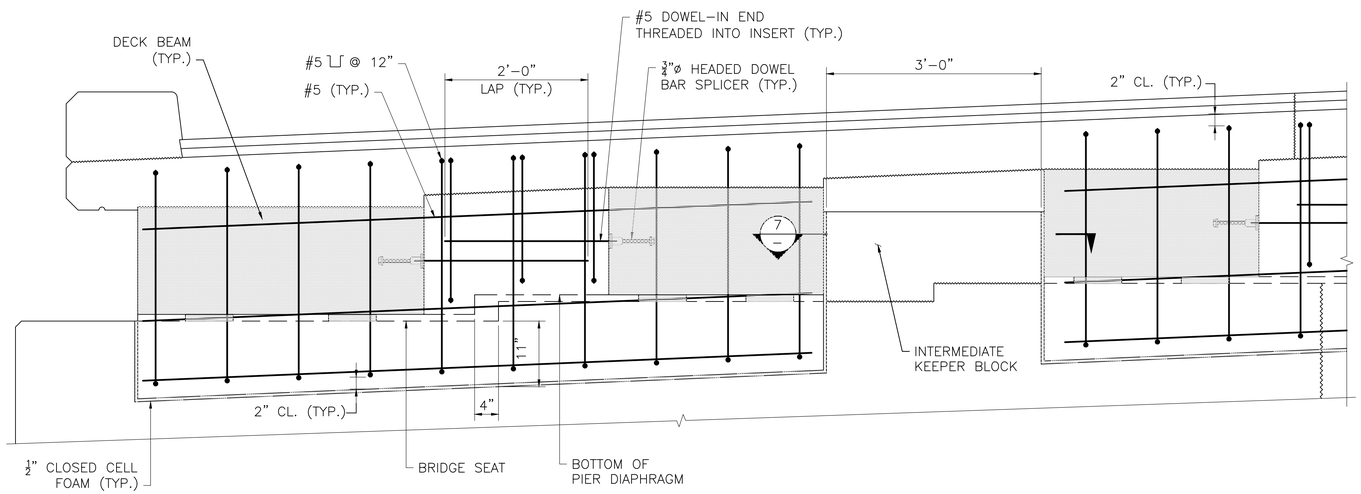


PIER DIAPHRAGM PLAN
SCALE: 1" = 1'–0"



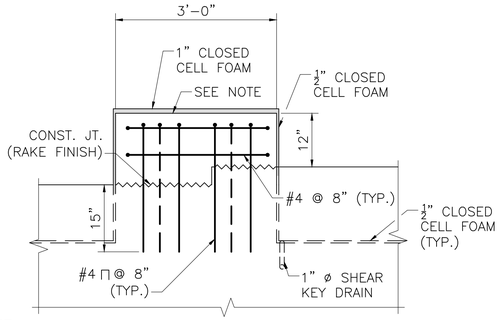
NOTE:

INTERMEDIATE KEEPER BLOCKS SHALL BE CAST BEFORE BEAMS ARE SET AND THE PIER DIAPHRAGM CONCRETE IS PLACED.



PIER DIAPHRAGM SECTION
SCALE: 1" = 1'–0"

SECTION 7
SCALE: ¾" = 1'–0"



NOTE:

TOP OF INTERMEDIATE KEEPER BLOCK SHALL BE TROWELED SMOOTH PARALLEL TO PROFILE GRADE.

SECTION 8
SCALE: ¾" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

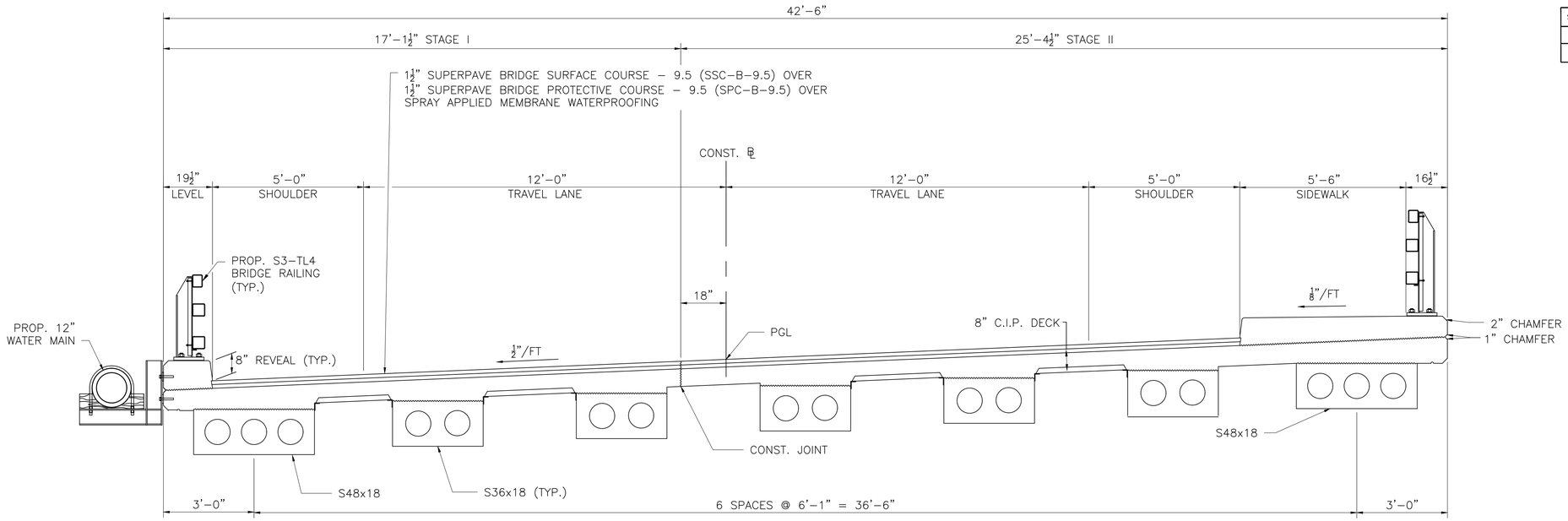
608460_BR22 (H-01-005)_PIERS DETAILS.DWG Plotted on 24-Aug-2021 1:20 PM

608460 Bridge Sketch Plans () XX-April-2018

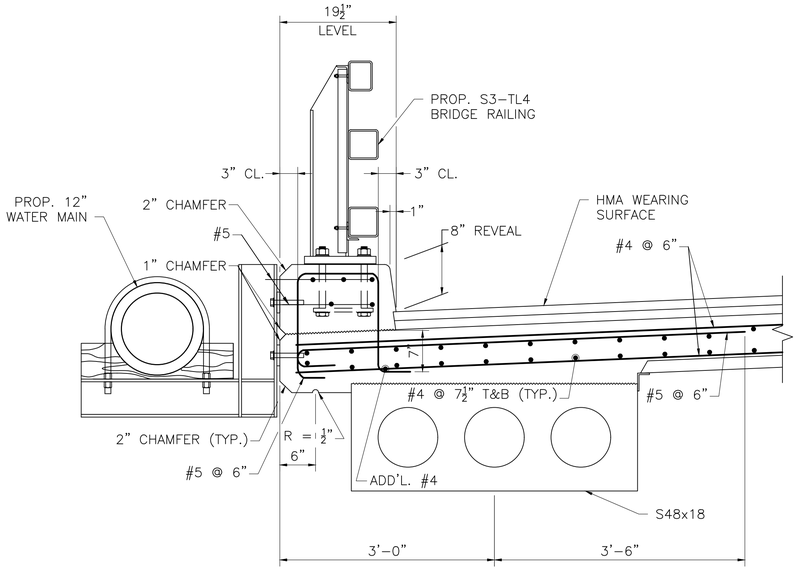
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	63	77
PROJECT FILE NO. 608460			

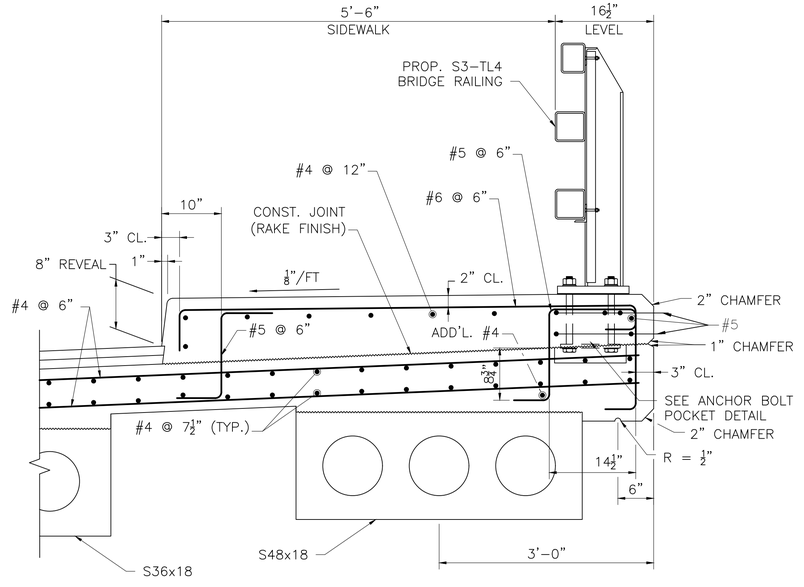
TYPICAL SECTIONS



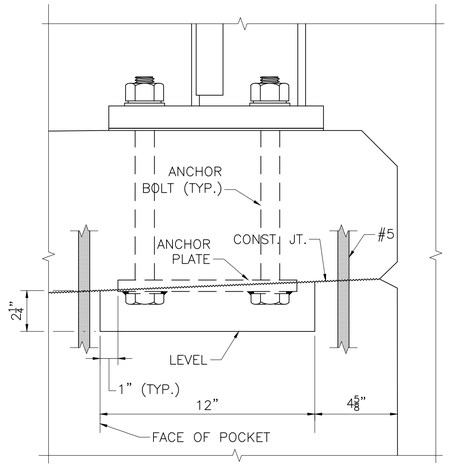
TRANSVERSE SECTION
SCALE: ½" = 1'-0"



WEST SAFETY CURB SECTION
SCALE: 1" = 1'-0"



EAST SIDEWALK SECTION
SCALE: 1" = 1'-0"



NOTE:

PROVIDE 15¾" LONG, 11¼" WIDE, 2¼" DEEP POCKET IN THE DECK SLAB AT THE LOCATION OF EACH RAIL POST.

ANCHOR BOLT POCKET AT SIDEWALK
SCALE: 3" = 1'-0"

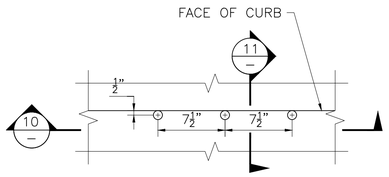
DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

608460_BR27 (H-01-005)_TYPICAL SECTIONS.DWG Plotted on 24-Aug-2021 1:23 PM
608460 Bridge Sketch Plans () XX-April-2018

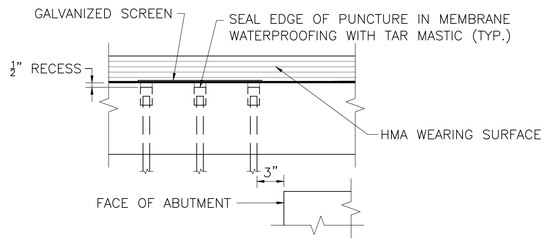
HADLEY
BAY RD (ROUTE 47)
OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	66	77
PROJECT FILE NO. 608460			

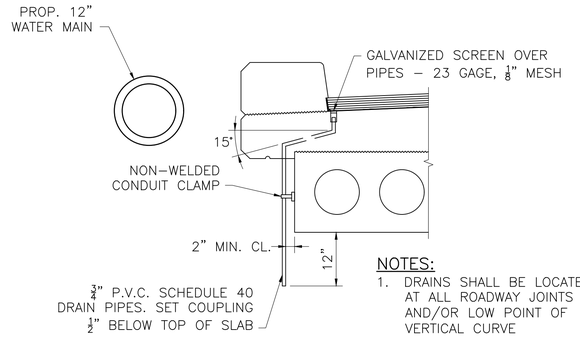
MISCELLANEOUS DETAILS



DECK PLAN
SCALE: 1 1/2" = 1'–0"

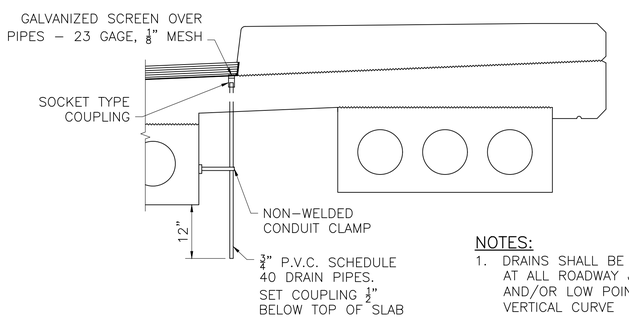


SECTION 10
SCALE: 1 1/2" = 1'–0"



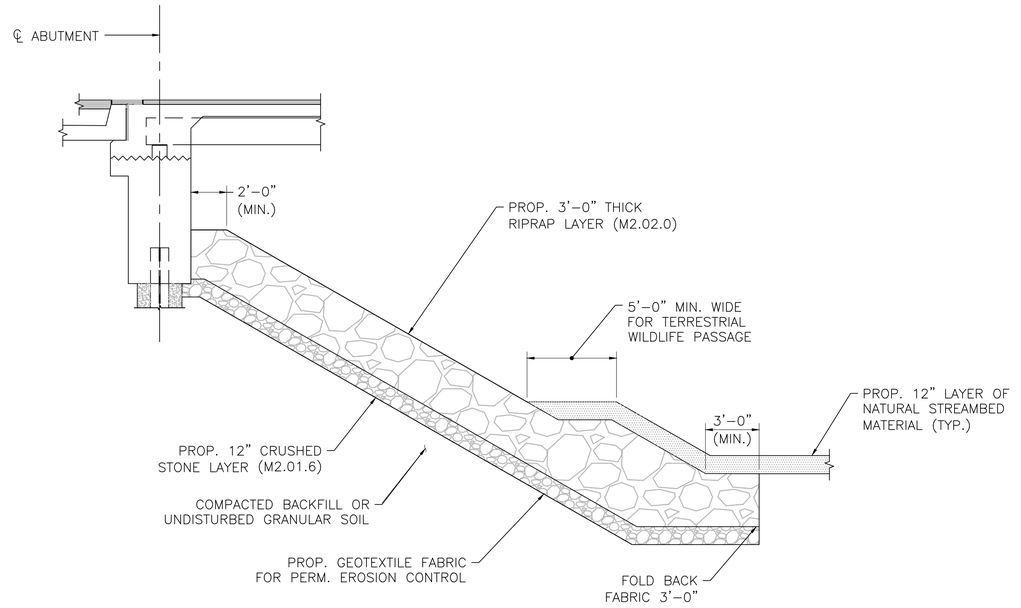
NOTES:
1. DRAINS SHALL BE LOCATED AT ALL ROADWAY JOINTS AND/OR LOW POINT OF VERTICAL CURVE

SECTION 11
DECK DRAIN PIPES AT SAFETY CURB
SCALE: 3/4" = 1'–0"



NOTES:
1. DRAINS SHALL BE LOCATED AT ALL ROADWAY JOINTS AND/OR LOW POINT OF VERTICAL CURVE

SECTION 11
DECK DRAIN PIPES AT SIDEWALK
SCALE: 3/4" = 1'–0"



RIPRAP DETAIL
SCALE: 1/4" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

608460_BR29 (H-01-005)_MISCELLANEOUS DETAILS.DWG Plotted on 24-Aug-2021 1:25 PM
608460 Bridge Sketch Plans () XX-April-2018

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT N

Section 7 Documentation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 03/15/2024 14:41:52 UTC
Project code: 2024-0062332
Project Name: 608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER

Subject: Concurrence verification letter for the '608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER' project under the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (NLEB).

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated March 15, 2024 to verify that the **608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER** (Proposed Action) may rely on the concurrence provided in the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures. **At least one of the qualification interview questions indicated an activity or portion of your project is consistent with a not likely to adversely affect determination therefore, the overall determination for your project is, may affect, and is not likely to adversely affect (NLAA) the endangered Indiana bat (*Myotis sodalis*) and/or the endangered northern long-eared bat (*Myotis septentrionalis*)**. Consultation with the Service pursuant to section 7(a)(2) of ESA (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.) is required.

The Service has 14 calendar days to notify the lead Federal action agency or designated non-federal representative if we determine that the Proposed Action does not meet the criteria for a NLAA determination under the PBO. If we do not notify the lead Federal action agency or designated non-federal representative within that timeframe, you may proceed with the Proposed

Action under the terms of the NLAA concurrence provided in the PBO. This verification period allows Service Field Offices to apply local knowledge to implementation of the PBO, as we may identify a small subset of actions having impacts that were unanticipated. In such instances, Service Field Offices may request additional information that is necessary to verify inclusion of the proposed action under the PBO.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities: If your initial bridge/culvert or structure assessment documented signs of bat use or occupancy, or an assessment failed to detect Indiana bats and/or NLEBs, yet are later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of any potential take. In these instances, potential incidental take of Indiana bats and/or NLEBs is covered under the Incidental Take Statement in the 2018 FHWA, FRA, FTA PBO (provided that the take is reported to the Service).

If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA Section 7(a)(2) may be required.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities:
If your initial bridge/culvert or structure assessments failed to detect Indiana bats and/or NLEB use or occupancy, yet bats are later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of the incident. In these instances, potential incidental take of Indiana bats and/or NLEBs may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species, and/or any designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please contact this Service Office.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate

PROJECT DESCRIPTION

The following project name and description was collected in IPaC as part of the endangered species review process.

NAME

608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER

DESCRIPTION

608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER

This project will replace the existing Bay Road bridge (Route 47) over the Fort River. The bridge will be reconstructed with wider shoulders and new sidewalks.

Monarch Butterfly: Candidate Species only, no conservation measures at this time.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.3327051,-72.5787180343803,14z



DETERMINATION KEY RESULT

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the endangered Indiana bat and/or the endangered northern long-eared bat, therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the concurrence provided in the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

QUALIFICATION INTERVIEW

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the northern long-eared bat[1]?

   [1] See northern long-eared bat species profile

   Automatically answered
   Yes

3. Which Federal Agency is the lead for the action?

   A) Federal Highway Administration (FHWA)

4. Are *all* project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No

5. Does the project include *any* activities that are **greater than** 300 feet from existing road/rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No

6. Does the project include *any* activities **within** 0.5 miles of a known Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No

7. Is the project located **within** a karst area?

   No

8. Is there *any* suitable[1] summer habitat for Indiana Bat or NLEB **within** the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the User's Guide for the Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat.

   Yes

9. Will the project remove *any* suitable summer habitat[1] and/or remove/trim any existing trees **within** suitable summer habitat?

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   Yes

10. Will the project clear more than 20 acres of suitable habitat per 5-mile section of road/rail?

    No

11. Have presence/probable absence (P/A) summer surveys[1][2] been conducted[3][4] **within** the suitable habitat located within your project action area?

    [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

    [2] Presence/probable absence summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate distance from hibernacula) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    [3] For projects within the range of either the Indiana bat or NLEB in which suitable habitat is present, and no bat surveys have been conducted, the transportation agency will assume presence of the appropriate species. This assumption of presence should be based upon the presence of suitable habitat and the capability of bats to occupy it because of their mobility.

    [4] Negative presence/probable absence survey results obtained using the summer survey guidance are valid for a minimum of two years from the completion of the survey unless new information (e.g., other nearby surveys) suggest otherwise.

    Yes

    SUBMITTED DOCUMENTS

    - *608460_Hadley_PA_Bridge_survey_report.pdf https://ipac.ecosphere.fws.gov/project/MYEBGJLJ75C4TP6RVPTZ3BMC4Q/projectDocuments/140064895*

12. Did the presence/probable absence (P/A) summer surveys detect Indiana bats and/or NLEB[1]?

    [1] P/A summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate home range) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    No

13. Were the P/A summer surveys conducted **within** the fall swarming/spring emergence range of a documented Indiana bat hibernaculum[1]?

    [1] Contact the local Service Field Office for appropriate distance from hibernacula.

    No

14. Does the project include activities **within documented NLEB habitat**[1][2]?

    [1] Documented roosting or foraging habitat – for the purposes of this consultation, we are considering documented habitat as that where Indiana bats and/or NLEB have actually been captured and tracked using (1) radio telemetry to roosts; (2) radio telemetry biangulation/triangulation to estimate foraging areas; or (3) foraging areas with repeated use documented using acoustics. Documented roosting habitat is also considered as suitable summer habitat within 0.25 miles of documented roosts.)

    [2] For the purposes of this key, we are considering documented corridors as that where Indiana bats and/or NLEB have actually been captured and tracked to using (1) radio telemetry; or (2) treed corridors located directly between documented roosting and foraging habitat.

    No

15. Will the removal or trimming of habitat or trees occur **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors?

    Yes

16. What time of year will the removal or trimming of habitat or trees **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors occur?

    C) During both the active and inactive seasons

17. Will *any* tree trimming or removal occur **within** 100 feet of existing road/rail surfaces?

    Yes

18. Will *any* tree trimming or removal occur **between** 100-300 feet of existing road/rail surfaces?

    No

19. Are *all* trees that are being removed clearly demarcated?

    Yes

20. Will the removal of habitat or the removal/trimming of trees involve the use of **temporary** lighting?

    Yes

21. Will the removal of habitat or the removal/trimming of trees include installing new or replacing existing **permanent** lighting?

    No

22. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

    Yes

23. Does the project include slash pile burning?

    No

24. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    Yes

25. Is there *any* suitable habitat[1] for Indiana bat or NLEB **within** 1,000 feet of the bridge? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

    [1] See the Service's current summer survey guidance for our current definitions of suitable habitat.

    Yes

26. Has a bridge assessment[1] been conducted **within** the last 24 months[2] to determine if the bridge is being used by bats?

    [1] See User Guide Appendix D for bridge/structure assessment guidance

    [2] Assessments must be completed no more than 2 years prior to conducting any work below the deck surface on all bridges that meet the physical characteristics described in the Programmatic Consultation, regardless of whether assessments have been conducted in the past. Due to the transitory nature of bat use, a negative result in one year does not guarantee that bats will not use that bridge/structure in subsequent years.

    Yes

    SUBMITTED DOCUMENTS

    - *608460_Hadley_PA_Bridge_survey_report.pdf https://ipac.ecosphere.fws.gov/project/MYEBGJLJ75C4TP6RVPTZ3BMC4Q/projectDocuments/140064895*

27. Did the bridge assessment detect *any* signs of Indiana bats and/or NLEBs roosting in/under the bridge (bats, guano, etc.)[1]?

    [1] If bridge assessment detects signs of *any* species of bats, coordination with the local FWS office is needed to identify potential threatened or endangered bat species. Additional studies may be undertaken to try to identify which bat species may be utilizing the bridge prior to allowing *any* work to proceed.

    Note: There is a small chance bridge assessments for bat occupancy do not detect bats. Should a small number of bats be observed roosting on a bridge just prior to or during construction, such that take is likely to occur or does occur in the form of harassment, injury or death, the PBO requires the action agency to report the take. Report all unanticipated take within 2 working days of the incident to the USFWS. Construction activities may continue without delay provided the take is reported to the USFWS and is limited to 5 bats per project.

    No

28. Will the bridge removal, replacement, and/or maintenance activities include installing new or replacing existing **permanent** lighting?

    No

29. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No

30. Will the project involve the use of *any* **temporary** lighting in addition to the lighting already indicated for habitat removal (including the removal or trimming of trees), or bridge/structure removal, replacement or maintenance activities?

    Yes

31. Is there *any* suitable habitat **within** 1,000 feet of the location(s) where **temporary** lighting (other than the lighting already indicated for habitat removal (including the removal or trimming of trees) or bridge/structure removal, replacement or maintenance activities) will be used?

    Yes

32. Will the project install new or replace existing **permanent** lighting?

    No

33. Does the project include percussives or other activities (**not including tree removal/ trimming or bridge/structure work**) that will increase noise levels above existing traffic/ background levels?

    Yes

34. Will the activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the active season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

35. Will *any* activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the inactive season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

36. Are *all* project activities that are **not associated with** habitat removal, tree removal/ trimming, bridge and/or structure activities, temporary or permanent lighting, or use of percussives, limited to actions that DO NOT cause any additional stressors to the bat species?

    Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

    Yes

37. Will the project raise the road profile **above the tree canopy**?

    No

38. Are the wetland or stream protection activities associated with compensatory wetland/ stream mitigation portion of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because your activities associated with compensatory wetland/stream mitigation activities do not clear suitable summer habitat and are not within 0.5 miles of Indiana bat or NLEB hibernaculum.

39. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the active season within undocumented habitat.

40. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) and/or increase noise levels above existing traffic/background levels consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the inactive season

41. Is the location of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because no bats were detected during presence/probable absence surveys conducted during the summer survey season and outside of the fall swarming/spring emergence periods. Additionally, all activities were at least 0.5 miles from any hibernaculum.

42. Is the bridge removal, replacement, or maintenance activities portion of this project consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the bridge has been assessed using the criteria documented in the BA and no signs of bats were detected

43. **General AMM 1**
    Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

    Yes

PROJECT QUESTIONNAIRE

1. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

   N/A

2. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

   N/A

3. How many acres[1] of trees are proposed for removal between 0-100 feet of the existing road/rail surface?

   [1] If described as number of trees, multiply by 0.09 to convert to acreage and enter that number.

   1.2

4. Please describe the proposed bridge work:

   The proposed bridge substructure consists of two (2) integral abutments and two (2) pipe pile bents with reinforced concrete pile caps. New riprap will be installed at the base of the south and north abutment walls.

   The entire bridge superstructure will be replaced and widened using a combination of S36-18 and S48-18 precast concrete deck beams. The superstructure supports a 8" cast-in-place reinforced concrete slab with 3" HMA overlay and one sidewalk along the east side of the bridge. The total bridge is 126' long, with spans of 42', 42' and 42' from centerline of bearings. The total out-to-out width is 42'-6", all within current right-of-way limits. This superstructure replacement requires a 15" rise in profile to maintain the bridge low chord.

5. Please state the timing of all proposed bridge work:

   October 1st, 2024 to June 16th, 2025

6. Please enter the date of the bridge assessment:

   6/16/2023

AVOIDANCE AND MINIMIZATION MEASURES (AMMS)

This determination key result includes the committment to implement the following Avoidance and Minimization Measures (AMMs):

GENERAL AMM 1

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

DETERMINATION KEY DESCRIPTION: FHWA, FRA, FTA PROGRAMMATIC CONSULTATION FOR TRANSPORTATION PROJECTS AFFECTING NLEB OR INDIANA BAT

This key was last updated in IPaC on October 30, 2023. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the endangered **northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPAC USER CONTACT INFORMATION

Agency: Massachusetts Department of Transportation
Name: Ian Battles
Address: 10 Park Plaza
City: Boston
State: MA
Zip: 02116
Email ian.h.battles@dot.state.ma.us
Phone: 8572623378

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT O

Section 106 Documentation

CULTURAL RESOURCES PROJECT RECORD

City/Town: Hadley

Project # 608460

Date Cleared 6/22/2018

Project Name: Bridge replacement, H-01-005, Bay Road over Fort River

Date Filed 5/30/2018

Finding Under Review ☐

FHWA to MHC

Project Type: Bridge Replacement

Review: Section 106 (PA)

Finding: Stip VB - No historic properties affected

Early Coord. Letter Sent: ☑

Comment Received: ☐ MHC ☐ LHC

Reviewer: KJ

Consultant

Comment: MassDOT Project 607740 - bridge repair project, was previously cleared on October 26, 2016 (MHC stamped PNF). PNFs for bridge replacement project sent to MHC, ATHPO, MTHPO, and NTHPO on May 30, 2018. MHC stamped PNF 6/22/18. MTHPO and BUAR no concerns comments. No comments from ATHPO and NTHPO. Emails to ATHPO, NTHPO, and MTHPO 4/26/2024

Determination based on: ☑ Scope of Work ☑ Plan ☑ Inventory ☐ Site Visit ☐ Archaeological Survey

Attach appropriate documentation for checked items

Projects Requiring No Massachusetts SHPO Review

Programmatic Agreement, Appendix 1 (check all that apply) :

☐ 1) Interstate bridge or roadway projects
☐ 2) Resurfacing, repair existing roadways
* ☐ 3) Reconstruction on existing roadway
* ☐ 4) Roadway geometrics, intersections
* ☐ 5) Curbs and sidewalks
☐ 6) Pavement markings, rumble strips, etc
☐ 7) Curbs, sidewalks (MAAB, ADA)
* ☐ 8) Removal of trees
☐ 9) Landscaping
☐ 10) Utilities
☐ 11) Railroad crossing
☐ 12) Stream stabilization and restoration
☐ 13) Wetland mitigation area
* ☐ 14) Bridge (NR "Not Eligible" or "Conditionally Not Eligible")
* ☐ 15) Bridge (concrete slab post 1900, steel stringer)
☐ 16) Bridge (less than 20' span)
* ☐ 17) Highway safety improvement
☐ 18) Drainage system element
* ☐ 19) Traffic signal, safety improvement
* ☐ 20) Intelligent Transportation System project
☐ 21) Rest area, maintenance facility
* ☐ 22) Bicycle, pedestrian lane, path or facility
☐ 23) Lighting system
☐ 24) Sign
☐ 25) Hazardous waste
☐ 26) Highway fencing
☐ 27) Emergency repair
☐ 28) Erosion control
☐ 29) Noise barrier

* National Register eligibility evaluation required

-OR-

No Historic Properties Affected
Programmatic Agreement Stipulation V.B. (check one):

☐ No NR listed or -eligible properties within Area of Potential Effect
☑ No effect on National Register listed or -eligible properties

Reviewer's Initials: KJ

CULTURAL RESOURCES PROJECT RECORD

Summary of MassDOT Highway Division Finding
(Appendix 1 and Section V.B. Projects only)

MassDOT proposes replacing Bridge H-01-005, which carries Bay Road over Fort River, in the Town of Hadley. The project was previously submitted in October 2016 as a bridge repair project (MassDOT Project #607744). This federally funded project will require a permit from the US Army Corps of Engineers.

The existing Bridge No. H-01-005, built in 1935, consists of an eight-span continuous reinforced concrete slab superstructure supported by two reinforced concrete abutments on timber piles and seven open bent piers with reinforced concrete pier caps on timber piles. The bridge supports a two (2) lane roadway width of 30' from curb-to-curb. There is one concrete sidewalk on the east side of the bridge with 4'-6" clear. The out-to-out width of the bridge is 39' and the total length of the bridge is 124'. The seven piers and two abutments are supported on 12" diameter timber piles with many having 18" diameter concrete jackets on their bottom 10' from the mudline that were added to address deterioration. It is unknown when these jackets were added as they are not included in the original plans. There have been numerous repairs to the existing timber piles consisting of encasing the deteriorating portions in concrete. The existing timber piles supporting the bridge have deteriorated to the point of being unable to carry any load without repair and are the governing structural element.

The proposed bridge will be a complete superstructure and substructure replacement and widening. The total length of the bridge will be approximately the same length as the existing bridge, 126'±. The total out-to-out width would be 42'-6", all within current right-of-way limits. The bridge will provide a 34'-0" wide roadway with one 5'-6" sidewalk and will be approximately the same length as the existing bridge, 126'±. The roadway in each direction will consist of a 12' wide travel lane and 5' wide shoulder. The roadway across the bridge will require widening from 30' to 34' for increased shoulder widths. Widening of the bridge would occur to the easterly side of the bridge (line of west curbline held) to aid with meeting into the existing horizontal alignment and to minimize alterations to the roadway layout.

A review of the State/National Registers revealed that Bridge H-01-005 is situated within the Hadley Center Historic District (HAD.T). Bridge H-01-005 is not listed as a contributing structure to this district. Bridge H-01-005 was constructed in 1935 downstream (westerly) of the former bridge crossing. The former Bay Road Stone Bridge Foundations (HAD.918) are listed as contributing elements to the NR-listed Hadley Center Historic District. Mill remains with mortared stone and brick foundations are visible in the northeast bridge quadrant near the former bridge crossing. The former bridge foundations and mill remains are located outside the project's APE and will not be impacted by the proposed bridge work.

A review of the Inventory of Historic and Archaeological Assets of the Commonwealth revealed no inventoried buildings, structures or areas within the project area.

A review of the MHC's archaeological maps revealed a number of recorded pre-contact sites in the vicinity of the project area including: 19-HS-150; 19-HS-163; 19-HS-293; 19-HS-294; and 19-HS-158. Site 19-HS-163 was tested as part of a 2006 archaeological survey conducted in advance of a proposed water treatment facility (MHC Report #2706). The intensive survey identified a low number of historic artifacts from plowzone. No pre-contact artifacts or features were identified at Site 19-HS-163 and no further work was recommended. The visible remains of both the pre-1935 bridge foundations (HAD.918) and a former mill are located northeasterly of the existing bridge. It is the opinion of MassDOT's Staff Archaeologist that little to no potential for significant pre-contact archaeological remains can be ascribed to the project's area of potential effect (APE) based on past bridge and roadway construction. The project work is confined to the existing bridge alignment and to the existing bridge approach/roadway slope and toe of slope. The former bridge foundations and mill remains are located outside the project's APE and will not be impacted by the proposed bridge work.

An early coordination letter was forwarded to the Hadley Historical Commission on March 19, 2018. A copy was forwarded to the MHC. PNFs were forwarded to the MHC, ATHPO, MTHPO, and NTHPO on October 3, 2016 (Bridge Repair Project #607740) and May 30, 2018 (Bridge Replacment Project #608460).

Reviewer's Initials: _____

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

RECEIVED
JUN 0 1 2018
MASS. HIST. COMM
RC. 61012

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Bridge Replacement H-01-005 (MassDOT Project #608460

Location /Address: Bay Road over Fort River

City/Town: Hadley

Project Proponent

Name: Massachusetts Department of Transportation

Address: 10 Park Plaza

City/Town/Zip/Telephone: Boston, MA 02116

After review of the MHC's files and the materials you submitted, the MHC has determined that the proposed project will have "no adverse effect" on significant historic or archaeological properties.

Brona Simon 6/22/18
Brona Simon Date
Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
MassDOT / FHWA	Federal funding (FHWA lead federal agency)
US Army Corps	Permit

Project Description (narrative):

MassDOT proposes replacing Bridge H-01-005, which carries Bay Road over Fort River, in the Town of Hadley. The project was previously submitted in October 2016 as a bridge repair project (MassDOT Project #607744). This federally funded project will require a US Army Corps permit.

The existing Bridge No. H-01-005, built in 1935, consists of an eight-span continuous reinforced concrete slab superstructure supported by two reinforced concrete abutments on timber piles and seven open bent piers with reinforced concrete pier caps on timber piles. The bridge supports a two (2) lane roadway width of 30' from curb-to-curb. There is one concrete sidewalk on the east side of the bridge with 4'-6" clear. The out-to-out width of the bridge is 39' and the total length of the bridge is 124'. The seven piers and two abutments are supported on 12" diameter timber piles with many having 18" diameter concrete jackets on their bottom 10' from the mudline that were added to address deterioration. It is unknown when these jackets were added as they are not included in the original plans. There have been numerous repairs to the existing timber piles consisting of encasing the deteriorating portions in concrete. The existing timber piles supporting the bridge have deteriorated to the point of being unable to carry any load without repair and are the governing structural element.

The proposed bridge will be a complete superstructure and substructure replacement and widening. The total length of the bridge will be approximately the same length as the existing bridge, 126'±. The total out-to-out width would be 42'-6", all within current right-of-way limits. The bridge will provide a 34'-0" wide roadway with one 5'-6" sidewalk and will be approximately the same length as the existing bridge, 126'±. The roadway in each direction will consist of a 12' wide travel lane and 5' wide shoulder. The

roadway across the bridge will require widening from 30' to 34' for increased shoulder widths. Widening of the bridge would occur to the easterly side of the bridge (line of west curbline held) to aid with meeting into the existing horizontal alignment and to minimize alterations to the roadway layout.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

N/A

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

N/A

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

See plans

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

A review of the State/National Registers revealed that Bridge H-01-005 is situated within the Hadley Center Historic District (HAD.T). Bridge H-01-005 is not listed as a contributing structure to this district. Bridge H-01-005 was constructed in 1935 downstream (westerly) of the former bridge crossing. The former Bay Road Stone Bridge Foundations (HAD.918) are listed as contributing elements to the NR-listed Hadley Center Historic District. Mill remains with mortared stone and brick foundations are visible in the northeast bridge quadrant near the former bridge crossing.

A review of the Inventory of Historic and Archaeological Assets of the Commonwealth revealed no inventoried buildings, structures or areas within the project area.

A review of the MHC's archaeological maps revealed a number of recorded pre-contact sites in the vicinity of the project area including: 19-HS-150; 19-HS-163; 19-HS-293; 19-HS-294; and 19-HS-158. Site 19-HS-163 was tested as part of a 2006 archaeological survey conducted in advance of a proposed water treatment facility (MHC Report #2706). The intensive survey identified a low number of historic artifacts from plowzone. No pre-contact artifacts or features were identified at Site 19-HS-163 and no further work was recommended. The visible remains of both the pre-1935 bridge foundations (HAD.918) and a former mill are located northeasterly of the existing bridge. It is the opinion of MassDOT's Staff Archaeologist that little to no potential for significant pre-contact archaeological remains can be ascribed to the project's area of potential effect (APE) based on past bridge and roadway construction. The project work is confined to the existing bridge alignment and to the existing bridge approach/roadway slope and toe of slope. The former bridge foundations and mill remains are located outside the project's APE and will not be impacted by the proposed bridge work.

What is the total acreage of the project area?

Woodland	_____	acres	Productive Resources:		
Wetland	_____	acres	Agriculture	_____	acres

APPENDIX A (continued)

Floodplain	_____	acres	Forestry	_____	acres
Open Space	_____	acres	Mining/Extraction	_____	acres
Developed	_____	acres	Total Project Acreage	_____	acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

Bridge H-01-005- Bay Road over the Fort River

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: _____ **Date:** 5/30/18

Name: Jameson Harwood

Address: 10 Park Plaza

City/Town/Zip: Boston, MA 02717

Telephone: 857-368-8799

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC: B. Simon, MHC
R. Peters, MTHPO
B. Washington, ATHPO
D. Harris, Deputy NTHPO
CC:

From: Mastone, Victor (EEA)
To: McArthur, Susan M. (DOT)
Cc: Rempelakis, John E. (DOT); Harwood, Jameson (DOT)
Subject: BUAR comments on Project No. 608460, Bridge Replacement (H-01-005), Bay Road over Fort River in Hadley
Date: Friday, November 9, 2018 10:09:20 AM

Dear Susan,

The staff of the Massachusetts Board of Underwater Archaeological Resources has reviewed the notice and supplemental materials provided by MassDOT for the following USACE PCN project: No. 608460, Bridge Replacement (H-01-005), Bay Road over Fort River in Hadley. We offer the following comments.

The Board has conducted a preliminary review of its files and secondary literature sources to identify known and potential submerged cultural resources in the proposed project area. No record of any underwater archaeological resources was found. MHC's MACRIS identifies several properties in the area, but MHC and MassDOT's Cultural Resources Section determined there should be no impacts to archaeological resoruces. Based on the results of this review and nature of the proposed project (footprint replacement), the Board expects that this project is unlikely to impact submerged cultural resources.

However, the area may be considered archaeologically sensitive. Therefore, should heretofore-unknown submerged cultural resources be encountered during the course of the project, the Board expects that the project's sponsor will take steps to limit adverse effects and notify the Board and the Massachusetts Historical Commission, as well as other appropriate agencies, immediately in accordance with the Board's *Policy Guidance for the Discovery of Unanticipated Archaeological Resources*.

The Board appreciates the opportunity to provide these comments as part of the review process. Should you have any questions regarding these comments, please do not hesitate to contact me.

Yours,

Vic

Victor T. Mastone
Director and Chief Archaeologist
Board of Underwater Archaeological Resources
251 Causeway Street, Suite 800
Boston, MA 02114
Direct Line: 617-626-1141
Fax line: 617-626-1240
Email: victor.mastone@state.ma.us
Website: http://www.mass.gov/orgs/board-of-underwater-archaeological-resources

Mashpee Wampanoag Tribe
Section 106 Review
Consultation Response Form

Project Docket Number:	Bridge H-01-005
Consultant/Environmental Firm:	FHWA/ ACOE/MassDOT
Address or Location Description:	Bay Rd.,
City, State:	Hadley, MA
Point of Contact	Jameson Harwood

Response:

☒ We have no concerns related to the present proposed project. MWT anticipates no adverse effects to our sites of cultural significance, by you or your client at this time.

☐ The MWT considers this project in compliance with the MWT's section 106 review process with agreed upon mitigations.

☐ This site will require the on-site presence of a Tribal Cultural Resource Monitor during ground disturbing activities. Contact the Compliance Review Supervisor with your construction schedule.

☐ This project has the potential to have "adverse effects" to historic or cultural resources and or sites of significance important to our tribe. We recommend the following actions:

Native American habitation and occupation of the area is well documented and the sensitivity of the area is considered very high for cultural significance. MHC's list of inventories documents extensive occupation of the area. Another consideration is the environmental settings and the proximity to water resources which are both known to sustain Native American habitation and occupation, making the sensitivity of the APE highly sensitive archaeologically.

Our office does not anticipate adverse effects or unanticipated discoveries during the project as currently described. If the scope of work should change please contact our office so that we may review thoroughly.

This consultation process is in compliance to the National Historic Preservation Act of 1966 and all relevant amendments including but not limited to section 106 and 36 CFR 800.

Condition: In the case that archeological resources or human remains are found during construction, **you must immediately stop construction and notify our office.**

Ramona Peters

Ramona Peters, THPO - Compliance Review Supervisor
Tribal Historic Preservation Department

12.5.16
Date

Mashpee Wampanoag Indian Tribal Council
Historic Preservation Department
483 Great Neck Rd South, Mashpee, MA 02649 | Phone: 508-477-0208*101 | Email: 106review@mwtribe.com

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

October 3, 2016

Ms. Ramona Peters
Tribal Historic Preservation Officer
Mashpee Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

RE: Hadley (MassDOT #607744) Bridge H-01-005 **(NOW #608460)**
District 2 Scheduled and Emergency Bridge Substructure Repairs
Project Notification

Dear Ms. Peters:

The enclosed project notification package has been submitted in accordance with the U.S. Army Corps of Engineers permit requirements pertaining to Section 106

MassDOT requests that the Tribe review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: Kevin Walsh, Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

atts: Project Plans/Locus map/PNF

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

May 30, 2018

Ms. Ramona Peters
Tribal Historic Preservation Officer
Mashpee Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

RE: Hadley (MassDOT #608460) Bridge H-01-005 Replacement
Bay Road over Fort River
Project Notification

Dear Ms. Peters:

The enclosed project notification package has been resubmitted in accordance with the U.S. Army Corps of Engineer permit requirements pertaining to Section 106. A project notification package was previously forwarded on October 3, 2016 for the repair of Bridge H-01-005 (MassDOT Project #607444; however, the project work now consists of the replacement of the bridge (MassDOT Project #608460)

MassDOT requests that the Tribe review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: David White, Acting Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

atts: Project Plans/Locus map/PNF

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

May 30, 2018

Mr. Doug Harris
Deputy Tribal Historic Preservation Officer
Narragansett Indian Tribe
4425 South County Trail
Charlestown, Rhode Island 02813

RE: Hadley (MassDOT #608460) Bridge H-01-005 Replacement
Bay Road over Fort River
Project Notification

Dear Mr. Harris:

The enclosed project notification package has been resubmitted in accordance with the U.S. Army Corps of Engineer permit requirements pertaining to Section 106. A project notification package was previously forwarded on October 3, 2016 for the repair of Bridge H-01-005 (MassDOT Project #607444; however, the project work now consists of the replacement of the bridge (MassDOT Project #608460)

MassDOT requests that the Tribe review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: David White, Acting Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

Attachments: PNF/Project Plans/Locus Map

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

May 30, 2018

Ms. Bettina Washington
Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

RE: Hadley (MassDOT #608460) Bridge H-01-005 Replacement
Bay Road over Fort River
Project Notification

Dear Ms. Washington:

The enclosed project notification package has been resubmitted in accordance with the U.S. Army Corps of Engineer permit requirements pertaining to Section 106. A project notification package was previously forwarded on October 3, 2016 for the repair of Bridge H-01-005 (MassDOT Project #607444; however, the project work now consists of the replacement of the bridge (MassDOT Project #608460)

MassDOT requests that the Tribe review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: David White, Acting Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

atts: Project Plans/Locus map/PNF

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

May 30, 2018

Ms. Brona Simon
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

RE: Hadley (MassDOT #608460) Bridge H-01-005 Replacement
Bay Road over Fort River
Project Notification

Dear Ms. Simon:

The enclosed project notification package has been resubmitted in accordance with the U.S. Army Corps of Engineer permit requirements pertaining to Section 106. A project notification package was previously forwarded on October 3, 2016 for the repair of Bridge H-01-005 (MassDOT Project #607444; however, the project work now consists of the replacement of the bridge (MassDOT Project #608460)

MassDOT requests that the Commission review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: David White, Acting Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

Attachments: PNF/Project Plans/Locus Map

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

October 3, 2016

Ms. Brona Simon
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

Now MassDOT #608460

RE: Hadley (MassDOT ~~#607744~~) Bridge H-01-005
District 2 Scheduled and Emergency Bridge Substructure Repairs
Project Notification

Dear Ms. Simon:

The enclosed project notification package has been submitted in accordance with the U.S. Army Corps of Engineer permit requirements pertaining to Section 106.

MassDOT requests that the Commission review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: Kevin Walsh, Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

Attachments: PNF/Project Plans/Locus Map

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

RECEIVED
OCT 0 7 2016
MASS. HIST. COMM
RC.61012

PROJECT NOTIFICATION FORM

Project Name: District 2 Scheduled and Emergency Bridge Substructure Repairs

Location /Address: Bridge H-01-005 (Bay Road over Fort River)

City/Town: Hadley

Project Proponent

Name: Massachusetts Department of Transportation

Address: 10 Park Plaza

City/Town/Zip/Telephone: Boston, MA 02116

After review of the MHC's files and the materials you submitted, the MHC has determined that the proposed project will have "no adverse effect" on significant historic or archaeological properties.

Brona Simon 10/26/16
Brona Simon Date
Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
MassDOT	State
US Army Corps	Permit

Project Description (narrative):

MassDOT will perform substructure repairs on Bridge H-01-005, which carries Bay Road over Fort River, in the Town of Hadley. This state funded project will require a US Army Corps permit.

The project work includes removing and replacing deteriorated concrete and reinforcing steel from pier caps, pier columns, exposed pier footings, wing walls, breast walls, parapets, retaining walls, etc.

The work may also include structural steel beam and end bearing repairs, to include cleaning and painting with possible steel repairs of the specific areas, as directed by the Engineer. These will primarily be in areas requiring jacking and shoring in combination with substructure concrete repairs.

The project work also includes placing construction matting, crushed stone and compost filter tubes along the roadway slopes within the northeast and southeast quadrants to allow access under the bridge by a small bobcat machine (see attached plan sheet). The crushed stone will be removed following the completion of construction.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

N/A

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

and describe the building(s) which are proposed for rehabilitation.

N/A

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

N/A

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

A review of the State/National Registers revealed that Bridge H-01-005 is situated within the Hadley Center Historic District (HAD.T). Bridge H-01-005 is not listed as a contributing structure to this district. Bridge H-01-005 was constructed in 1935 downstream (westerly) of the former bridge crossing (see enclosed 1935 plan sheet). The former Bay Road Stone Bridge Foundations (HAD.918) are listed as contributing elements to the NR-listed Hadley Center Historic District. Mill remains with mortared stone and brick foundations are visible in the northeast bridge quadrant near the former bridge crossing.

A review of the Inventory of Historic and Archaeological Assets of the Commonwealth revealed no inventoried buildings, structures or areas within the project area.

A review of the MHC's archaeological maps revealed a number of recorded pre-contact sites in the vicinity of the project area including: 19-HS-150; 19-HS-163; 19-HS-293; 19-HS-294; and 19-HS-158. Site 19-HS-163 was tested as part of a 2006 archaeological survey conducted in advance of a proposed water treatment facility (MHC Report #2706). The intensive survey identified a low number of historic artifacts from plowzone. No pre-contact artifacts or features were identified at Site 19-HS-163 and no further work was recommended. The visible remains of both the pre-1935 bridge foundations (HAD.918) and a former mill are located northeasterly of the existing bridge. It is the opinion of MassDOT's Staff Archaeologist that little to no potential for significant pre-contact archaeological remains can be ascribed to the project's area of potential effect (APE) based on the limited scope of the project work and past bridge and roadway construction. The project work is confined to the existing bridge substructure and to the existing bridge approach/roadway slope and toe of slope. The former bridge foundations and mill remains are located outside the project's APE and will not be impacted by the proposed bridge work.

What is the total acreage of the project area?

			Productive Resources:		
Woodland	_____	acres			
Wetland	_____	acres	Agriculture	_____	acres
Floodplain	_____	acres	Forestry	_____	acres
Open Space	_____	acres	Mining/Extraction	_____	acres
Developed	_____	acres	Total Project Acreage	_____	acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

Bridge H-01-005- Bay Road over the Fort River

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: _____ **Date:** 10-3-2016

Name: Jameson Harwood

Address: 10 Park Plaza

City/Town/Zip: Boston, MA 02717

Telephone: 857-368-8799

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC: B. Simon, MHC
R. Peters, MTHPO
B. Washington, ATHPO
D. Harris, Deputy NTHPO
CC:

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

October 3, 2016

Ms. Ramona Peters
Tribal Historic Preservation Officer
Mashpee Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

RE: Hadley (MassDOT #607744) Bridge H-01-005 Now MassDOT #608460
District 2 Scheduled and Emergency Bridge Substructure Repairs
Project Notification

Dear Ms. Peters:

The enclosed project notification package has been submitted in accordance with the U.S. Army Corps of Engineers permit requirements pertaining to Section 106

MassDOT requests that the Tribe review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: Kevin Walsh, Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

atts: Project Plans/Locus map/PNF

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

October 3, 2016

Ms. Bettina Washington
Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

RE: Hadley (MassDOT #607744) Bridge H-01-005 Now MassDOT #608460
District 2 Scheduled and Emergency Bridge Substructure Repairs
Project Notification

Dear Ms. Washington:

The enclosed project notification package has been submitted in accordance with the U.S. Army Corps of Engineers early notification requirements pertaining to Section 106.

MassDOT requests that the Tribe review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: Kevin Walsh, Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

atts: Project Plans/Locus map/PNF

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas J. Tinlin, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

October 3, 2016

Mr. Doug Harris
Deputy Tribal Historic Preservation Officer
Narragansett Indian Tribe
4425 South County Trail
Charlestown, Rhode Island 02813

RE: Hadley (MassDOT #607744) Bridge H-01-005 Now MassDOT #608460
District 2 Scheduled and Emergency Bridge Substructure Repairs
Project Notification

Dear Mr. Harris:

The enclosed project notification package has been submitted in accordance with the U.S. Army Corps of Engineers permit requirements pertaining to Section 106.

MassDOT requests that the Narragansett Indian Tribe review the enclosed materials at its earliest convenience and solicit comments that it wishes to make regarding this project. Written comments should be submitted to: Kevin Walsh, Director, Environmental Services, Massachusetts Department of Transportation, 10 Park Plaza, Room 4260, Boston, MA 02116, Attn: Jameson Harwood.

If you have any questions concerning the project information, please feel free to contact Jameson Harwood at (857.368.8799)

Sincerely,

Jameson Harwood
Staff Archaeologist
Environmental Services

Attachments: PNF/Project Plans/Locus Map

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Bettina Washington
Sent: Friday, April 26, 2024 9:07 AM
Subject: Relayed: MassDOT Project #608460: Hadley, Bridge H-01-005 replacement

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Bettina Washington (thpo@wampanoagtribe-nsn.gov)

Subject: MassDOT Project #608460: Hadley, Bridge H-01-005 replacement

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Friday, April 26, 2024 9:06 AM
To: Bettina Washington
Subject: MassDOT Project #608460: Hadley, Bridge H-01-005 replacement
Attachments: Hadley, Bridge H-01-005, PNF (MassDOT #608460).pdf; Hadley, Bridge H-01-005 (608460) Plans.pdf

Ms. Washington,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. This project was previously submitted to your office in 2018.

Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: David Weeden (David.Weeden@mwtribe-nsn.gov)
Sent: Friday, April 26, 2024 9:18 AM
Subject: Relayed: MassDOT Project #608460: Huntington, Bridge H-01-005 PNF

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

David Weeden (David.Weeden@mwtribe-nsn.gov) (David.Weeden@mwtribe-nsn.gov)

Subject: MassDOT Project #608460: Huntington, Bridge H-01-005 PNF

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Friday, April 26, 2024 9:17 AM
To: David Weeden (David.Weeden@mwtribe-nsn.gov)
Subject: MassDOT Project #608460: Huntington, Bridge H-01-005 PNF
Attachments: Hadley, Bridge H-01-005, PNF (#608460).pdf; Hadley, Bridge H-01-005 (608460) Plans.pdf

David,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. This project was previously submitted to your office in 2016 and 2018.

Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Tashtesook@aol.com
Sent: Friday, April 26, 2024 9:10 AM
Subject: Relayed: MassDOT Project #608460: Hadley, Bridge H-01-005 PNF

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Tashtesook@aol.com (Tashtesook@aol.com)

Subject: MassDOT Project #608460: Hadley, Bridge H-01-005 PNF

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Friday, April 26, 2024 9:10 AM
To: Tashtesook@aol.com
Subject: MassDOT Project #608460: Hadley, Bridge H-01-005 PNF
Attachments: Hadley, Bridge H-01-005, PNF (MassDOT #608460).pdf; Hadley, Bridge H-01-005 (608460) Plans.pdf

Mr. Brown,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. This project was previously submitted to your office in 2018.

Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza – Rm 7130
Boston, MA 02116
508-542-6967 (cell)

benesch
engineers · scientists · planners

Alfred Benesch & Company
Eastern Harbor Office Park
50 Redfield Street
Boston, MA 02122
www.benesch.com
P 617-288-0900
F 617-265-8739

March 19, 2018

Ginger Goldsbury, Chairperson
Hadley Historical Commission
100 Middle Street
Hadley, MA 01035

RE: **Replacement of Bridge H-01-005**
Bay Road over Fort River
Hadley (MassDOT 608460)
Section 106 Review

Dear Ms. Goldsbury,

The Massachusetts Department of Transportation, Highway Division (MassDOT Highway Division) and the Town of Hadley propose to replace Bridge H-01-005, which carries Bay Road over the Fort River. It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the Hadley Historical Commission's review in compliance with the regulations governing Section 106.

The purpose of this project is to replace bridge H-01-005 due to the existing timber piles supporting the bridge have deteriorated to the point of being unable to carry any load without repair and are the governing structural element. Please refer to the attached Project Description document for details of the project.

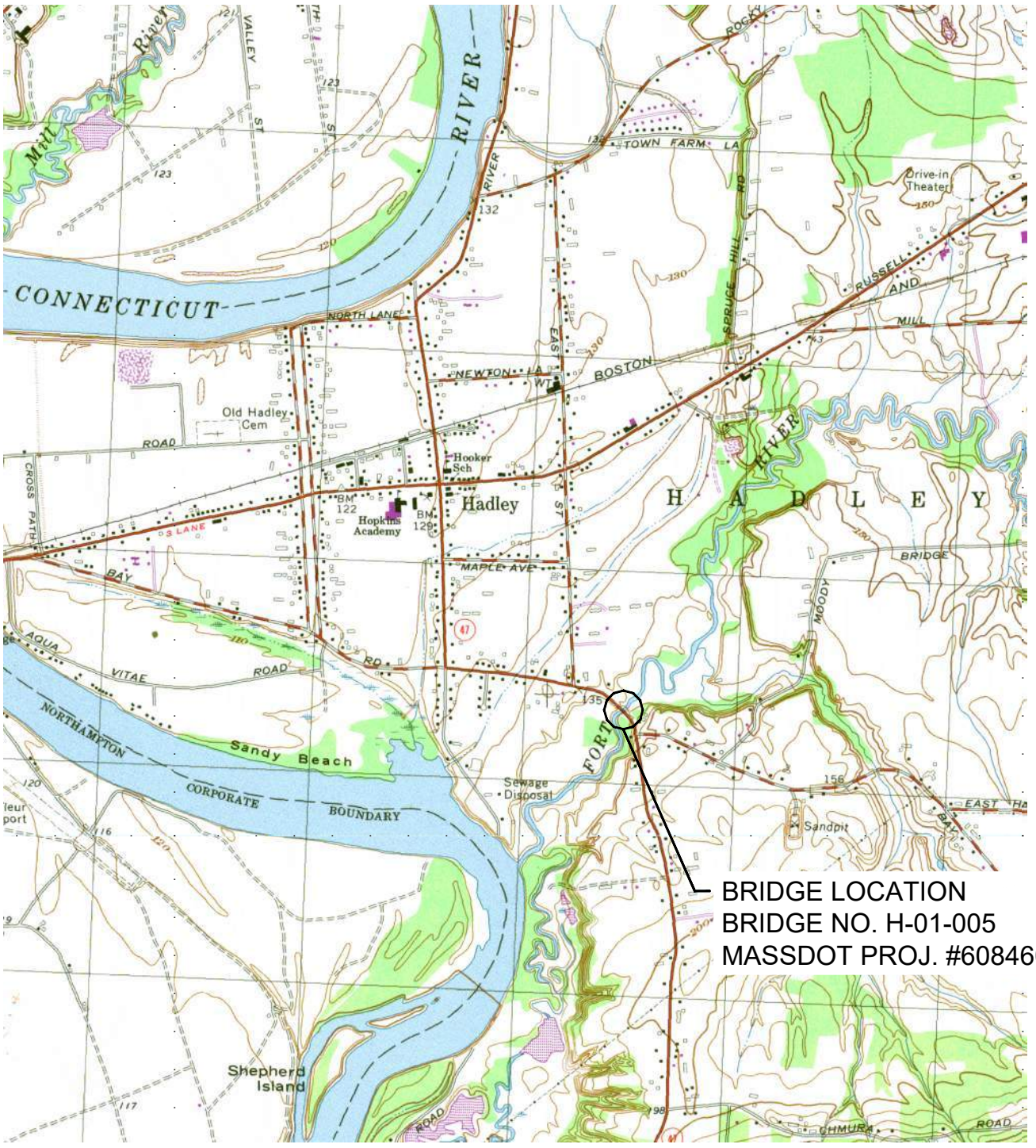
MassDOT Highway Division and the Town of Hadley requests that the Hadley Historical Commission review the enclosed materials at their earliest convenience, and solicit any comments that the Commission wishes to make regarding this project. Written comments should be submitted to: Patricia Leavenworth, P.E., Chief Engineer, MassDOT Highway Division, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton, and please forward a copy to me also.

If you have any questions concerning the enclosed project information, please feel free to contact James Dalton (857.368.9313) of MassDOT Highway Division's Project Management Section. If you have any questions concerning the Section 106 process, please feel free to contact Jeffrey Shrimpton (857.368.8824) of MassDOT Highway Division's Cultural Resources Unit.

Sincerely,

Anthony Timperio, P.E., Senior Project Manager
Alfred Benesch & Company

atts: locus map and project description
xcs: B. Simon, SHPO, with atts.
J. Shrimpton, MassDOT Highway Division, with atts.



LOCUS MAP

benesch	**BAY ROAD (ROUTE 47) OVER FORT RIVER HADLEY, MA**	DATE: 03/19/2018 SCALE: N.T.S. EXHIBIT NO. 1

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT P

NHESP Coordination

To be provided by MassDOT

WATER QUALITY CERTIFICATION
MassDOT Proj. # 608460 – Bay Road (Route 47) over Fort River
Hadley, MA

ATTACHMENT Q

NOAA Coordination

From: Sabrina Pereira - NOAA Federal
To: Burns, Trevor B. (DOT)
Subject: Re: Fort River EFH assessment
Date: Monday, July 31, 2023 12:25:38 PM
Attachments: image001.png

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

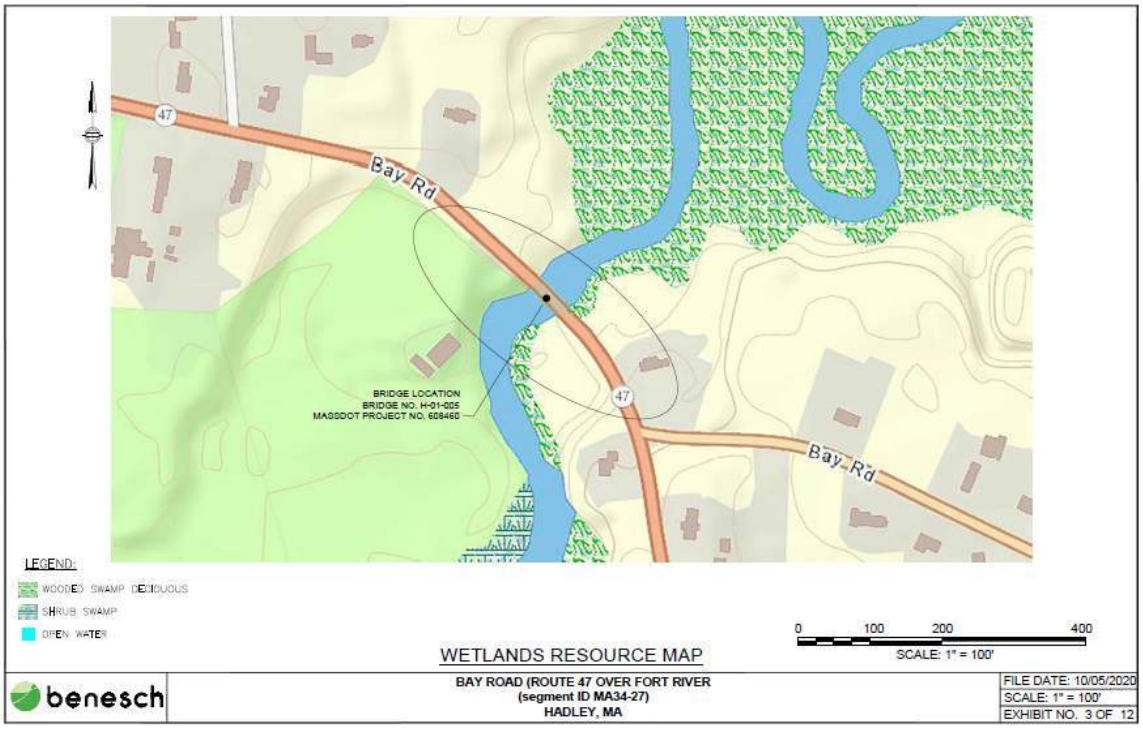
Hi Trevor,

Thanks for reaching out. No consultation required for this one.

Best wishes,
Sabrina Pereira
Marine Habitat Resource Specialist
Habitat and Ecosystem Services Division
NOAA/ National Marine Fisheries Service
Narragansett, RI
she/her/hers
(978)-675-2178
Sabrina.pereira@noaa.gov

On Fri, Jul 28, 2023 at 11:43 AM Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us> wrote:

> Hi Sabrina
>
> MassDOT is proposing to replace the existing Bay Road Bridge which spans over the Fort River in Hadley, MA. The work-in-water will occur in two stages, using temporary sandbag cofferdams to dewater
>
> portions of the river. The duration of the work-in-water is anticipated to be for two construction seasons. In total, there is an estimated 8614 sqft of temporary LUW impacts, and 500sqft of permanent impacts. Also, 1033 sqft of temporary and 188 sqft or permanent BVW impacts. The Fort River is designated habitat for Atlantic Salmon. My question for you is if this is a project you need to review and what is your recommendation for consultation.
>
> Have a great weekend!



Trevor Burns

Wildlife Biologist

Environmental Services

MassDOT Highway Division

DOCUMENT A00828

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

ADMINISTRATIVE COMPLETENESS AND TECHNICAL DEFICIENCY REVIEW

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Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
100 Cambridge Street Suite 900 Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

October 28, 2024

Massachusetts Department of Transportation Highway Division
Ten Park Plaza, Room 7360
Boston, MA 02116
ATTN: Courtney Walker

RE: 401 WATER QUALITY CERTIFICATION
Administrative Completeness and Technical Deficiency Review
401 WQC Transmittal No: 24-WW26-0055-APP (Combined Fill and Dredge)

AT: Bay Road (Route 47) over Fort River Bridge Replacement
Hadley, MA

Dear Ms. Walker:

The Massachusetts Department of Environmental Protection (MassDEP) Wetlands Program Highway Unit has completed its Administrative Completeness Review of the application for the above-referenced Water Quality Certification (WQC) application. The application is hereby deemed administratively complete.

MassDEP has also completed its Technical Review of the above-referenced application and requests that you submit the following additional information:

Site Plans

1. As discussed during the site visit on October 24, 2024, MassDEP understands the Highway & Bridge Design Plans (the Design Plans), last revised August 9, 2021, and submitted as Attachment M are not the most recent design plans. As such, MassDEP reviewed only the Proposed & Existing Design Exhibits (the Exhibits) in Attachment C. Please note if the Exhibits are intended to be the permitting plans of record, they will need to be revised to depict the entire limit of work similar to the Design Plans.

This information is available in alternate format. Please contact Melixza Esenyie at 617-626-1282.
TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

2. The intermittent stream identified in the Wetland Delineation Summary Report as a drainage channel that begins from the stormwater outfall within Bordering Vegetated Wetland (BVW) 3 and depicted on the accompanying figures will need to be added to the Exhibits. The stream exhibited defined bed and bank, and appears to receive hydrology from stormwater, groundwater, and periodic flood flows from the Fort River as evidenced by the presence of large woody debris and alluvial soils.

3. Please provide hatching differentiating the natural streambed items in the legend and on the plans of Exhibit 1.

Potentially Contaminated Soil, Sediment, and Groundwater

4. MassDEP understands sediment sampling is underway, and reserves further comment regarding potentially contaminated soil, sediment, and groundwater management pending the results. Please also note that, although not required for this project based on the anticipated volume of dredged material, MassDEP did not pre-approve a sediment sampling plan.

5. The narrative states no new streambed material is anticipated to be imported onto the site, as the dredged material will be reused as much as possible. As the due diligence review and specifications indicate the potential for contaminated soil, sediment, and/or groundwater, please note MassDEP will require sampling of dredged material to determine its suitability for reuse as a condition in the WQC.

Construction and Design

6. Given the steep banks of the Fort River in each quadrant, please describe and if needed depict how equipment will access the river, including whether any temporary grading of the banks is proposed.

7. Per 314 CMR 9.06 (1) and (2), please describe and if needed depict specific efforts to avoid and minimize temporary impacts to the BVW and intermittent stream. It must be demonstrated that the proposed extent of the temporary impacts is required to complete the work.

8. If the intermittent stream will be impacted by the project activities, please provide a plan to restore it to pre-construction conditions following completion of the work. In particular, the stream restoration should maintain the existing functions relative to receiving periodic flood flows from the Fort River as identified in Comment 2.

9. Please note that laydown areas and dewatering areas will also need to be identified in the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan, and the Control of Water Plan that will be conditioned in the WQC. Given the space constraints at this site, MassDEP recommends identifying these areas now during the design phase.

10. Please clarify whether the existing catch basin and stormwater outfall will remain active during construction. If they will remain active and the project activities will impact the

outfall and receiving intermittent stream, please describe how the construction-period stormwater at the outfall will be managed until it is relocated.

11. The proposed limits of riprap in the river end abruptly at its ends. Please evaluate tapering the riprap into the bank to avoid creating areas of scour.

12. Section 2.4 of the narrative states no trees are proposed to be removed. Please clarify, as it appears work will require tree removal, and tree plantings are proposed following the work. Please also provide an evaluation as to whether areas of rip rap proposed along the banks could also be revised to modified rock fill and seeded and/or planted.

13. Details for the streambed restoration need to include a specification for construction of a low-flow channel.

14. Please provide the values used to calculate the openness ratio for the Stream Crossing Standards.

Stormwater

15. Section 2.3 of the narrative states there will be a 1,960 square foot (sf) increase in impervious surface while the Stormwater Management Memo states 2,900 sf. Please clarify the increase in impervious surface and revise the stormwater calculations if needed.

16. Please note that in addition to the Fort River being a coldwater fishery, there are two Zone I Wellhead Protection Areas (WPAs) that intersect the project, and the entire site is in a Zone II WPA, all of which are also Critical Areas per 314 CMR 9.02. Per Stormwater Management Standard 6, the use of salt for the deicing of impervious surfaces must be minimized within WPAs and coldwater fisheries. Section 2.1.4 of the Long-Term Pollution Prevention Plan needs to be revised to reflect this.

17. Relevant calculations for Stormwater Management Standards 2, 3, and 4 are required including pre- and post-construction peak discharge flow rates; required groundwater recharge volume for the net increase in impervious surface; and the total area of impervious surface that will drain to the deep sump catch basin versus the total area of impervious surface proposed to remain as country drainage.

18. The Stormwater Checklist states runoff from all impervious surface is discharging to an infiltration Best Management Practice (BMP). Please clarify as no infiltration BMPs are proposed.

19. The Operations and Maintenance Plan will need to be revised to reflect catch basin inspection and cleaning frequencies in accordance with Volume 2, Chapter 2 of the Stormwater Handbook.

20. Please add specifications for deep sump catch basins and erosion and sedimentation controls as needed to the Exhibits.

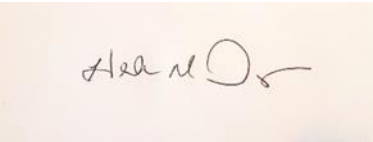
Wildlife and Rare Species

21. MassDEP understands coordination with the Massachusetts Natural Heritage and Endangered Species Program (NHESP) is ongoing regarding Priority and Estimated Habitats of Rare Species at the project site. Per 314 CMR 9.06(2) and 9.07(1), no project may be permitted which will have any adverse effect on specified habitat sites of Rare Species unless the work is subject to a Conservation and Management Permit or Determination of No Take issued by NHESP. As such, NHESP coordination must be complete prior to issuance of the WQC.
22. In addition to NHESP consultation, the regulations at 314 CMR 9.07(3)(d) require consultation with the MA Division of Fisheries and Wildlife (DFW) regarding Time of Year restrictions and/or in-water sediment management for the other species listed in the regulation. Please provide the consultation letter or email from the DFW.

Upon receipt of all requested supplemental information, MassDEP has 30 calendar days in which to issue or deny a certification.

Should you have any questions relative to this letter, please contact me at heidi.davis@mass.gov or Ryan Hale at ryan.hale@mass.gov.

Sincerely,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP WERO – Michael McHugh
MassDOT – Erica Larner
MassDOT – Michael Joa
MassDOT – Anthony Christakis
USACE – Dan Vasconcelos
USACE – Kevin Newton
Benesch – Ashley Bomely
Hadley Conservation Commission – Kayla Loubriel, conservation@hadleyma.gov

benesch

50 Redfield Street, Suite 102
Boston, MA 02122
www.benesch.com
P 617-288-0900

February 20, 2025

Heidi Davis
Senior Environmental Analyst & Highway Unit Supervisor
MassDEP Boston Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: 401 Water Quality Certification for the Replacement of Bridge H-01-005, Bay Road (Route 47) over the Fort River
MassDOT Project File No. 608460
MassDEP 401 WQC Transmittal No. 24-WW26-0055-APP (Combined Fill and Dredge)

Dear Ms. Davis,

Benesch has reviewed the Technical Deficiency Letter provided by MassDEP regarding the 401 Water Quality Certification filed on October 7, 2024 for the subject project. Following this page, please find copies of the comments received in the Technical Deficiency Letter along with Benesch's response.

Additionally, the following addendum attachments have been provided:

- Addendum Attachment 1: Summary of Revised Impact Areas
- Addendum Attachment 2: Revised Proposed & Existing Design Exhibits
- Addendum Attachment 3: Wetland Delineation Summary Report, dated 10/22/2024
- Addendum Attachment 4: Sediment Sampling Summary
- Addendum Attachment 5: Stormwater Management Memo
- Addendum Attachment 6: O&M Plan and LTPPP
- Addendum Attachment 7: Revised Relevant Project Special Provisions or Special Provisions Not Previously Provided
- Addendum Attachment 8: NHESP Coordination
- Addendum Attachment 9: NOAA Coordination

Should you require additional information, please let me know.

Thank you,

Ashley Bomely

Ashley Bomely, PE

CC: Anthony Christakis, MassDOT
Michael Joa, MassDOT
Courtney Walker, MassDOT
Michael McHugh, DEP WERO
Dan Vasconcelos, USACE
Kevin Newton, USACE
Kayla Loubriel, Hadley Conservation Commission

Comments dated October 28, 2024 from MassDEP:

Site Plans

1. As discussed during the site visit on October 24, 2024, MassDEP understands the Highway & Bridge Design Plans (the Design Plans), last revised August 9, 2021, and submitted as Attachment M are not the most recent design plans. As such, MassDEP reviewed only the Proposed & Existing Design Exhibits (the Exhibits) in Attachment C. Please note if the Exhibits are intended to be the permitting plans of record, they will need to be revised to depict the entire limit of work similar to the Design Plans.
    a. *Benesch Response: Noted. The permitting plans of record are intended to be the exhibits shown in Attachment C of the original filing. Based on other comments provided by MassDEP, revised exhibits have been provided in Addendum Attachment 1. Additionally, for clarity, the Plan View (Exhibits 1-3) have been revised to depict the full roadway project limits.*
2. The intermittent stream identified in the Wetland Delineation Summary Report as a drainage channel that begins from the stormwater outfall within Bordering Vegetated Wetland (BVW) 3 and depicted on the accompanying figures will need to be added to the Exhibits. The stream exhibited defined bed and bank, and appears to receive hydrology from stormwater, groundwater, and periodic flood flows from the Fort River as evidenced by the presence of large woody debris and alluvial soils.
    a. *Benesch Response: Agree, linework depicting the intermittent stream centerline has been added to the exhibits provided in Addendum Attachment 1. As discussed between Epsilon and MassDEP, the existing channel has a width of 2'-6" as visually observed in the field. The intermittent stream functions as a drainage channel for the existing drainage outlet, as well as a channel for natural upland flow and floodwater when the Fort River elevation rises. In the proposed condition, 21 square feet of the intermittent stream will be permanently impacted and replaced with loam and part shade roadside mix. During construction, 45 square feet of the intermittent stream will be temporarily impacted by the cofferdams and construction access. Impacts were limited as much as possible by designing the proposed grading to meet into existing grades as quickly as possible while still adhering to MassDOT bridge, roadway and guardrail design criteria. Although there are permanent impacts, the intermittent stream will continue to function as it does in the existing condition with the exception of acting as a drainage channel for the existing drainage outlet. The existing drainage outlet is being removed as part of this project and roadway drainage will instead be directed to a new drainage outlet/drainage channel on the upstream side of the bridge. The Contractor shall not permanently impact the intermittent stream until the new drainage outlet is constructed. Since the intermittent stream flows through existing Bordering Vegetated Wetlands/Vegetated Wetland, the restoration of the temporarily impacted intermittent stream is included in the project special provision Item 755.45 – Inland Wetland Restoration.*
3. Please provide hatching differentiating the natural streambed items in the legend and on the plans of Exhibit 1.
    a. *Benesch Response: Agree, hatches have been reconciled for the 12" streambed material being regraded within the Fort River. Please note, the material makeup for both the proposed drainage channel and wildlife passage are intended to match the existing material within the Fort River.*

Potentially Contaminated Soil, Sediment, and Groundwater

4. MassDEP understands sediment sampling is underway, and reserves further comment regarding potentially contaminated soil, sediment, and groundwater management pending the results. Please also note that, although not required for this project based on the anticipated volume of dredged material, MassDEP did not pre-approve a sediment sampling plan.

a. *Benesch Response: The Sediment Sampling Plan was approved by MassDEP on November 20, 2024. The sediment sampling results, dated December 5, 2024, and sediment sampling summary have been included in Addendum Attachment 3.*

5. The narrative states no new streambed material is anticipated to be imported onto the site, as the dredged material will be reused as much as possible. As the due diligence review and specifications indicate the potential for contaminated soil, sediment, and/or groundwater, please note MassDEP will require sampling of dredged material to determine its suitability for reuse as a condition in the WQC.
    a. *Benesch Response: The sediment sampling, dated December 5, 2024, has been included in Addendum Attachment 3. Per the sediment sample results, there are concentrations of polycyclic aromatic hydrocarbons (PAHs) and metals detected above laboratory reporting limits in the samples collected. The samples were taken within areas of proposed dredging. While the material is proposed to be dredged, as described in the original filing, the material is proposed to be reused in the existing location, however graded to different elevations. The dredged material will not be relocated to other portions of the site with lesser contaminant concentrations.*

Construction and Design

6. Given the steep banks of the Fort River in each quadrant, please describe and if needed depict how equipment will access the river, including whether any temporary grading of the banks of proposed.
    a. *Benesch Response: Exact construction equipment will be determined by the Contractor as part of their means and methods. Access is anticipated to occur from the southwest and southeast bridge quadrants. The existing southwest quadrant was regraded to accommodate Contractor access as part of prior bridge repairs and the upland slope was restored in place upon completion of the repairs. The existing southeast quadrant has more gradual slopes than the other quadrants. The Contractor may also elect to use a small crane for the placement of materials and/or equipment below the bridge.*
7. Per 314 CMR 9.06 (1) and (2), please describe and if needed depict specific efforts to avoid and minimize temporary impacts to the BVW and intermittent stream. It must be demonstrated that the proposed extent of the temporary impacts of required to complete the work.
    a. *Benesch Response: As shown on Exhibits 11 and 12 of 20 in Addendum Attachment 2, temporary sandbag cofferdams will be utilized as part of the staged work-in-water and extend into the existing limits of the BVW. The cofferdams are located to allow for installation of the proposed riprap in the dry. Additionally, due to the proposed approximately 15" rise in the profile (shown in the proposed profile on Exhibit 7 of 20 in Addendum Attachment 2), regrading of all quadrants is required to blend the required vertical clearances and 1.5:1 slope of the riprap below the bridge into the existing banks. Sediment control barriers are utilized to capture upland construction related sediments prior to flowing through the existing BVW. As part of the proposed work, the Contractor shall restore 895 SF of the impacted existing BVW. The proposed grading within the area of restoration was optimized to stay as close as possible to existing slopes while still accommodating the 15" profile rise previously mentioned. As discussed in the field, the intermittent stream identified in the Wetland Delineation Summary Report primarily conveys discharge from an existing stormwater outfall, as well as accommodating flood flows from the Fort River during flood events. At no time during construction will the intermittent stream be blocked from accommodating flood flows that overtop the berm between the Fort River and intermittent stream. The temporary sandbag cofferdams have been shown to not preclude stormwater from the existing outfall from flowing towards the intermittent stream, however please note this outfall will be removed as part of the proposed work. As previously mentioned, the grading of the area of BVW restoration is as close as possible to the existing grades and would therefore minimize impacts to the beginning of the intermittent stream. As part of the regrading of the southwest quadrant, 18 LF of the intermittent stream bank will be permanently impacted and replaced with loam and part shade roadside seed mix. The portion of*

the intermittent stream that will be permanently impacted appears to primarily function as the drainage channel for the existing stormwater outfall. Since the existing outfall will be removed, this function is no longer necessary for the intermittent stream and therefore the 18 LF of bank will not be restored as a drainage channel.

8. If the intermittent stream will be impacted by the project activities, please provide a plan to restore it to pre-construction conditions following completion of the work. In particular, the stream restoration should maintain the existing functions relative to receiving periodic flood flows from the Fort River as identified in Comment 2.
    a. *Benesch Response: Linework for the centerline and bank lines of the intermittent stream have been included on the exhibits in Addendum Attachment 2. Proposed grading in the vicinity of the intermittent stream is shown on Exhibit 15 of 20. No additional provisions beyond the BVW Restoration specification (Item 755.45) are anticipated. Please note, the specifications have been updated since the original filing to account for the intermittent stream. The revised relevant special provisions are included in Addendum Attachment 7.*
9. Please note that laydown areas and dewatering areas will also need to be identified in the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan, and the Control of Water Plan that will be conditioned in the WQC. Given the space constraints at this site, MassDEP recommends identifying these areas now during the design phase.
    a. *Benesch Response: The exact location for sedimentation basins as part of the dewatering will be determined by the Contractor as part of their means and methods. Once determined by the Contractor, this information shall be provided to MassDEP.*
10. Please clarify whether the existing catch basin and stormwater outfall will remain active during construction. If they will remain active and the project activities will impact the outfall and receiving intermittent stream, please describe how the construction period stormwater at the outfall will be managed until it is relocated.
    a. *Benesch Response: The existing catch basin and stormwater outfall will remain active until the completion of the new stormwater outfall in the northeast quadrant of the bridge. The switchover to the new stormwater outfall is anticipated to occur during the first stage of construction.*
11. The proposed limits of riprap in the river end abruptly at its ends. Please evaluate tapering the riprap into the bank to avoid creating areas of scour.
    a. *Benesch Response: Riprap has been tapered differently into the bank and all impact areas recalculated. The change resulted in an increase of 46 SF of permanent impacts to Land-Under-Water. A summary of all changes to impact areas since the original filing is provided in Addendum Attachment 1.*
12. Section 2.4 of the narrative states no trees are proposed to be removed. Please clarify, as it appears work will require tree removal, and tree plantings are proposed following the work. Please also provide an evaluation as to whether areas of rip rap proposed along the banks could also be revised to modified rock fill and seeded and/or planted.
    a. *Benesch Response: As mentioned in Section 2.4 of the Narrative in the original filing, clearing and grubbing is proposed to occur within the limits of slope grading. Per MassDOT standards specifications, tree and stump removal within areas designated as clearing and grubbing are incidental to the clearing and grubbing work. Details for the riprap have been revised above the bank line to include modified rockfill, compost and seeding to fill in the voids of the riprap. The riprap detail is provided on Exhibit 5 of 20 in Addendum Attachment 2. Due to the proximity of the bridge structure, no plantings are proposed within the areas of riprap, however numerous upland plantings are proposed as part of this project. The proposed upland plantings and landscaping notes are provided on Exhibits 17 through 20 of 20.*

13. Details for the streambed restoration need to include a specification for construction of a low-flow channel.
    a. *Benesch Response: Item 983.521 – Streambed Restoration has been provided in Addendum Attachment 7.*
14. Please provide the values used to calculate the openness ratio for the Stream Crossing Standards.
    a. *Benesch Response: The cross sectional area from bottom of bridge to top of substrate is approximately 1700 SF and the bridge width is approximately 43 FT. 1700 SF / 43 FT = 39.5 FT.*

Stormwater

15. Section 2.3 of the narrative states there will be a 1,960 square foot (sf) increase in impervious surface while the Stormwater Management Memo states 2,900 sf. Please clarify the increase in impervious surface and revise the stormwater calculations if needed.
    a. *Benesch Response: 2,900 is the correct SF increase. This is shown in the revised Stormwater Management Memo in Addendum Attachment 5.*
16. Please note that in addition to the Fort River being a coldwater fishery, there are two Zone I Wellhead Protection Areas (WPAs) that intersect the project, and the entire site is in a Zone II WPA, all of which are also Critical Areas per 314 CMR 9.02. Per Stormwater Management Standard 6, the use of salt for the deicing of impervious surfaces must be minimized within WPAs and coldwater fisheries. Section 2.1.4 of the Long-Term Pollution Prevention Plan needs to be revised to reflect this.
    a. *Benesch Response: Agree, Section 2.1.4 has been revised. This is shown in the revised O&M Plan and LTPPP in Addendum Attachment 6.*
17. Relevant calculations for Stormwater Management Standards 2, 3, and 4 are required including pre- and post-construction peak discharge flow rates; required groundwater recharge volume for the net increase in impervious surface; and the total area of impervious surface that will drain to the deep sump catch basin versus the total area of impervious surface proposed to remain as country drainage.
    a. *Benesch Response: Calculations for Standard 2, as well as additional language for Standards 3 and 4, have been provided in the Stormwater Management Memo in Addendum Attachment 5.*
18. The Stormwater Checklist states runoff from all impervious surface is discharging to an infiltration Best Management Practice (BMP). Please clarify as no infiltration BMPs are proposed.
    a. *Benesch Response: There is no proposed infiltration basin.*
19. The Operations and Maintenance Plan will need to be revised to reflect catch basin inspection and cleaning frequencies in accordance with Volume 2, Chapter 2 of the Stormwater Handbook.
    a. *Benesch Response: DEP's handbook represents goals for public works agencies to meet. MassDOT will continue to strive to meet DEP's frequencies listed until a programmatic operation and maintenance plan is established, which will supersede this project-specific O&M plan. It is noted that Volume 2, Chapter 2 suggests that deep sump catch basins be inspected 4 times per year and cleaned 4 times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.*
20. Please add specifications for deep sump catch basins and erosion and sedimentation controls as needed to the Exhibits.
    a. *Benesch Response: Deep sump catch basins are covered in MassDOT Standard Specifications and do not require Special Provisions. The Special Provision for Erosion and Sedimentation Controls was already included in Attachment L of the original filing (under Item 767.121). Similarly, since deep sump catch basins are included in MassDOT's Construction Standard Details, details are not shown on the exhibits.*

Wildlife and Rare Species

21. MassDEP understands coordination with the Massachusetts Natural Heritage and Endangered Species Program (NHESP) is ongoing regarding Priority and Estimated Habitats of Rare Species at the project site. Per 314 9.06(2) and 9.07(1), no project may be permitted which will have any adverse effect on specified habitat sites of Rare Species unless the work is subject to a Conservation and Management Permit or Determination of No Take issued by NHESP. As such, NHESP coordination must be complete prior to issuance of the WQC.
    a. *Benesch Response: NHESP coordination has been completed. Documentation of NHESP coordination has been added to Addendum Attachment 8.*
22. In addition to NHESP consultation, the regulations at 314 CMR 9.07(3)(d) require consultation with the MA Division of Fisheries and Wildlife (DFW) regarding Time of Year restrictions and/or in-water sediment management for the other species listed in the regulation. Please provide the consultation letter or email from the DFW.
    a. *Benesch Response: Documentation has been included in Addendum Attachment 9 which states no requirement of consultation.*

ADDENDUM ATTACHMENT 1

Summary of Revised Impact Areas

Since the original filing, the below revisions have been made to the project impact areas. The revised impacts are also reflected in the exhibits in Addendum Attachment 2.

Land-Under-Water/Waters of the US Temporary Impacts (Fort River) = 8,745 SF
Land-Under-Water/Waters of the US Temporary Impacts (Intermittent Stream) = 45 SF
Land-Under-Water/Waters of the US Temporary Impacts (TOTAL) = 8,790 SF

Land-Under-Water/Waters of the US Permanent Impacts (Fort River) = 1,525 SF
Land-Under-Water/Waters of the US Permanent Impacts (Intermittent Stream) = 21 SF
Land-Under-Water/Waters of the US Permanent Impacts (TOTAL) = 1,546 SF

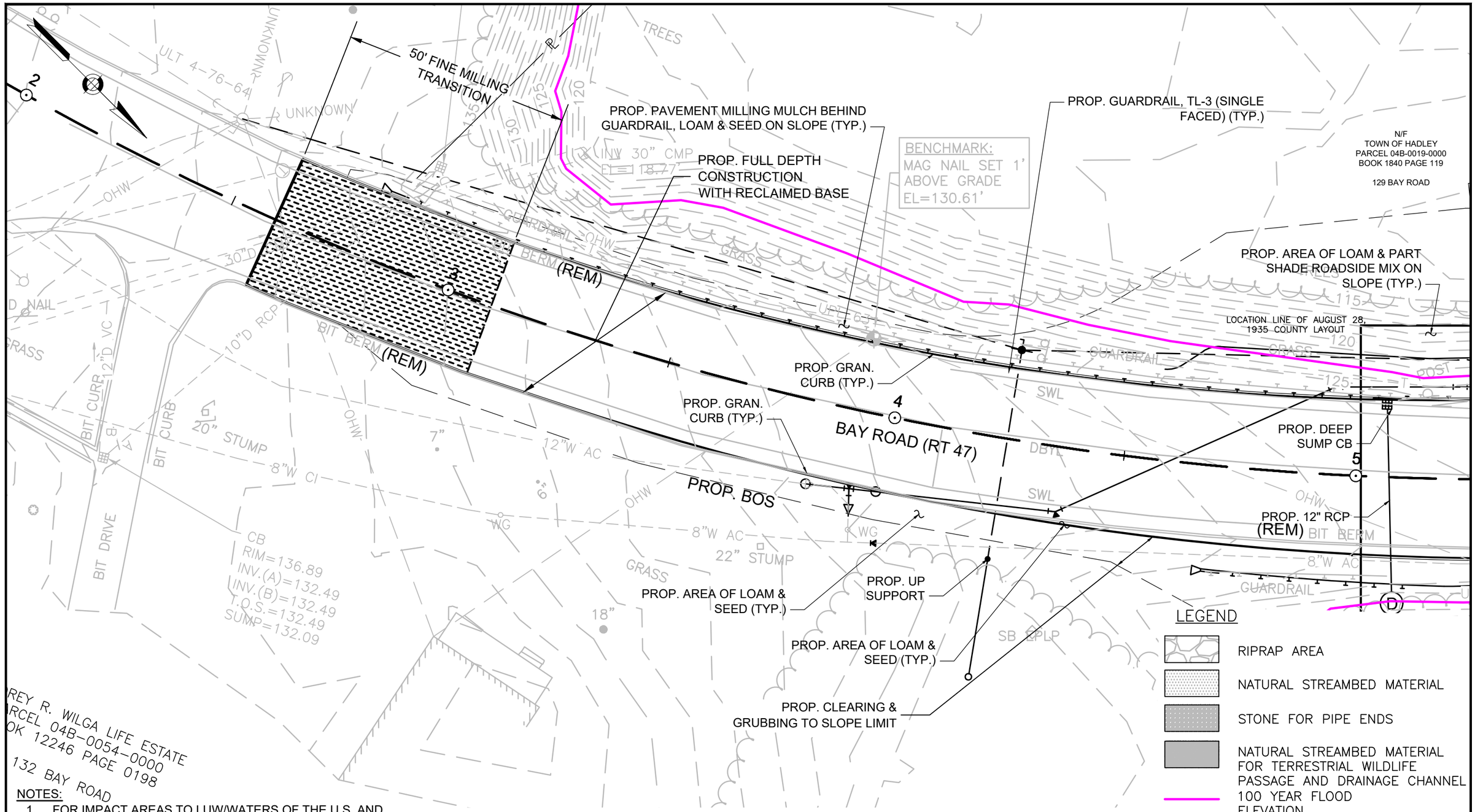
Bordering Vegetated Wetlands/Vegetated Wetland Temporary Impacts = 895 SF
Bordering Vegetated Wetlands/Vegetated Wetland Permanent Impacts = 0 SF
Bordering Vegetated Wetlands/Vegetated Wetlands Wetland Restoration = 895 SF

Volume of Dredging due to Streambed Restoration = 152 CY
Volume of Dredging due to Proposed Riprap = 226 CY
Volume of Dredging (TOTAL) = 378 CY

Permanent Bank Impacts to Fort River (with no loss to stream function) = 239 LF
Permanent Bank Impacts to Intermittent Stream (with loss of stream function) = 18 LF
Temporary Bank Impacts to Fort River = 23 LF
Temporary Bank Impacts to Intermittent Stream = 36 LF

ADDENDUM ATTACHMENT 2

Revised Proposed & Existing Design Exhibits



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

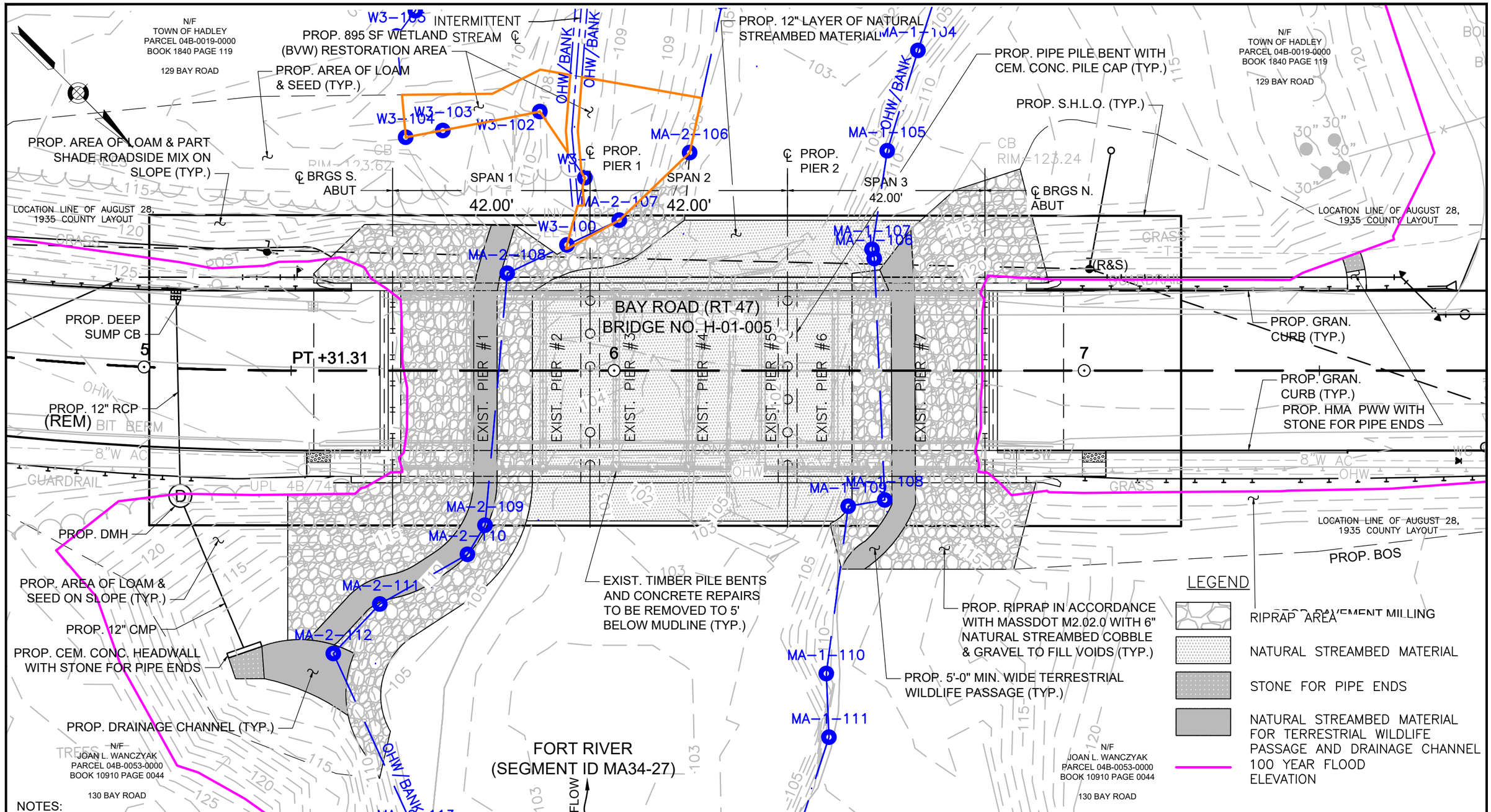
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 1 OF 20



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

PLAN VIEW

0 20 40 80

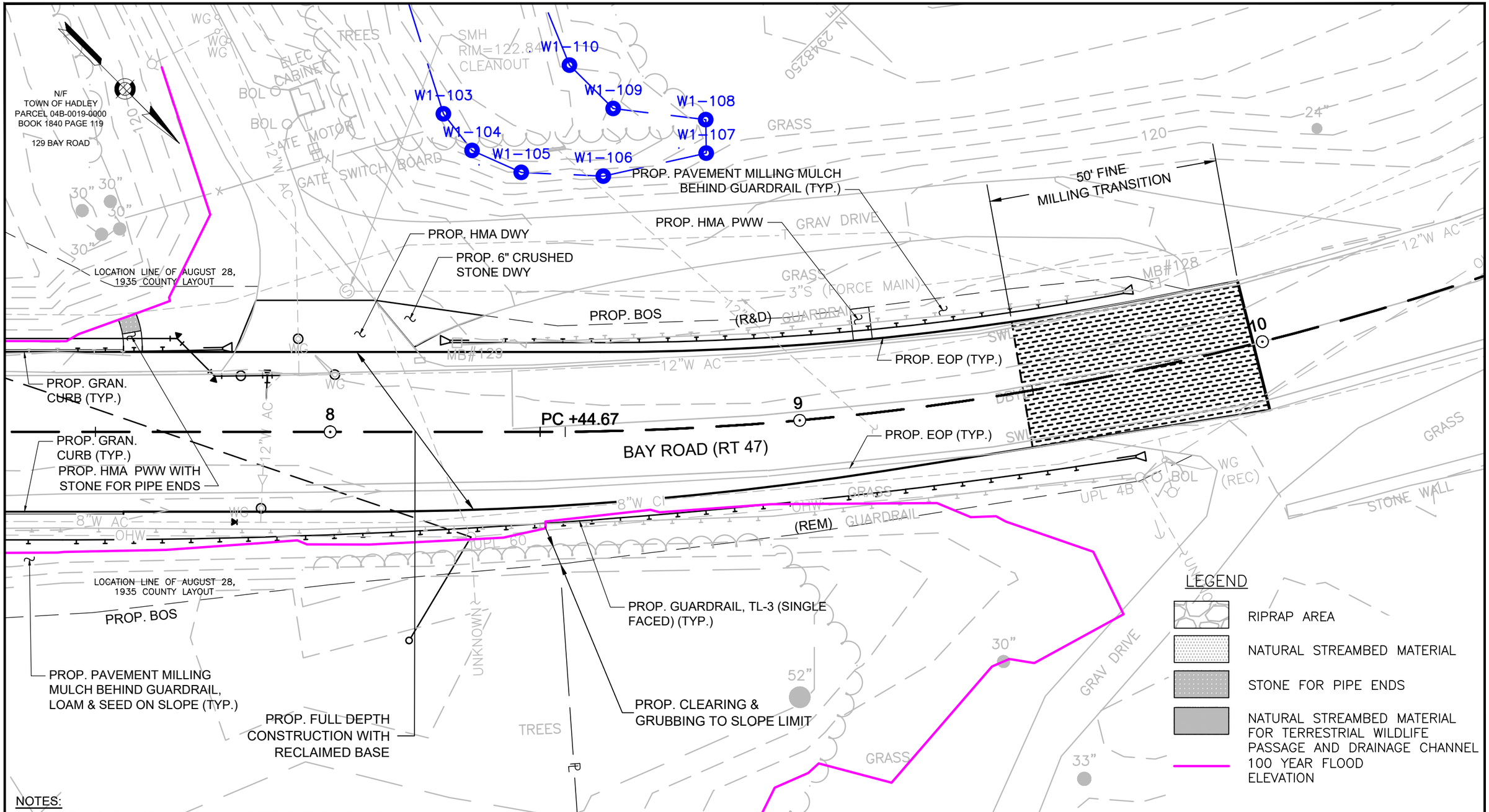
SCALE: 1" = 20'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 2 OF 20



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

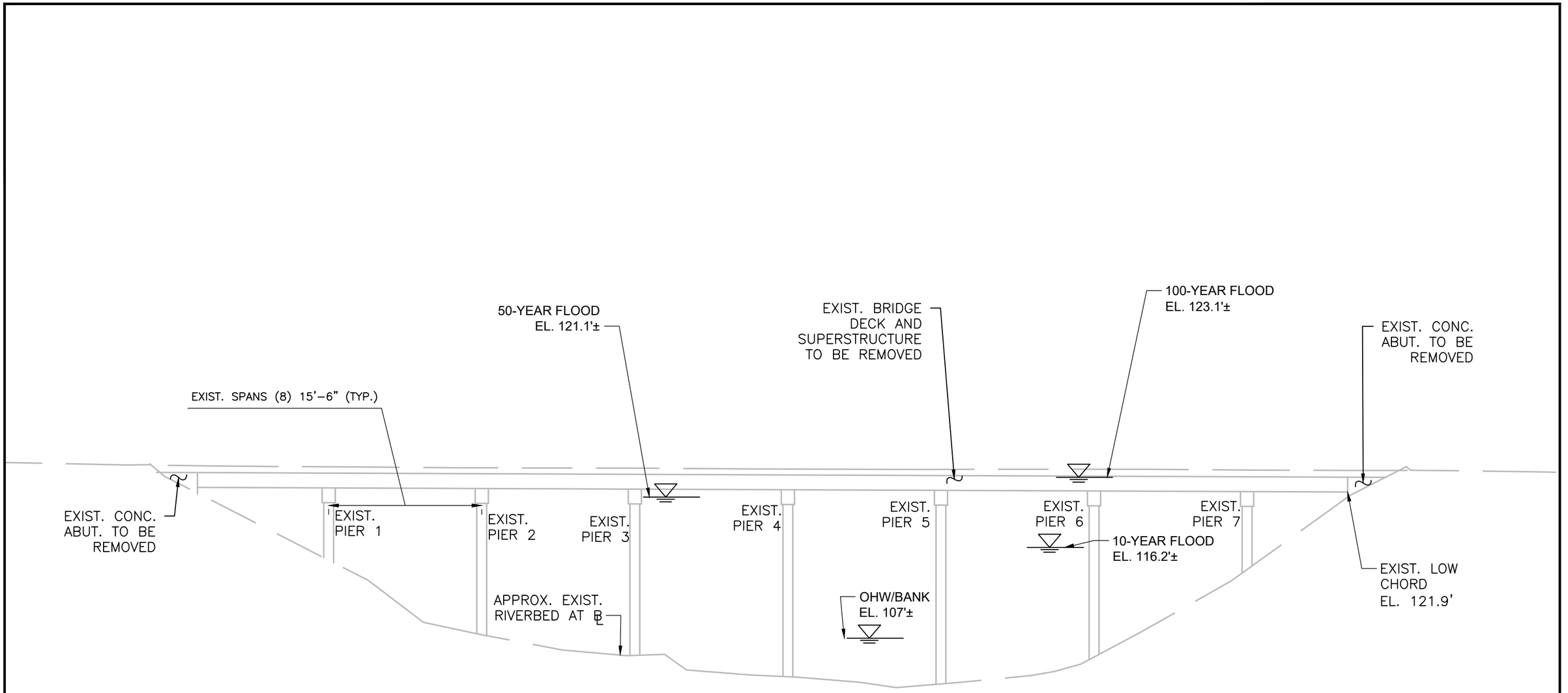
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 3 OF 20



EXISTING EAST ELEVATION

0 10 20 40

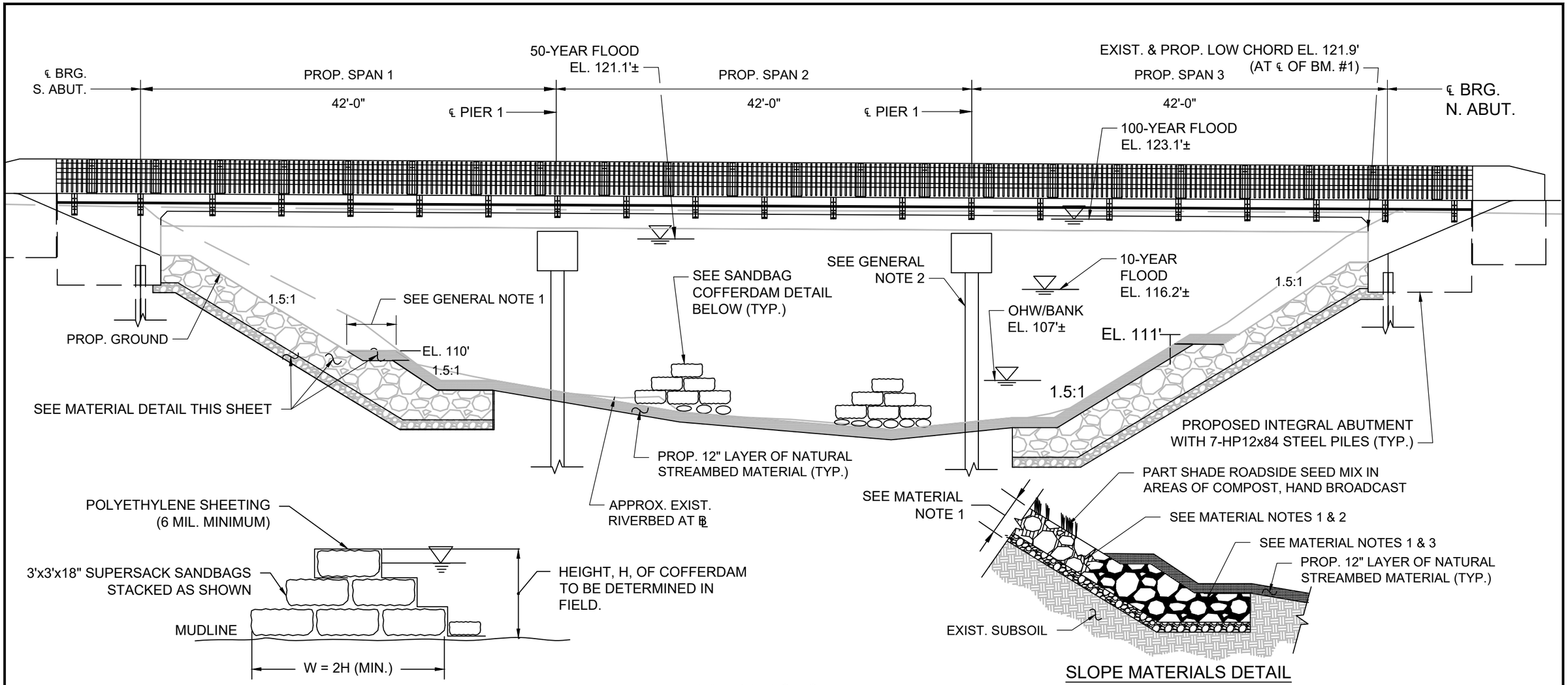
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 4 OF 20



SANDBAG COFFERDAM DETAIL
NOT TO SCALE

SLOPE MATERIALS DETAIL
NOT TO SCALE

GENERAL NOTES:

1. 5'-0" MIN. WIDE NATURAL STREAMBED MATERIAL FOR TERRESTRIAL WILDLIFE PASSAGE (TYP.)
2. PROP. PILE BENT WITH 16" Ø PIPE PILES WITH CONCRETE PILE CAP (TYP.)

SANDBAG NOTES:

1. SANDBAG COFFERDAM IS TO BE CONSTRUCTED IN A PYRAMID SHAPE BASED ON THE REQUIRED HEIGHT AND NUMBER OF BAGS REQUIRED.
2. THE SANDBAGS ARE TO BE PLACED OVERLAPPING ALONG THE LENGTH OF THE COFFERDAM.

MATERIAL NOTES:

1. PROP. 3'-0" LAYER OF RIPRAP (M2.02.0) OVER 12" LAYER OF CRUSHED STONE OVER GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL
2. AT ELEVATIONS HIGHER THAN THE OHW/BANK LINE, OR TERRESTRIAL WILDLIFE PASSAGE (WHERE PRESENT), MODIFIED ROCKFILL SHALL BE APPLIED OVER RIPRAP SUCH THAT MODIFIED ROCKFILL FILLS THE VOIDS AND IS 4" BELOW THE SURFACE OF THE STONES. COMPOST SHALL THEN BE PLACED OVER MODIFIED ROCKFILL TO AN ELEVATION AT OR SLIGHTLY BELOW THE TOP OF RIPRAP STONES. NOT ALL RIPRAP STONES WILL BE COMPLETELY COVERED. COMPOST IS NOT TO BE USED BELOW THE OHW/BANK LINE. PART SHADE ROADSIDE MIX SHALL BE HAND BROADCAST IN AREAS OF COMPOST.
3. AT ELEVATIONS LOWER THAN THE OHW/BANK LINE, OR AT TERRESTRIAL WILDLIFE PASSAGE (WHERE PRESENT), NATURAL STREAMBED MATERIAL SHALL BE PLACED TO FILL IN VOIDS IN THE RIPRAP TO CREATE A SMOOTH SURFACE PRIOR TO PLACEMENT OF 12" LAYER OF NATURAL STREAMBED MATERIAL OVER RIPRAP.

PROPOSED EAST ELEVATION

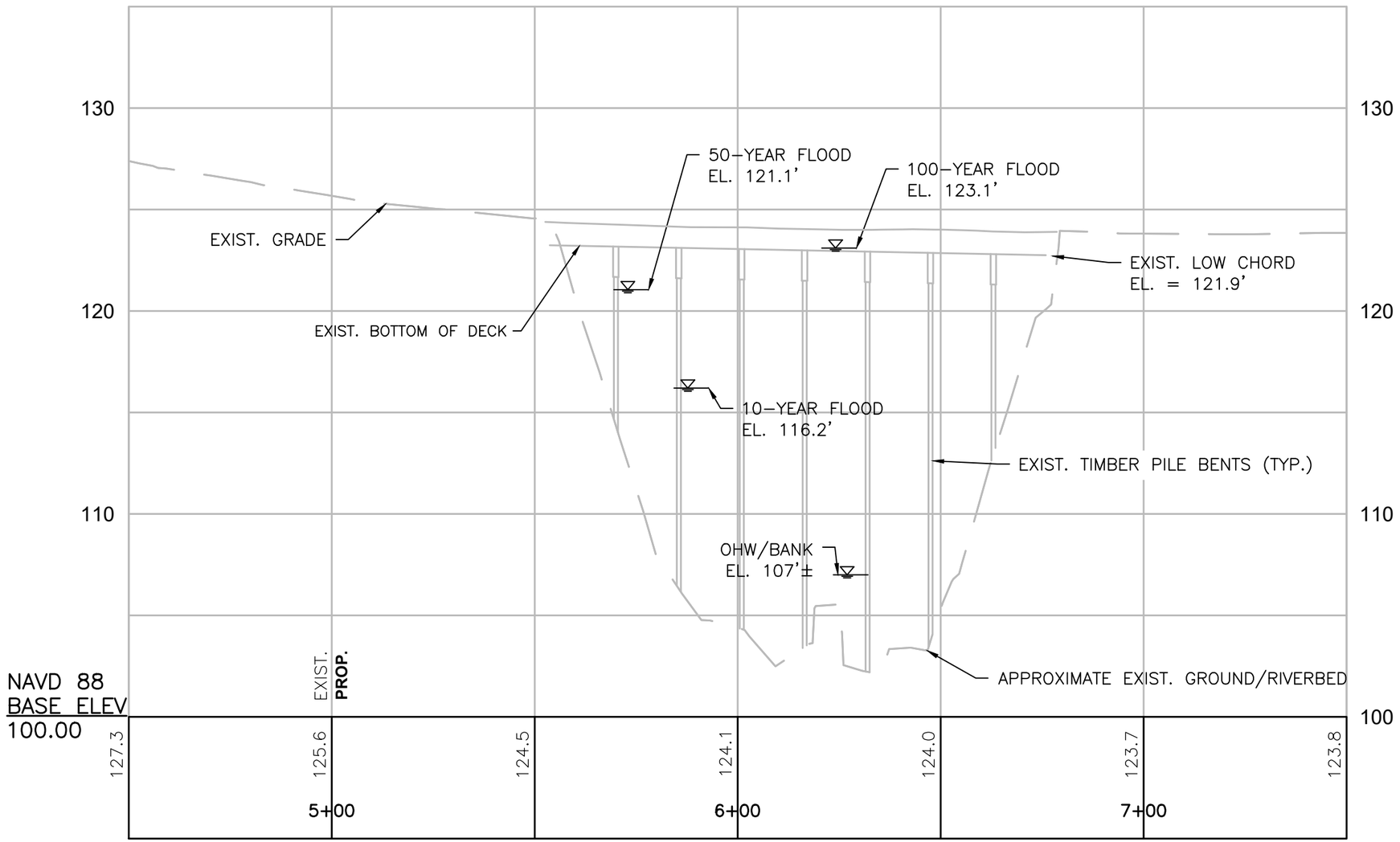
0 10 20 40
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 5 OF 20



HOR. SCALE IN FEET
30 0 30 60
6 0 6 12
VER. SCALE IN FEET

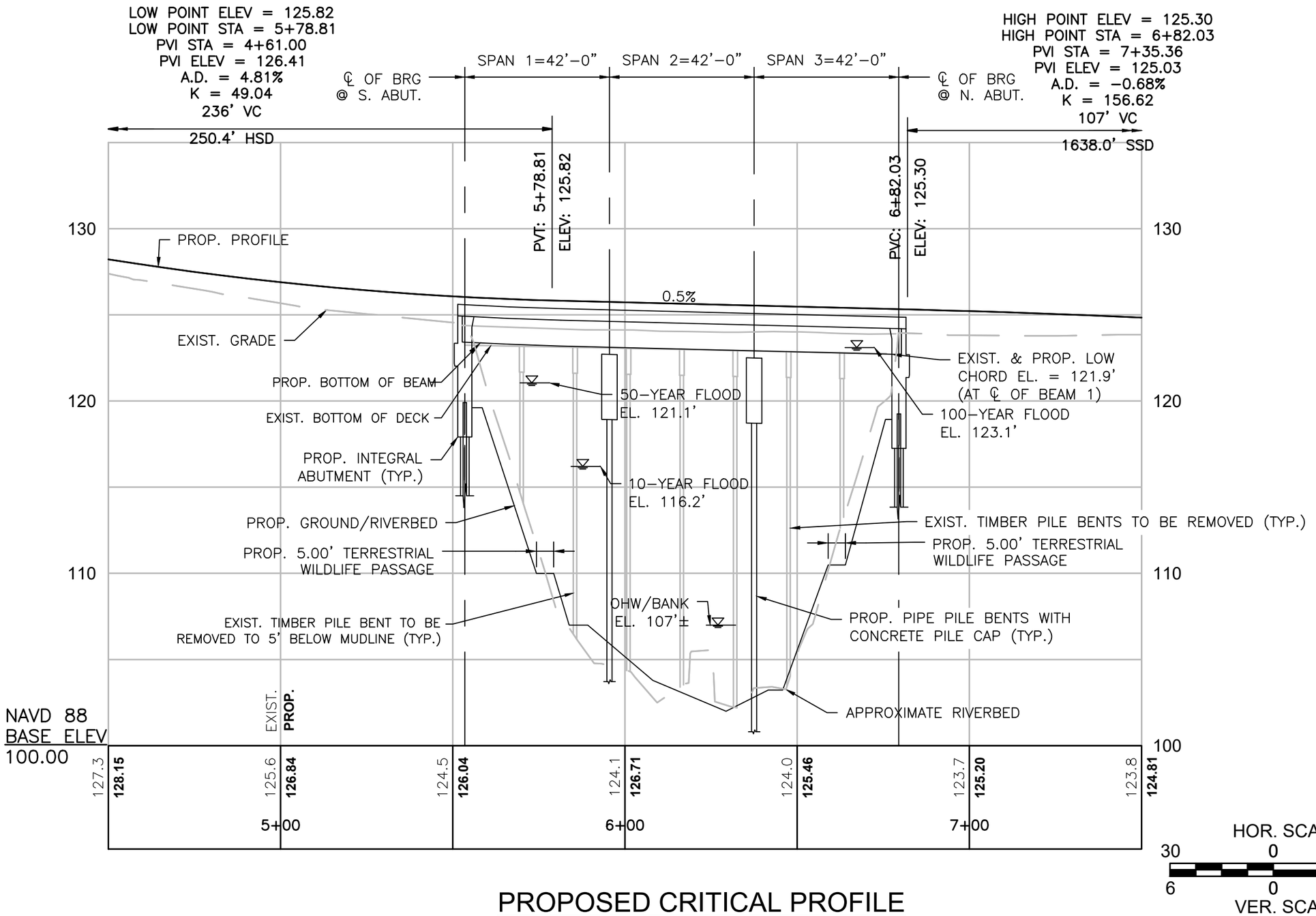
EXISTING CRITICAL PROFILE

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

benesch

SCALE: 1" = 30'

EXHIBIT NO. 6 OF 20



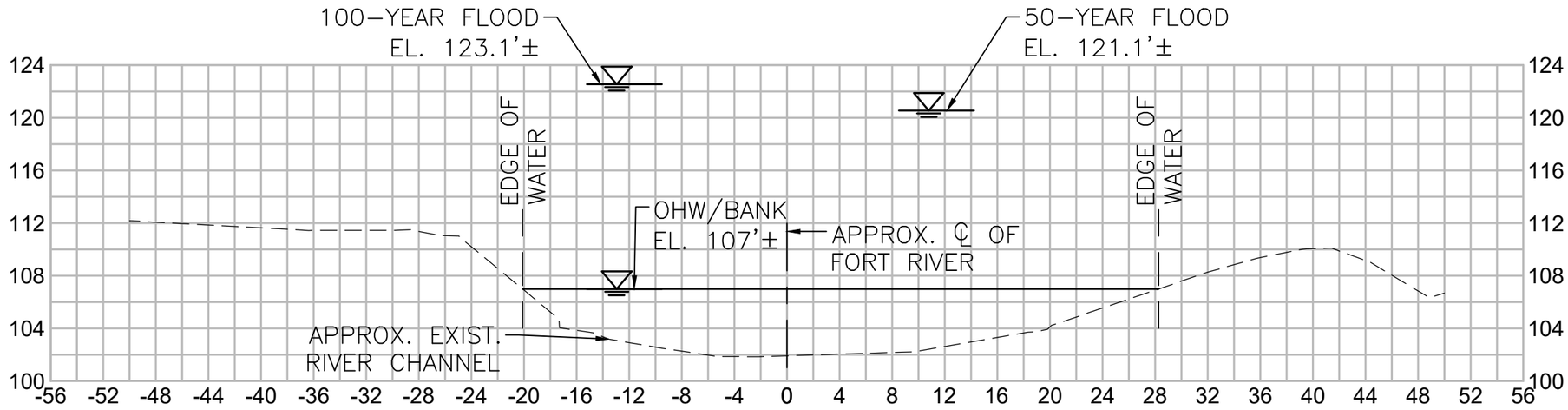
PROPOSED CRITICAL PROFILE

benesch

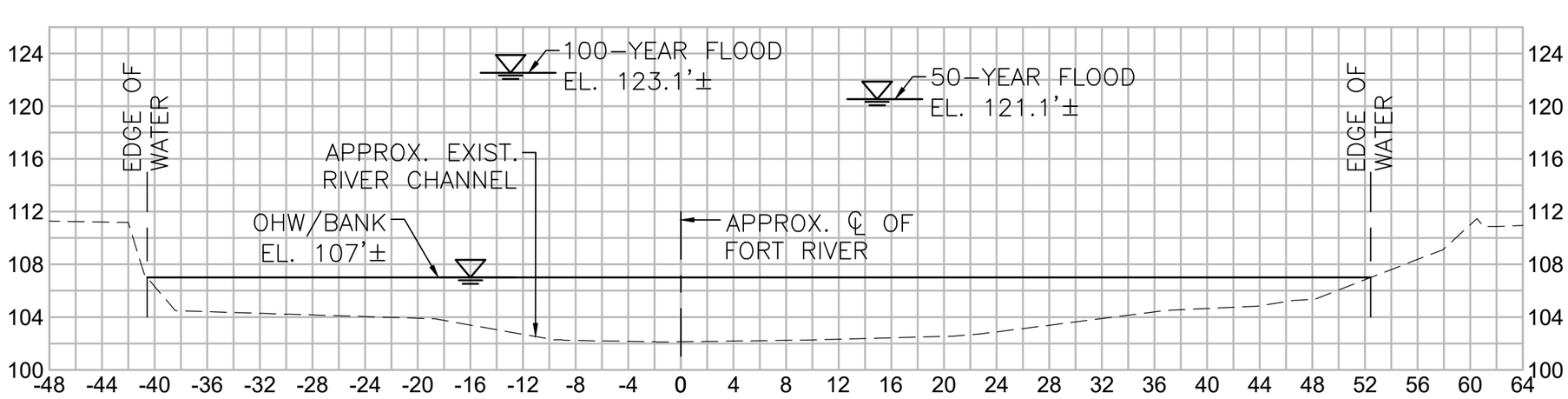
BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 30'

EXHIBIT NO. 7 OF 20



50 FT DOWNSTREAM OF WEST FASCIA
(LOOKING UPSTREAM)



50 FT UPSTREAM OF EAST FASCIA
(LOOKING UPSTREAM)

HOR. SCALE IN FEET
10 0 10 20
10 0 10 20
VER. SCALE IN FEET

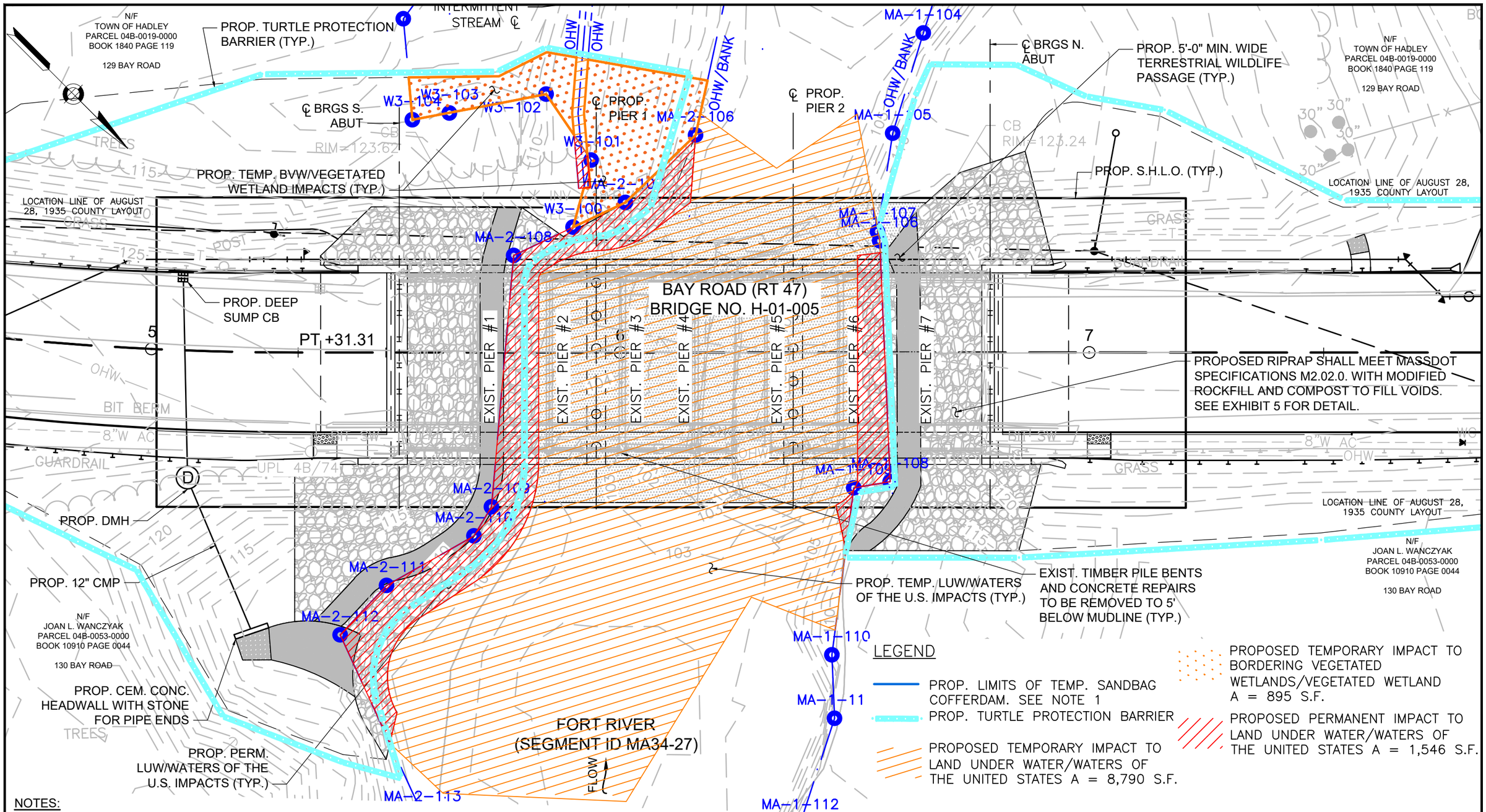
CHANNEL SECTIONS

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 8 OF 20



NOTES:

1. FOR WORK-IN-WATER SEQUENCING DURING STAGED CONSTRUCTION, SEE EXHIBITS 11 AND 12.
2. THE BANK IS COINCIDENT WITH THE OHW LINE. FOR BANK IMPACTS, SEE EXHIBIT 10.

TEMPORARY & PERMANENT IMPACTS

0 20 40 80

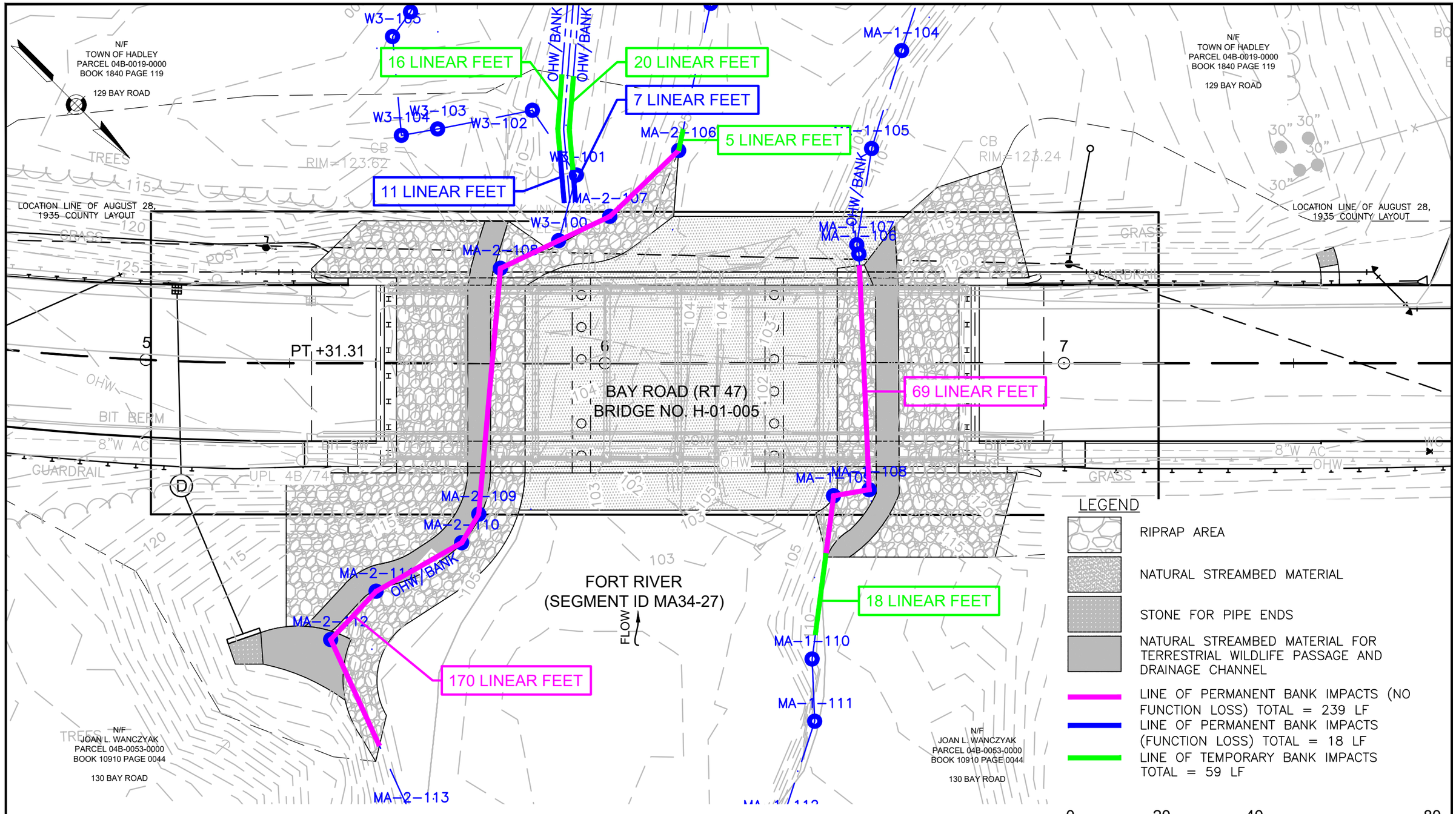
SCALE: 1" = 20'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 9 OF 20



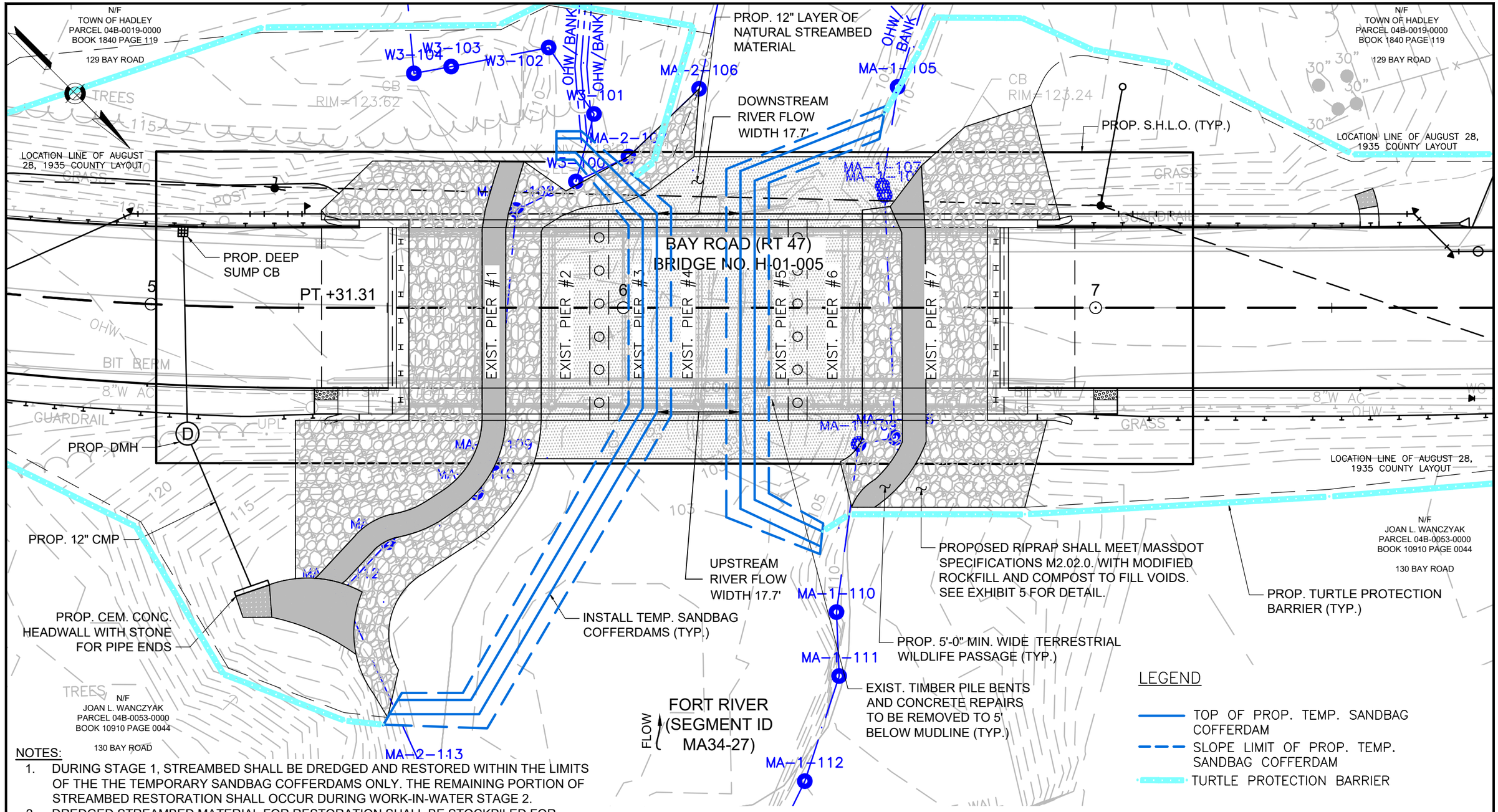
BANK IMPACTS

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 10 OF 20



NOTES:

1. DURING STAGE 1, STREAMBED SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY. THE REMAINING PORTION OF STREAMBED RESTORATION SHALL OCCUR DURING WORK-IN-WATER STAGE 2.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

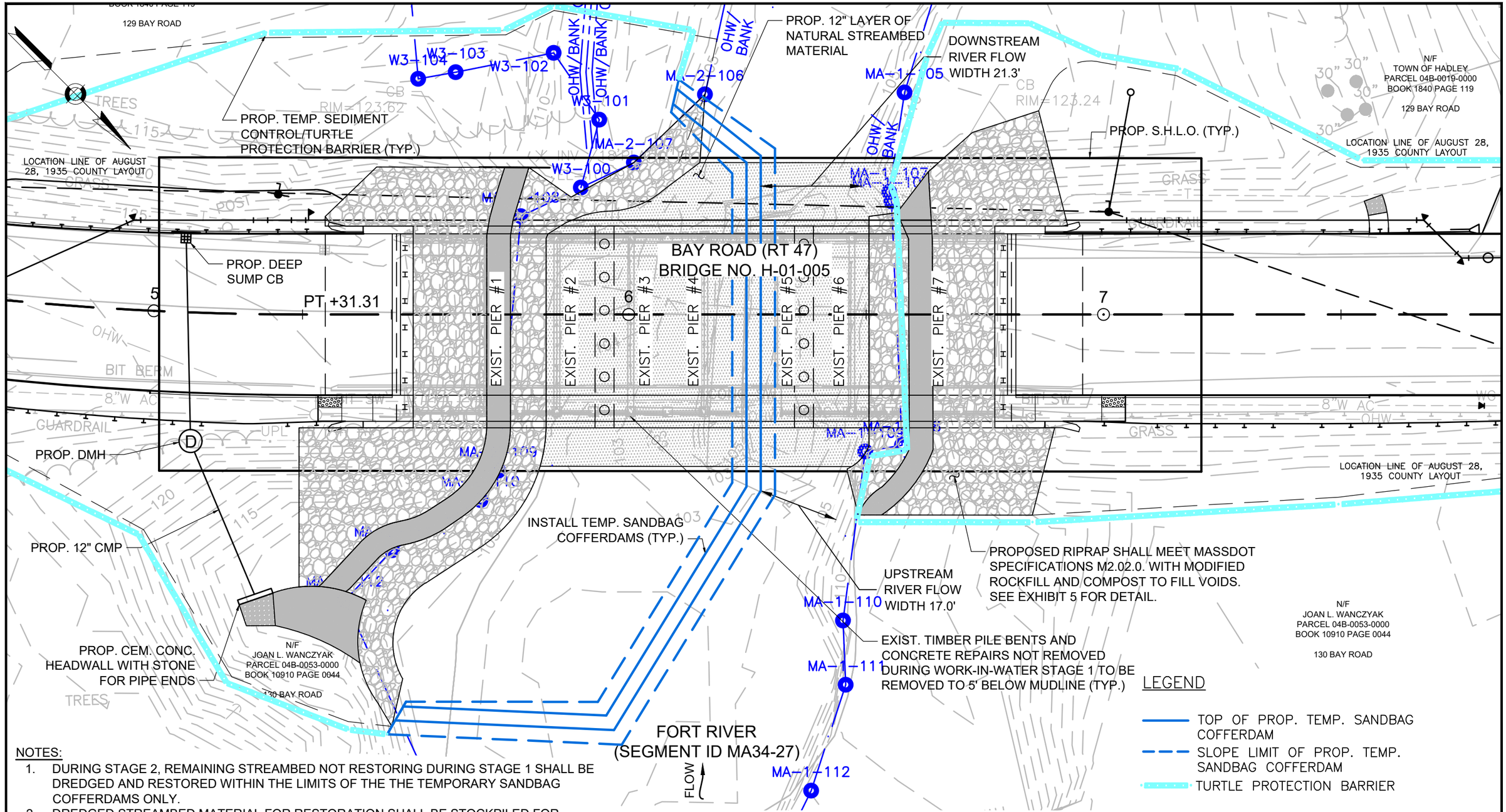
WORK-IN-WATER STAGE 1

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 11 OF 20



NOTES:

1. DURING STAGE 2, REMAINING STREAMBED NOT RESTORING DURING STAGE 1 SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

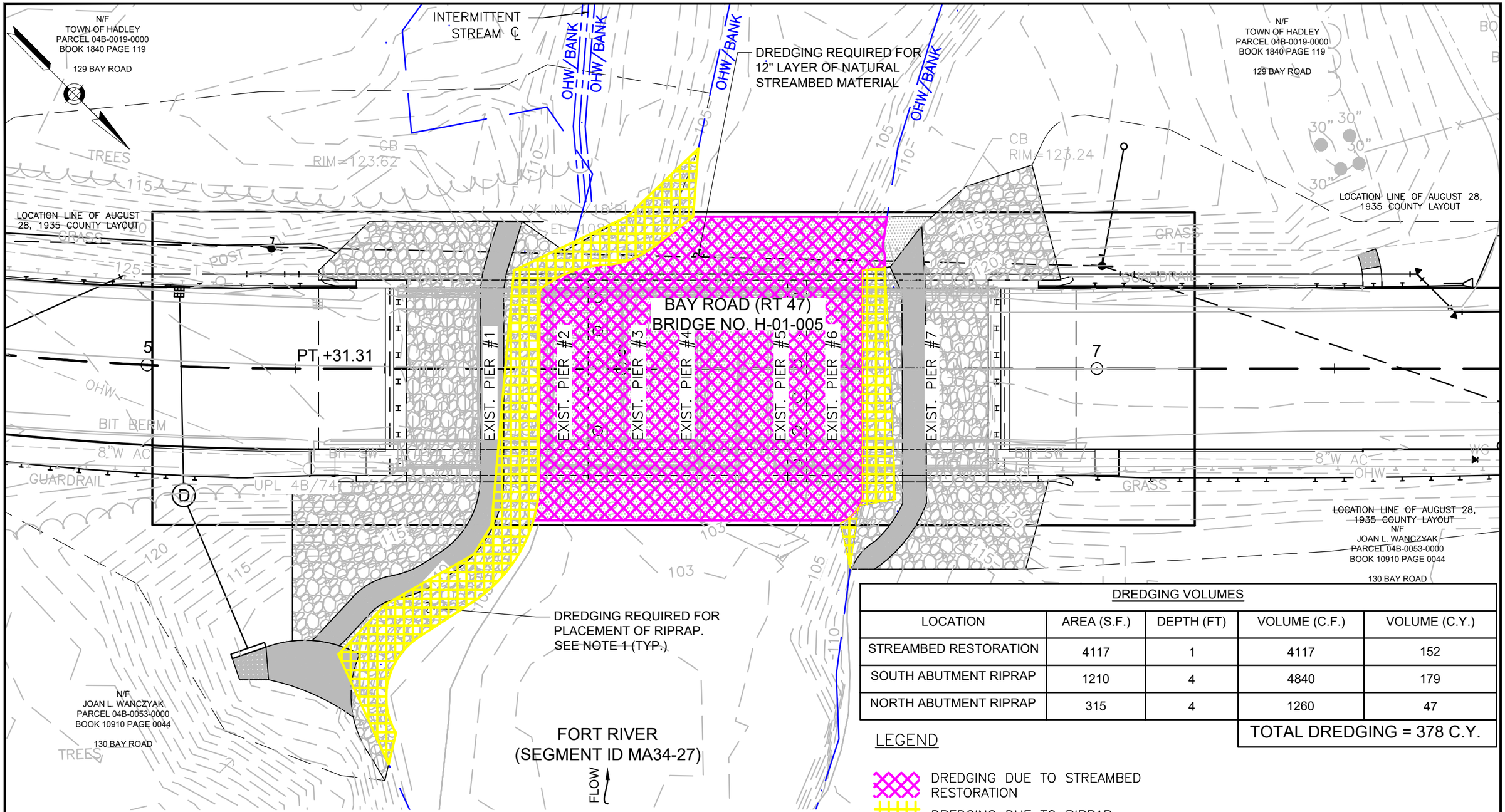
WORK-IN-WATER STAGE 2

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 12 OF 20



DREDGING VOLUMES				
LOCATION	AREA (S.F.)	DEPTH (FT)	VOLUME (C.F.)	VOLUME (C.Y.)
STREAMBED RESTORATION	4117	1	4117	152
SOUTH ABUTMENT RIPRAP	1210	4	4840	179
NORTH ABUTMENT RIPRAP	315	4	1260	47
			TOTAL DREDGING = 378 C.Y.	

LEGEND

- DREDGING DUE TO STREAMBED RESTORATION
- DREDGING DUE TO RIPRAP

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH MODIFIED ROCKFILL AND COMPOST TO FILL VOIDS. SEE EXHIBIT 5 FOR DETAIL.

0 20 40 80

SCALE: 1" = 20'

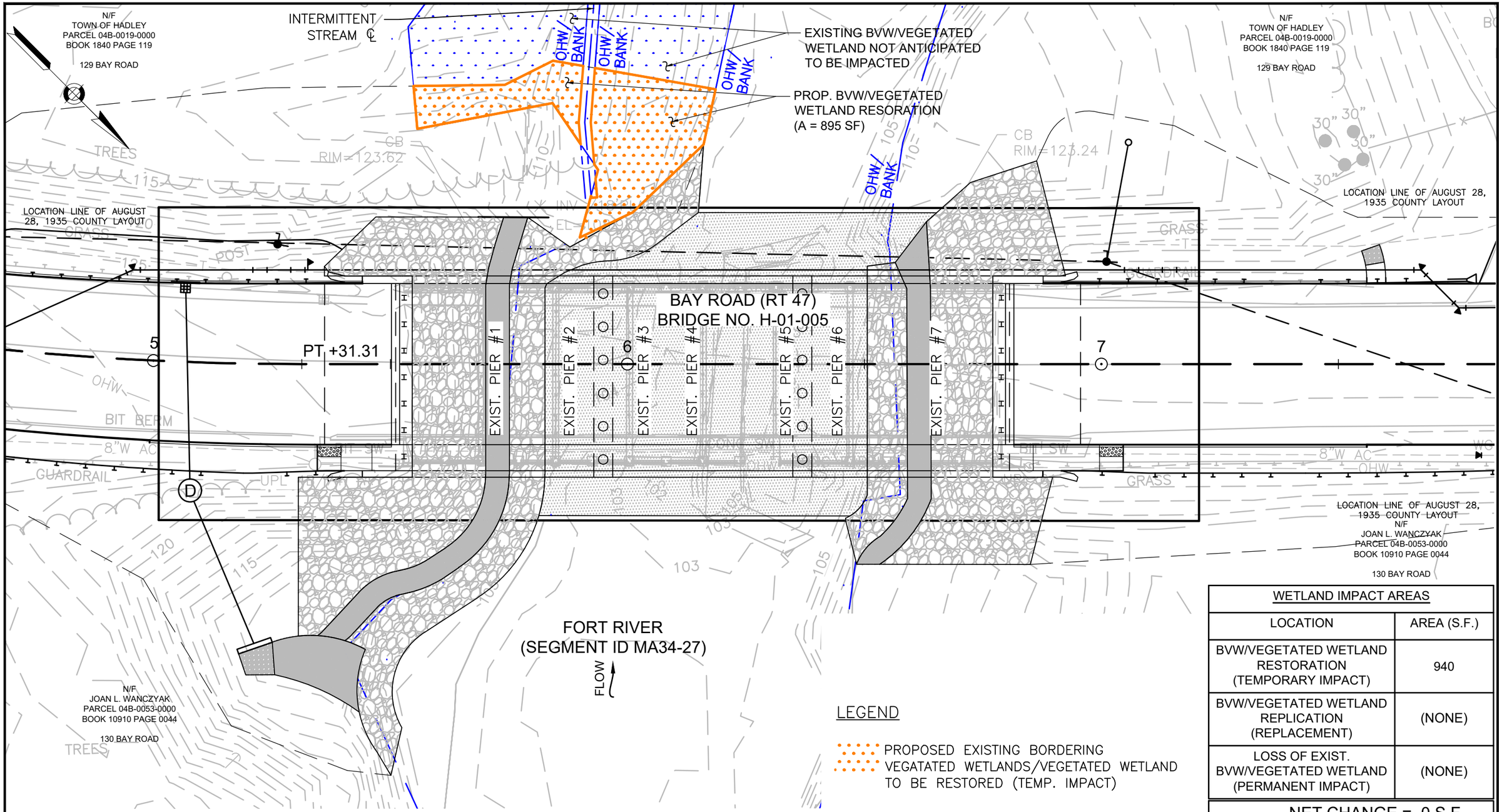
DREDGING LOCATION PLAN

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 13 OF 20



LEGEND

PROPOSED EXISTING BORDERING VEGATATED WETLANDS/VEGETATED WETLAND TO BE RESTORED (TEMP. IMPACT)

WETLAND IMPACT AREAS	
LOCATION	AREA (S.F.)
BVW/VEGETATED WETLAND RESTORATION (TEMPORARY IMPACT)	940
BVW/VEGETATED WETLAND REPLICATION (REPLACEMENT)	(NONE)
LOSS OF EXIST. BVW/VEGETATED WETLAND (PERMANENT IMPACT)	(NONE)
NET CHANGE = 0 S.F.	

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH MODIFIED ROCKFILL AND COMPOST TO FILL VOIDS. SEE EXHIBIT 5 FOR DETAIL.

0 20 40 80

SCALE: 1" = 20'

WETLAND MITIGATION PLAN

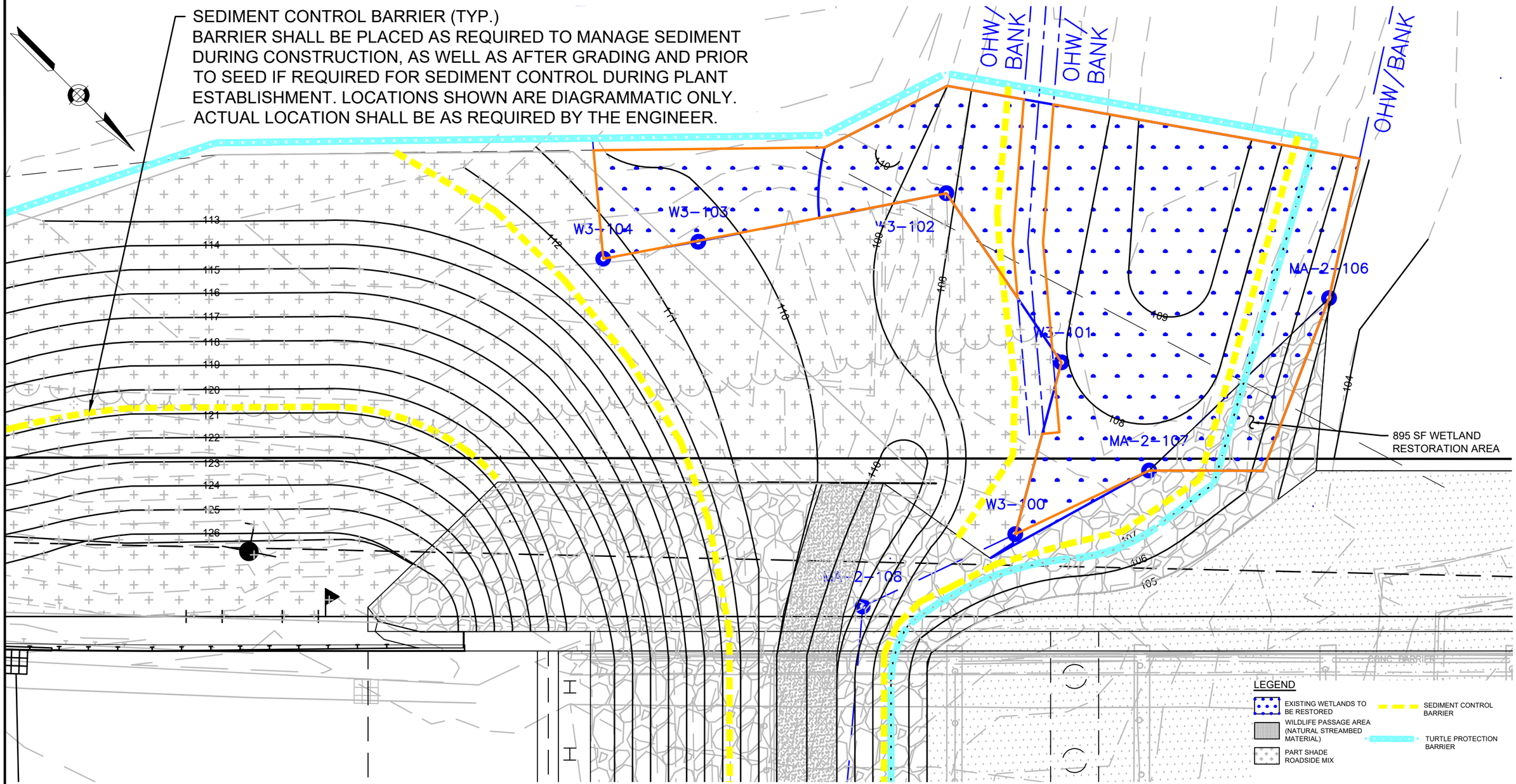
benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 14 OF 20

SEDIMENT CONTROL BARRIER (TYP.)
BARRIER SHALL BE PLACED AS REQUIRED TO MANAGE SEDIMENT DURING CONSTRUCTION, AS WELL AS AFTER GRADING AND PRIOR TO SEED IF REQUIRED FOR SEDIMENT CONTROL DURING PLANT ESTABLISHMENT. LOCATIONS SHOWN ARE DIAGRAMMATIC ONLY. ACTUAL LOCATION SHALL BE AS REQUIRED BY THE ENGINEER.



WETLAND RESTORATION AREA
PLAN VIEW

0 8 16 24 32

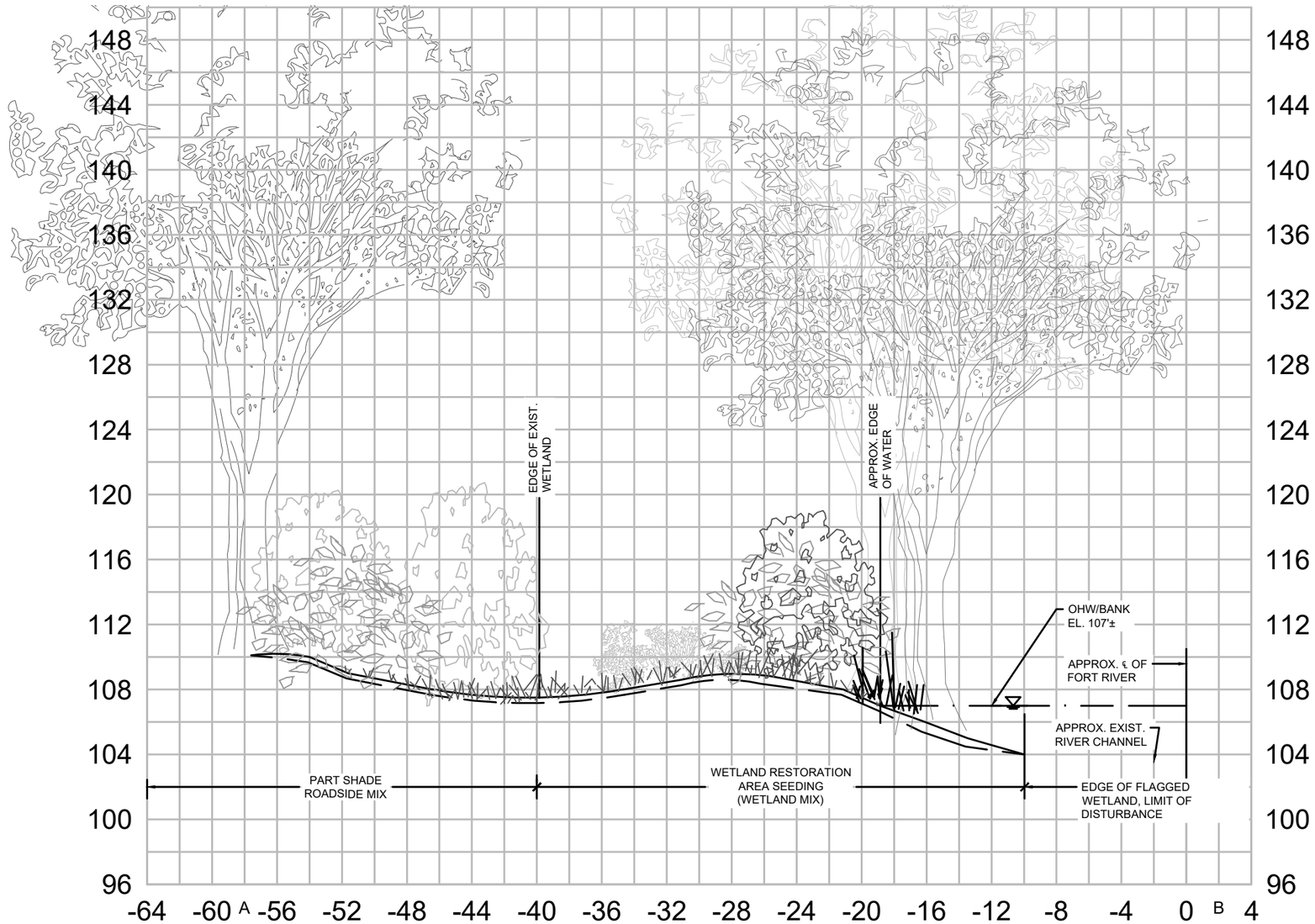
SCALE: 1" = 8'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 8'

EXHIBIT NO. 15 OF 20



WETLAND RESTORATION SECTION A-B
(LOOKING WEST)

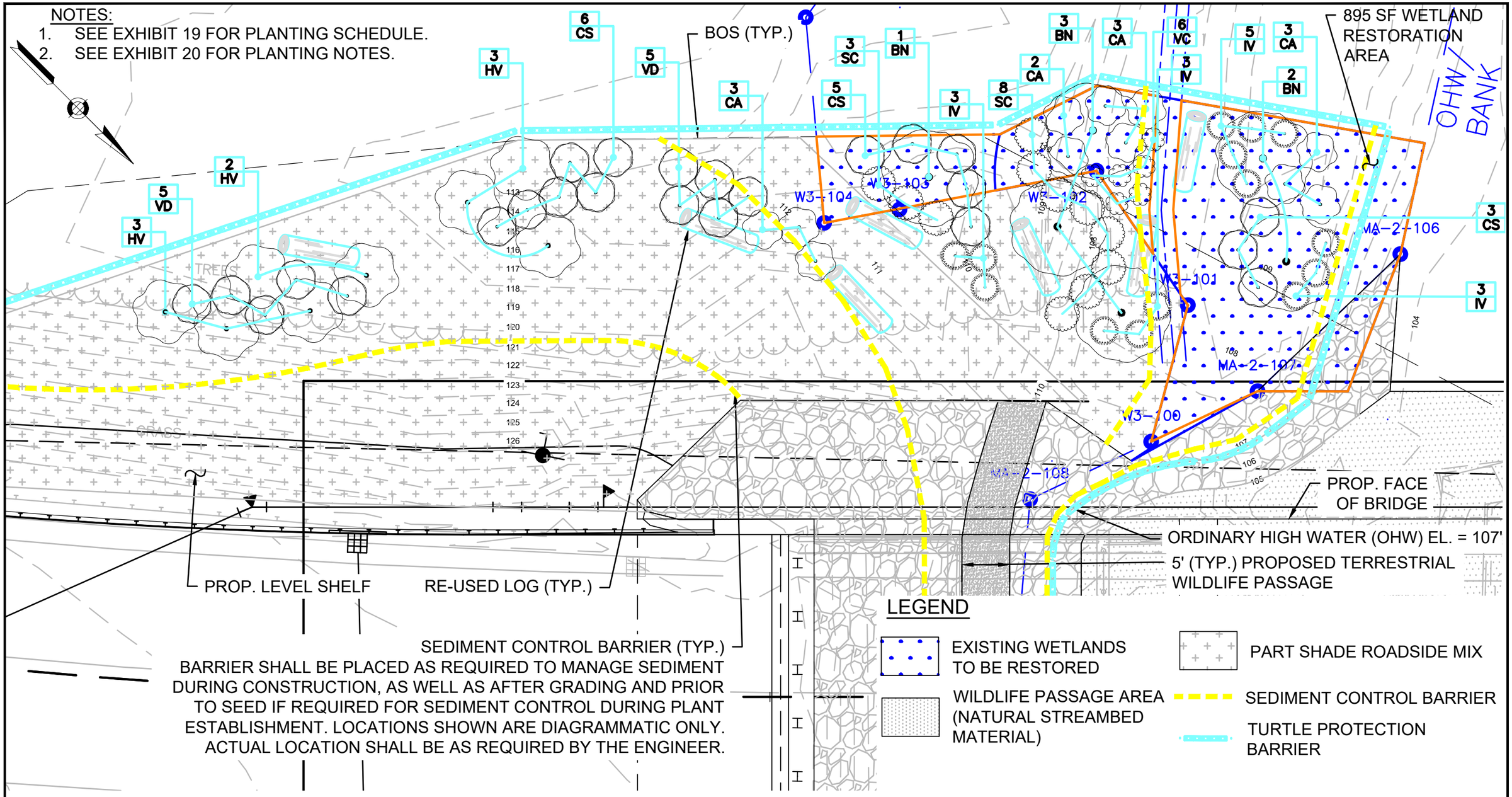
benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: NTS

EXHIBIT NO. 16 OF 20

NOTES:
1. SEE EXHIBIT 19 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 20 FOR PLANTING NOTES.



WETLAND RESTORATION AND PROPOSED WETLAND AND UPLAND PLANTINGS (WEST OF BRIDGE)

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 17 OF 20

NOTES:

1. SEE EXHIBIT 19 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 20 FOR PLANTING NOTES.

PROP. DMH

PROP. FACE OF BRIDGE

CONTRACTOR TO REMOVE EXISTING BITTERSWEET VINE (TYP.)

5' (TYP.) PROPOSED TERRESTRIAL WILDLIFE PASSAGE

ORDINARY HIGH WATER (OHW) EL. = 107'

SEDIMENT CONTROL BARRIER (TYP.)
BARRIER SHALL BE PLACED AS REQUIRED TO MANAGE SEDIMENT DURING CONSTRUCTION, AS WELL AS AFTER GRADING AND PRIOR TO SEED IF REQUIRED FOR SEDIMENT CONTROL DURING PLANT ESTABLISHMENT. LOCATIONS SHOWN ARE DIAGRAMMATIC ONLY. ACTUAL LOCATION SHALL BE AS REQUIRED BY THE ENGINEER.

CEM. CONC. HEADWALL WITH CHECK VALVE

1 AS
5 CS
1 BN
3 IV
5 SC
1 BN
5 CS
1 AS
7 SC
4 CA
1 BN
4 CA
3 IV
1 BN

GUARDRAIL
BIT SW
CONC SW
TREES
OHW / BANK

LEGEND

- RIPRAP AREA
- WILDLIFE PASSAGE AREA & DRAINAGE CHANNEL AREA (NATURAL STREAMBED MATERIAL)
- STONE FOR PIPE ENDS
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER
- TURTLE PROTECTION BARRIER

PROPOSED WETLAND AND UPLAND PLANTINGS (EAST OF BRIDGE)

0 10 20 30 40

SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 18 OF 20

PLANT LIST (WEST OF BRIDGE)

PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	3 + 8*	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	7 + 7*	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	6 + 8*	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	7 + 4*	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
	HV	8	HAMAMELIS VIRGINIANA	WITCH HAZEL	2'-2.5'	5' TYP.
	VD	10	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-2.5'	5' TYP.
	VC	6*	VACCINIUM CORYMBOSOM	HIGHBUSH BLUEBERRY	2'-3'	
TREES						
	BN	2 + 4*	BETULA NIGRA	RIVER BIRCH	5'-6'	

PLANT LIST (EAST OF BRIDGE)

PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	4	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	14	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	6	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	12	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
TREES						
	AS	2	ACER SACCHARINUM	SILVER MAPLE	5'-6'	
	BN	4	BETULA NIGRA	RIVER BIRCH	5'-6'	

* THE QUANTITIES MARKED WITH AN ASTERISK ARE LOCATED WITHIN THE AREAS OF WETLAND RESTORATION. ALL OTHER QUANTITIES ARE LOCATED WITHIN UPLAND AREAS.

PROPOSED WETLAND AND UPLAND PLANTING SCHEDULE

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: N/A

EXHIBIT NO. 19 OF 20

GENERAL NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER. REFER TO THE APPLICABLE SPECIAL PROVISION.
2. ORDINARY HIGH WATER IS AT EL. 107'.

PLANTING NOTES:

1. FOR WETLAND RESTORATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.45.
2. RESTORATION WORK SHALL NOT COMMENCE UNTIL ALL WORK IN WATER AND SLOPE RECONSTRUCTION HAS BEEN COMPLETED TO AVOID DAMAGE TO MITIGATION AREA.
3. REFER TO CONSTRUCTION PLANS FOR LIMIT OF CLEARING AND GRUBBING. AS SHOWN ON THE PLANS AND PER SPECIAL PROVISION ITEM 767.122, TREES SHALL BE SELECTED TO BE REUSED ON SITE. PLACEMENT OF LOGS AT TIME OF WETLAND CONSTRUCTION SHALL BE PER THE WETLAND SPECIALIST (PLAN LOCATIONS ARE SYMBOLIC ONLY.)
4. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
5. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
6. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
7. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
8. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
9. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

PROPOSED WETLAND AND UPLAND PLANTING NOTES

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: N/A

EXHIBIT NO. 20 OF 20

ADDENDUM ATTACHMENT 3

Wetland Delineation Summary Report, Dated 10/22/2024

WETLAND DELINEATION SUMMARY REPORT

Date: October 22, 2024

To: Massachusetts Department of Transportation, Highway Division

From: Robert Brewer, Staff Scientist, Epsilon Associates, Inc.

Subject: Wetland Delineation Summary Memo – Bay Road (Route 47) Bridge over the Fort River, Hadley, Massachusetts

INTRODUCTION

Epsilon Associates, Inc. ("Epsilon") was retained by Massachusetts Department of Transportation ("MassDOT") to delineate wetland resource areas in the vicinity of Bay Road (Route 47) over the Fort River in Hadley, Massachusetts (the "Study Area"). This report describes general environmental conditions and delineated wetland resource areas within the Study Area, including a discussion of potential jurisdiction under local, state, and federal wetlands regulatory programs. The wetland resource areas described in further detail below were field delineated by Epsilon on June 10, 2024. Included with this Freshwater Wetland Delineation Summary Report are the following attachments:

- Attachment A – Figures (USGS Locus Map, MassGIS Wetlands & Hydrologic Connections, NHESP Priority/Estimated Habitat & potential and certified vernal pools, NRCS Soils Map, and FEMA-FIRM).
- Attachment B – Representative photographs of Study Area and delineated wetland resource areas.
- Attachment C – MassDEP Bordering Vegetated Wetland Determination Forms.
- Attachment D – Wetland Delineation Map.

STUDY AREA DESCRIPTION

The Study Area includes approximately 400 linear feet of the Fort River on the north and south of the Bay Road Bridge (Route 47), and the immediate surrounding area out to a distance of approximately 200 feet. (see Attachment D). The Fort River flows in a southeasterly direction beneath the bridge, before joining the Connecticut River, approximately 3,000 feet southwest of the bridge. Two drainage culverts were observed within the Study Area, one which outlets into a large drainage swale in the northwest portion of the Study Area (wetland flag series W1-100), and a second which outlets from the bridge deck, south of

the river crossing into a drainage channel that is parallel to the Fort River between wetland flag series W3 and Mean Annual High Water ("MAHW") series MA2-100, (see Attachment D).

The Study Area is bordered to the north, south, and east by residential properties, and to the west by land owned by the Town of Hadley (water treatment plant).

The upland portions of the Study Area generally consist of undeveloped forested areas. Plant species observed include: red oak (*Quercus rubra*), catalpa (*Catalpa speciosa*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), white ash (*Fraxinus americana*) trees and/or saplings; poison ivy (*Toxicodendron radicans*), asiatic bittersweet (*Celastrus orbiculatus*), virginia creeper (*Parthenocissus quinquefolia*), climbing woody vines; highbush blueberry (*Vaccinium corymbosum*), honeysuckle (*Lonicera spp.*), multiflora rose (*Rosa multiflora*), and mapleleaf viburnum (*Viburnum acerifolium*) shrubs; and poison ivy, new york fern (*Thelypteris noveboracensis*), bracken fern (*Pteridium aquilinum*), hayscented fern (*Dennstaedtia punctilobula*), teaberry (*Gaultheria procumbens*), partridge-berry (*Mitchella repens*), and wild-lily-of-the-valley (*Maianthemum canadense*), ground cover. The wetland resources observed on the site are described further in this memo.

According to U.S. Department of Agriculture ("USDA") Natural Resources Conservation Service ("NRCS") mapping information, soils in the Study Area include Pootatuck, Rippowam, and Limerick.

Soil Name	Proportion of Hydric Soils	Drainage Classification
Pootatuck fine sandy loam, (2A)	15%	Moderately well drained
Rippowam fine sandy loam, (4A)	95%	Poorly drained
Limerick silt loam, (8A)	95%	Poorly drained

See Attachment A, Figure 4 for additional detail.

The Study Area is mapped as Priority Habitat (PH 2084) of Rare Species and Estimated Habitat of Rare Wildlife by the Natural Heritage and Endangered Species Program (NHESP). There are no mapped Certified Vernal Pools; however, there is a mapped Potential Vernal Pool in the northwest corner of the Study Area, within the W2 Series BVW. (see Attachment A, Figure 3)[1].

The Study Area does not contain any mapped Certified Vernal Pools ("CVP's") or Potential Vernal Pools ("PVP's).

WETLAND DELINEATION METHODOLOGY & REGULATORY FRAMEWORK

Wetlands within the Study Area were delineated in accordance with the following guidance manuals and regulatory processes:

- U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987);

[1] Priority Habitat is based on the known geographical extent of habitat for all state-listed rare species, both plants and animals, and is codified under the Massachusetts Endangered Species Act ("MESA"). Estimated Habitats are a sub-set of the Priority Habitats and are based on the geographical extent of habitat of state-listed rare wetlands wildlife and is codified under the Wetlands Protection Act, which does not protect plants. State-listed wetland wildlife species are protected under MESA as well as the Wetlands Protection Act.

- Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Environmental Laboratory, Version 2.0, January 2012);

- Massachusetts Wetlands Protection Act ("WPA") and implementing regulations (310 CMR 10.00);

- Massachusetts Department of Environmental Protection ("MassDEP"), Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (MassDEP, 2nd Edition, September 2022); and

The wetland delineation methodologies referenced above generally prescribe a multi-parameter approach, where hydrophytic vegetation and hydrology (including hydric soils) are reviewed in conjunction with one another when delineating a wetland boundary.

The boundaries of the wetland resource areas were delineated in the field by tying brightly colored survey flagging to woody vegetation or other relatively permanent vegetation/structures. The flags were placed sufficiently close together to clearly identify wetland/resource area edges and to allow survey crews to see adjacent flags from one another. Flags were labeled successively using unique numeric identifiers for each wetland series.

RESULTS

The wetland resource areas delineated or otherwise identified by Epsilon are described below.

Bordering Vegetated Wetlands

According to the WPA Regulations, BVW's are "freshwater wetlands that border on creeks, rivers, streams, ponds and lakes and include wet meadows, marshes, swamps and bogs. Generally, the soils are saturated and/or inundated conditions exist such that these areas support a predominance of wetland indicator plants." Under the Act, BVW has a 100-foot Buffer Zone extending from its edge.

BVW Flag Series W1 (flags 100 through 112)

BVW Series W1 is located in the western portion of the Study Area on the wastewater treatment plant land and borders on the Fort River. This wetland system is a relatively wide drainage swale, ultimately ending in the Fort River. Vegetation species observed include: American elm (*Ulmus Americana*), red maple, catalpa, jump-seed (*Persicaria virginiana*), New York fern, sensitive fern (*Onoclea sensibilis*), poison ivy, Virginia creeper, Asiatic bittersweet, creeping charlie (*Glechoma hederacea*), jewelweed (*Impatiens capensis*), and jack-in-the-pulpit (*Arisaema triphyllum*).

BVW Flag Series W2 (flags 100 through 105)

BVW Series W2 is located adjacent to MAHW series MA1 in the northwest portion of the Study Area. The W2 series borders on the Fort River Vegetation species observed include; red maple, American elm, silver maple , white ash, silky dogwood (*Cornus amomum*), spicebush (*Lindera benzoin*), hop sedge (*Carex lupulina*), stinging nettle (*Urtica dioica*), New York fern, jewelweed, poison ivy, catalpa, and sensitive fern.

BVW Flag Series W3 (flags 100 through 108)

Wetland series W3 is located in the southeast portion of the Study Area and borders on the Fort River. An intermittent stream channel was observed that runs parallel to the Fort River that carries flood water from the Fort River and accepts stormwater from a culvert. The culvert conveys stormwater from a catch basin in Bay Road, and is not a jurisdictional stream under the WPA, as it does not flow out of an area subject to protection under the WPA, and because it is upgradient of all bogs, swamps, wet meadows and marshes. Vegetation species observed include: red maple, silver maple, American elm, ash, spice bush, silky dogwood, poison ivy, Virginia creeper, jump-seed, reed canary grass (*Phalaris arundinacea*), beggarticks (*Bidens aristosa*) New York fern, sensitive fern, and jewelweed.

Bordering Land Subject to Flooding

According to the WPA regulations, Bordering Land Subject to Flooding ("BLSF") is "an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland. The boundary of BLSF is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm. Said boundary shall be that determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed under the National Flood Insurance Program (NFIP, currently administered by the Federal Emergency Management Agency, successor to the U.S. Department of Housing and Urban Development). Said boundary, so determined, shall be presumed accurate."[2]

BLSF does not have a 100-foot Buffer Zone extending from its boundary.

According to the current Federal Emergency Management Agency Flood Insurance Rate Map ("FEMA-FIRM") Community Panel Number 2501630002Bfor the Town of Hadley, Hampshire County, dated June 1, 1978, the Study Area is located within the mapped 100-year floodplain (see Attachment A, Figure 5).

Inland Bank and Land Under Water Bodies and Waterways

According to the WPA regulations, an Inland Bank is "the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a bordering vegetated wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and upland. The upper boundary of Bank is the first observable break in slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level."

According to the WPA regulations, Land Under Water Bodies and Waterways ("LUW") is "the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock; the boundary of LUW is the mean annual low water level."

[2] As explained in the WPA regulations, this presumption is rebuttable and may be overcome only by credible evidence from a registered professional engineer or other professional competent in such matters. Where NFIP Profile data is unavailable, the boundary of BLSF shall be the maximum lateral extent of flood water which has been observed or recorded. In the event of a conflict, the issuing authority may require the applicant to determine the boundary of BLSF by engineering calculations. Please see 310 CMR 10.57 for additional information.

Bank and LUW are associated with the Fort River identified with the Study Area. LUW was not specifically field delineated as it is contained within the MA1 & MA2 MAHW/Bank flag series described below.

Riverfront Area

According to the WPA regulations, a river is any natural flowing body of water that empties to any ocean, lake, pond, or other river and which flows throughout the year. Rivers include streams (see 310 CMR 10.04: Stream) that are perennial because surface water flows within them throughout the year. Intermittent streams are not rivers as defined herein because surface water does not flow within them throughout the year.

A Riverfront Area ("RFA") is the area of land between a river's mean annual high-water ("MAHW") line and a parallel line measured horizontally. The RFA may include or overlap with other resource areas or their Buffer Zones. The RFA is the area of land between a river's MAHW line measured horizontally outward from the river and a parallel line located 200-feet away[3]. The RFA does not have a Buffer Zone under the WPA.

According to the WPA regulations, a perennial stream (aka "river") is defined (in part), as follows:

- A river or stream shown as perennial on the current USGS map or more recent map provided by MassDEP is perennial.

- A river or stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size greater than or equal to one square mile, is perennial.

- A stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size less than one square mile, is intermittent unless the stream has a watershed size of at least ½ (0.50) square mile and has a predicted flow rate greater than or equal to 0.01 cubic feet per second at the 99% flow duration using the USGS Stream Stats method; or it meets certain criteria specified in the WPA regulations.[4]

The Study Area contains one perennial stream reach, the Fort River, having an associated 200-foot RFA. The reach of the Fort River flowing through the Study Area is shown as perennial on the current USGS Map. This resource area is described in further detail below.

---

[3] Except that the parallel line is located: a. 25 feet away in Boston, Brockton, Cambridge, Chelsea, Everett, Fall River, Lawrence, Lowell, Malden, New Bedford, Somerville, Springfield, Winthrop, and Worcester; b. 25 feet away in densely developed areas, as designated by the Secretary of the Executive Office of Energy and Environmental Affairs pursuant to 301 CMR 10.00: Densely Developed Areas; and c. 100 feet away for new agricultural and aquacultural activities. Measured horizontally means that the riverfront area extends at a right angle to the MAHW line rather than along the surface of the land.

[4] See 310 CMR 10.58.2(a) for additional detail.

MAHW Flag Series MA1 (flags 100 through 117)

The MA1 series delineates the MAHW associated with the northern Bank of the Fort River. In this reach the MAHW is coincident with the Bank. Bankfull field indicators such as vertical banks, changes in vegetation, stain lines, changes in bank materials, and in some locations, bank undercuts, were used to establish the MAHW. Vegetation observed on the Bank include silky dogwood, catalpa, spicebush, silver maple, poison ivy, beggarticks, American elm, and jewelweed.

MAHW Flag Series MA2 (flags 100 through 117)

The MA2 series delineates the MAHW associated with the southern Bank of the Fort River. South of the bridge, the Bank gradually sloped down toward the river, while north of the bridge the Bank was vertical in many locations, much like the bank associated with the MA1 series described above. Vegetation observed on the Bank include American elm, silver maple, catalpa, poison ivy, silky dogwood, spicebush, jewelweed, and beggarticks.

DISCUSSION

Depending on the location and extent of potential future work, Epsilon recommends filing an Abbreviated Notice of Resource Area Delineation ("ANRAD") at the appropriate time with the Conservation Commission seeking formal approval of the proposed wetland resource area boundaries described herein. The ANRAD provides a procedure for an applicant to obtain official confirmation from the Conservation Commission regarding the extent and types of local and state jurisdictional wetland resource areas on the site. The Commission's approval of the wetland resource area boundaries is valid for 3 years, notwithstanding any extension permits issued thereto. Having an approved wetland boundary will allow Project Engineers to advance the design work in accordance with applicable regulatory performance standards and with confidence knowing that the wetland boundaries are "locked in" and not subject to change leading up to the eventual filing of a Notice of Intent ("NOI") with the Conservation Commission describing proposed work.

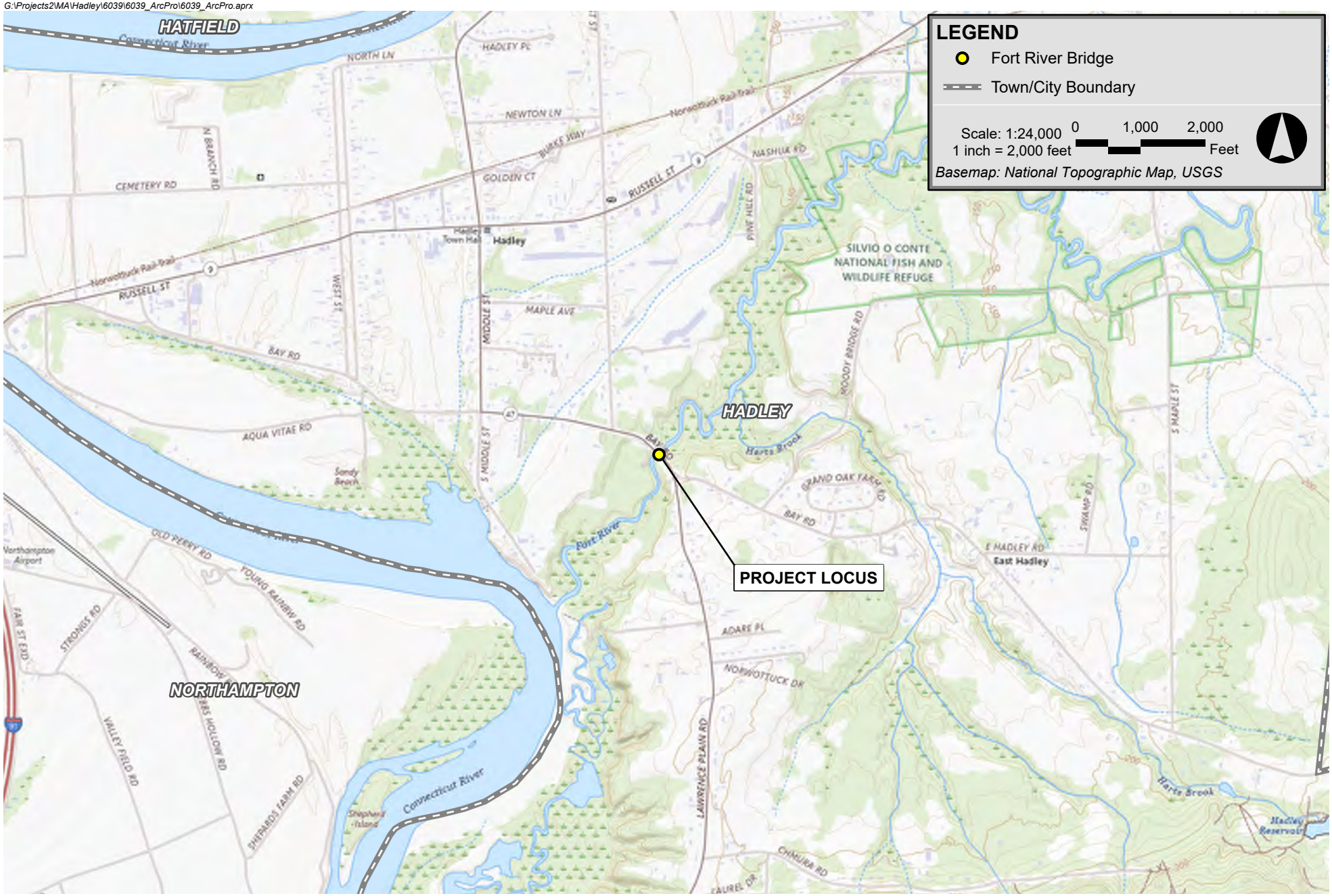
For purposes of this report, it is assumed that all the delineated vegetated wetlands are waters of the U.S. subject to regulation under Section 401 and 404 of the U.S. Clean Water Act.[5]

[5] "Waters of the United States" is broadly defined in the federal regulations that implement the Clean Water Act. It includes tidal waters, rivers, streams, lakes, ponds and wetlands. Wetlands are further defined MassDEP's 401 Water Quality Certification regulations as follows: "Bordering Vegetated Wetlands ("BVW") - Any land or surface area so defined by the Massachusetts Wetlands Protection Act, M.G.L. c. 131, § 40 and 310 CMR 10.55(2). [According to 310 CMR 10.55, BVW means (in part), "… freshwater wetlands which border on creeks, rivers, streams, ponds and lakes …"]; and Isolated Vegetated Wetlands ("IVW") - Areas subject to jurisdiction under 33 U.S.C. 1251, et seq. that are not Bordering Vegetated Wetlands subject to jurisdiction under M.G.L. c. 131, § 40 and 310 CMR 10.55(2).

Attachment A

Figures

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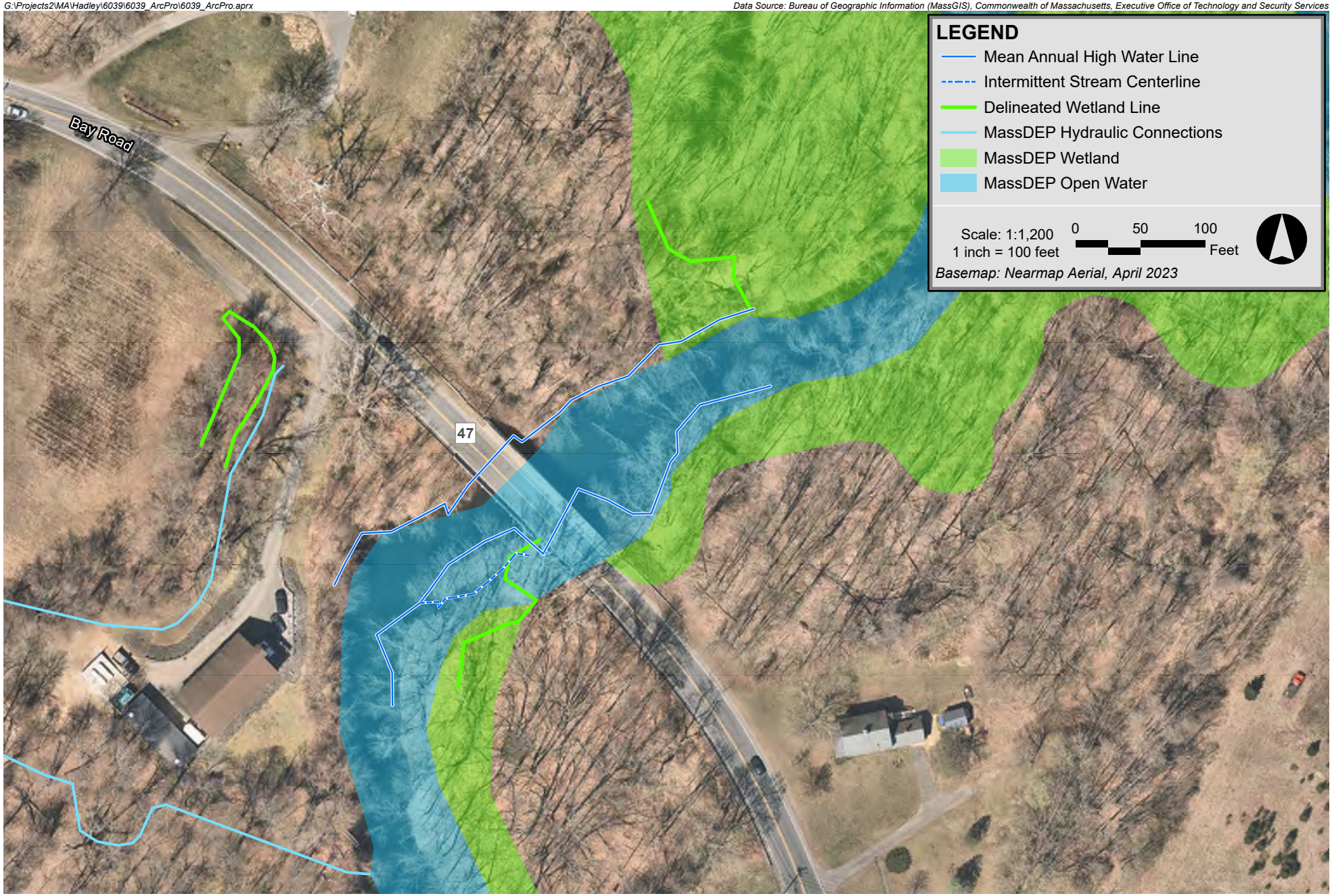


Fort River Bridge Hadley, Massachusetts

Figure 1
USGS Locus Map

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Fort River Bridge Hadley, Massachusetts

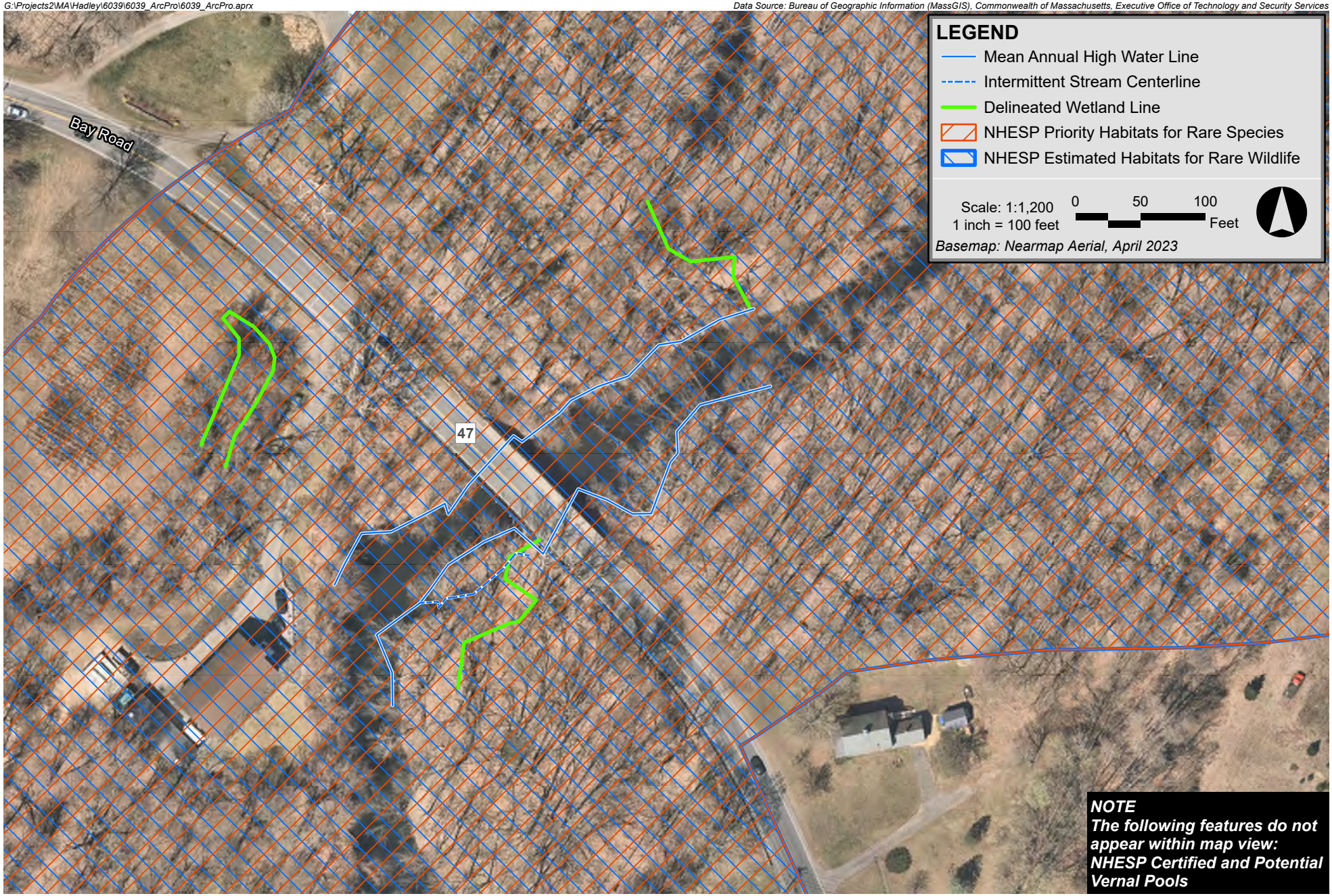
Epsilon Associates Inc.

Figure 2

MassDEP Wetlands and Hydraulic Connections

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Fort River Bridge **Hadley, Massachusetts**

Epsilon Associates Inc.

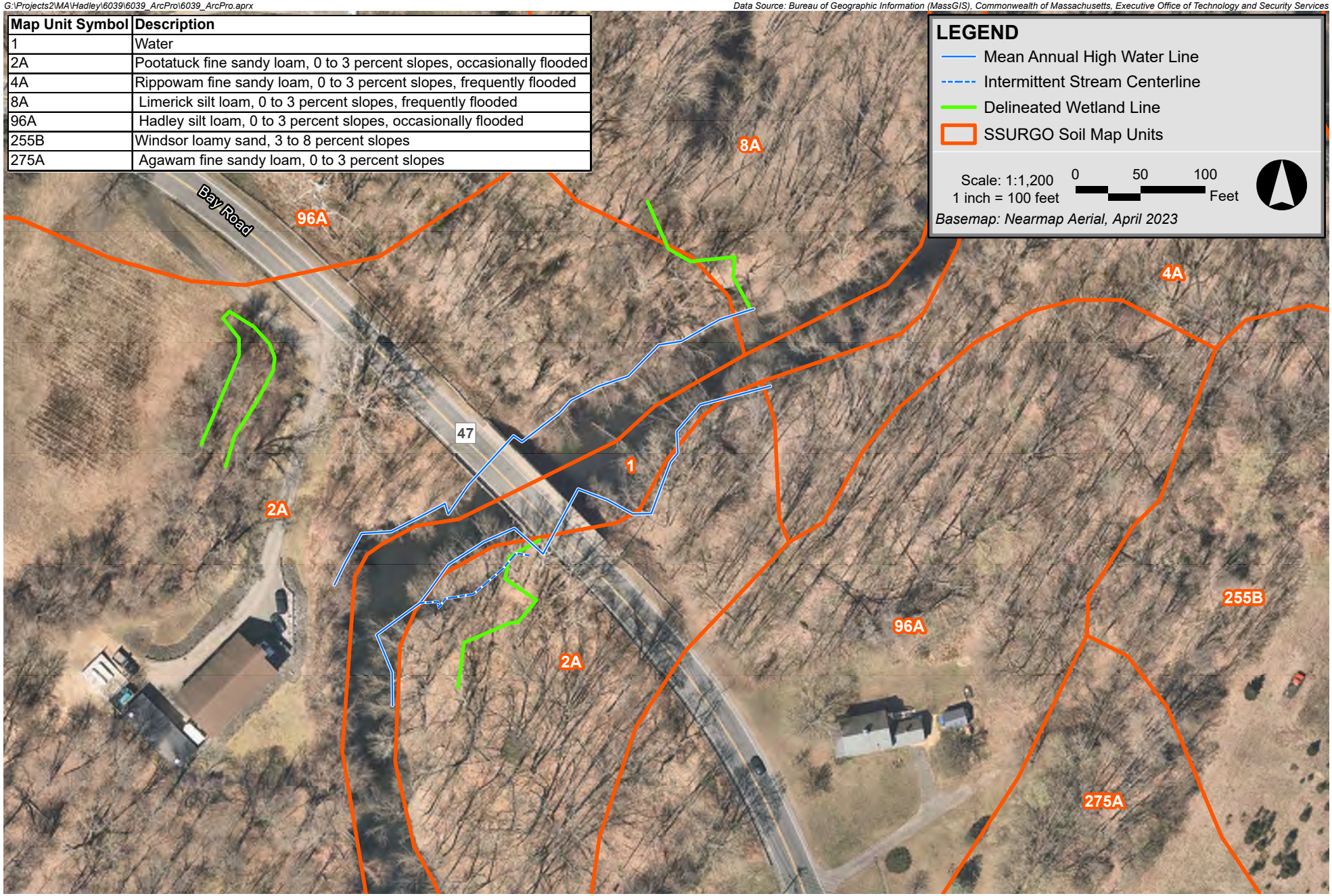
Figure 3

NHESP Habitats and Vernal Pools

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

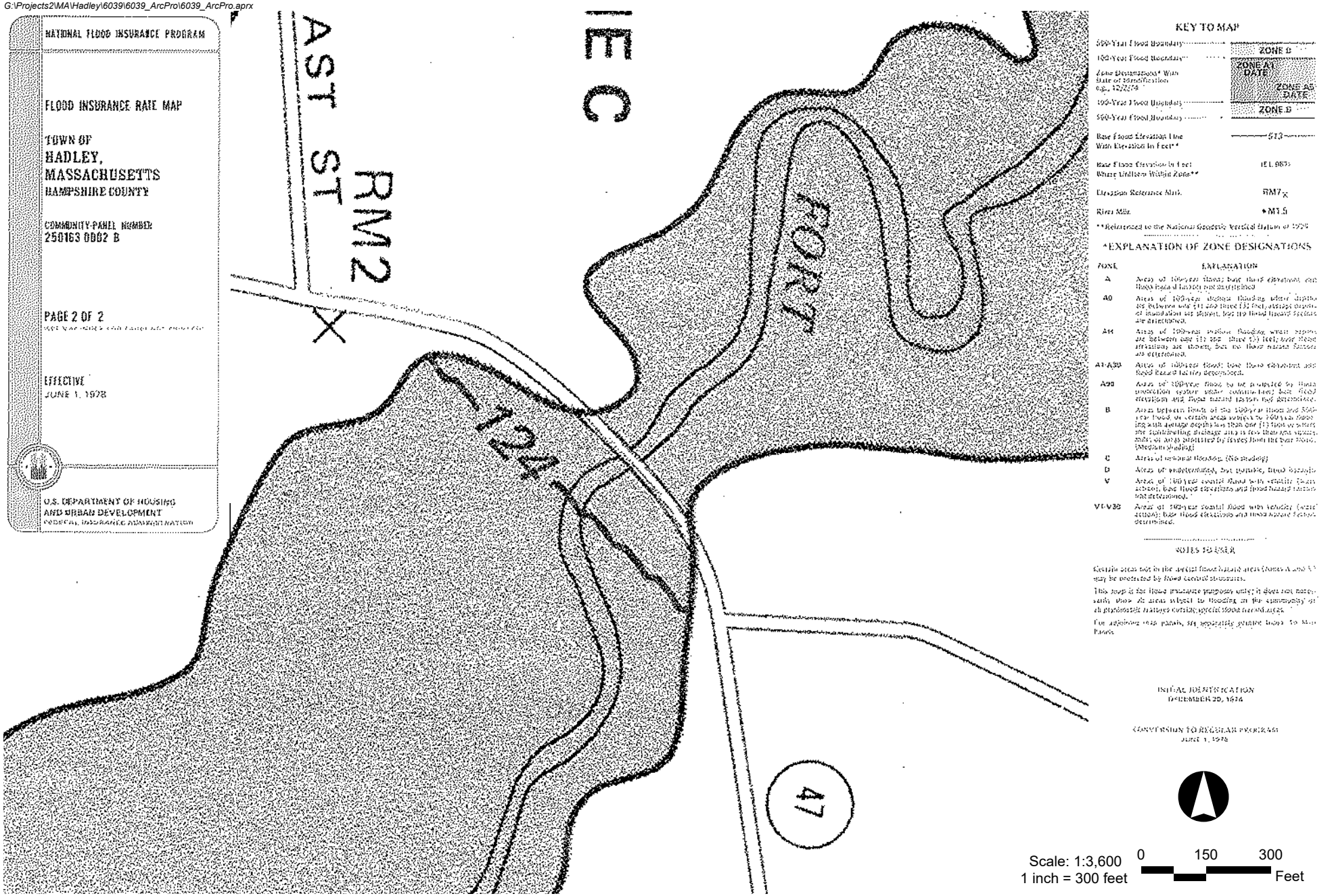
Map Unit Symbol	Description
1	Water
2A	Pootatuck fine sandy loam, 0 to 3 percent slopes, occasionally flooded
4A	Rippowam fine sandy loam, 0 to 3 percent slopes, frequently flooded
8A	Limerick silt loam, 0 to 3 percent slopes, frequently flooded
96A	Hadley silt loam, 0 to 3 percent slopes, occasionally flooded
255B	Windsor loamy sand, 3 to 8 percent slopes
275A	Agawam fine sandy loam, 0 to 3 percent slopes



Fort River Bridge Hadley, Massachusetts

Figure 4
NRCS SSURGO Soils

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Fort River Bridge Hadley, Massachusetts

Epsilon Associates Inc.

Figure 5
FEMA FIRM

Attachment B

Photos



Photo 1: Overview of wetland flag series W1 looking north toward Bay Road



Photo 2: Overview of wetland flag series W1 looking south toward Hadley Water Department facility



Photo 3: View from north side underneath Fort River Bridge



Photo 4: View of the Fort River as seen from the top of the bridge on Bay Road



Photo 5: View of gravel drive near wetland series W1, with the entrance to the Hadley water department to the right, and a view of Bay Road and the Fort River Bridge in the background to the left.



Photo 6: View of the culvert found just south of the bridge on the southern bank.



Photo 7: View of drainage ditch carrying water from the culvert found south of the bridge



Photo 8: View of Fort River from the southern bank, north of the Fort River Bridge

Attachment C

Wetland Determination Forms

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Town of Hadley Sampling Point or Zone: W1 - Upland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.333096, -72.579467

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: NA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ☐	No ✔	**Is the Sampled Area within a Wetland?**	**Yes** ☐ **No** ✔
Hydric Soils criterion met?	Yes ☐	No ✔		
Wetlands hydrology present?	Yes ☐	No ✔		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)_____
Water Table Present?	Yes ☐	No ✔	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes ☐	No ✔	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	☐ Drainage patterns
☐ Iron deposits	☐ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	☐ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W1 - Upland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. catalpa	Catalpa speciosa	FACU	38.0	Yes	No
3. red oak	Quercus rubra	FACU	38.0	Yes	No
4.					
5.					
6.					
7.					
8.					
9.					

114.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. multiflora rose	Rosa multiflora	FACU	38.0	Yes	No
2. green ash	Fraxinus pennsylvanica	FACW	10.5	No	
3. honeysuckle	Lonicera japonica	FACU	20.5	Yes	No
4. Norway maple	Acer platanoides	UPL	20.5	Yes	No
5.					
6.					
7.					
8.					
9.					

89.5 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. jewelweed	Impatiens capensis	FACW	20.5	Yes	Yes
2. christmas fern	Polystichum acrostichoides	FACU	10.5	Yes	Yes
3. poision ivy	Toxicodendron radicans	FAC	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

51.5 = Total Cover

Sampling Point W1 - Upland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	10.0	Yes	No
2. Virginia creeper	Parthenocissus quinquefolia	FACU	30.0	Yes	No
3.					
4.					
			40.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes _ _ No ✔
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	11	3		Yes _ _ No _ ✔
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	31	X 2	= 62.00
	FAC species	59	X 3	= 177.00
	FACU species	107	X 4	= 428.00
	UPL species	31	X 5	= 155.00
	Column Totals	(A) 228		(B) 822
Prevalence Index		B/A = 3.61		Is the Prevalence Index ≤ 3.0? Yes _ _ No _ ✔
Wetland vegetation criterion met?		**Yes** _ _	**No** ✔	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W1 - Upland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-8	10YR 3/2	100.00					FSL	
8-16+	7.5YR 5/6	100.00					FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: no redox

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Town of Hadley Sampling Point or Zone: W1 - Wetland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.333003, -72.579486

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: NA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ✔	No ☐	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ☐
Hydric Soils criterion met?	Yes ✔	No ☐		
Wetlands hydrology present?	Yes ✔	No ☐		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)
Water Table Present?	Yes ✔	No ☐	Depth (inches) 10.00
Saturation Present (including capillary fringe)?	Yes ✔	No ☐	Depth (inches) 10.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	✔ Drainage patterns
☐ Iron deposits	✔ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	✔ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W1 - Wetland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	63.0	Yes	Yes
2. catalpa	Catalpa speciosa	FACU	20.5	Yes	No
3. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

104.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
2. red maple	Acer rubrum	FAC	20.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

41.0 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. sensitive fern	Onoclea sensibilis	FACW	38.0	Yes	Yes
2. jewelweed	Impatiens capensis	FACW	20.5	No	
3. creeping charlie	Glechoma hederacea	FACU	10.5	No	
4. poison ivy	Toxicodendron radicans	FAC	38.0	Yes	Yes
5. New York fern	Thelypteris noveboracensis	FAC	20.5	No	
6.					
7.					
8.					
9.					
10.					
11.					
12.					

127.5 = Total Cover

Sampling Point W1 - Wetland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	20.5	Yes	No
2.					
3.					
4.					
			20.5 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	8	6		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	100	X 2	= 200.00
	FAC species	142	X 3	= 426.00
	FACU species	31	X 4	= 124.00
	UPL species	21	X 5	= 105.00
	Column Totals	(A) 294		(B) 855
Prevalence Index		B/A = 2.91		Is the Prevalence Index ≤ 3.0? Yes ☑ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W1 - Wetland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-6								fill
6-10	10YR 3/2	100.00					fine sandy loam	
10-20	2.5Y 4/2	85.00	5YR 5/8	15.00	C	M	loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Wanczyk Lee Ann Trustee Sampling Point or Zone: W2 - Upland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.332411, -72.578770

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: R2USC

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ☐	No ✔	**Is the Sampled Area within a Wetland?**	**Yes** ☐ **No** ✔
Hydric Soils criterion met?	Yes ☐	No ✔		
Wetlands hydrology present?	Yes ☐	No ✔		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)_____
Water Table Present?	Yes ☐	No ✔	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes ☐	No ✔	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	☐ Drainage patterns
☐ Iron deposits	☐ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	☐ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W2 - Upland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. silver maple	Acer saccharinum	FACW	38.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

76.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. multiflora rose	Rosa multiflora	FACU	38.0	Yes	No
2. honeysuckle	Lonicera japonica	FACU	20.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					

58.5 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. poison ivy	Toxicodendron radicans	FAC	20.5	Yes	Yes
2. creeping charlie	Glechoma hederacea	FACU	10.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

31.0 = Total Cover

Sampling Point W2 - Upland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	10.5	Yes	No
2. Virginia creeper	Parthenocissus quinquefolia	FACU	10.5	Yes	No
3.					
4.					
			21.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes _ _ No ✔
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	8	3		Yes _ _ No _ ✔ _
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	38	X 2	= 76.00
	FAC species	59	X 3	= 175.50
	FACU species	80	X 4	= 318.00
	UPL species	11	X 5	= 52.50
	Column Totals	(A) 186.5		(B) 622
Prevalence Index		B/A = 3.34		Is the Prevalence Index ≤ 3.0? Yes _ _ No _ ✔ _
Wetland vegetation criterion met?		**Yes** _ _	**No** ✔	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2 - Upland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or co firm the abse ce of indicators)								
Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]	Texture	Remarks
0-10	10YR 3/2	100.00					FSL	
10-16	7.5YR 5/6	100.00					FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: no redox

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Wanczyk Lee Ann Trustee Sampling Point or Zone: W2 - Wetland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.332495, -72.578757

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: R2USC

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ✔	No ☐	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ☐
Hydric Soils criterion met?	Yes ✔	No ☐		
Wetlands hydrology present?	Yes ✔	No ☐		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)
Water Table Present?	Yes ✔	No ☐	Depth (inches) 10.00
Saturation Present (including capillary fringe)?	Yes ✔	No ☐	Depth (inches) 10.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	✔ Drainage patterns
☐ Iron deposits	✔ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	✔ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W2 - Wetland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
3. silver maple	Acer saccharinum	FACW	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

79.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. silky dogwood	Swida amomum	FACW	20.5	Yes	Yes
2. green ash	Fraxinus pennsylvanica	FACW	3.0	No	
3. spice bush	Lindera benzoin	FACW	10.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

34.0 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. poison ivy	Toxicodendron radicans	FAC	10.5	Yes	Yes
2. sensitive fern	Onoclea sensibilis	FACW	10.5	Yes	Yes
3. jewelweed	Impatiens capensis	FACW	10.5	Yes	Yes
4. New York fern	Thelypteris noveboracensis	FAC	38.0	Yes	Yes
5. hop sedge	Carex lupulina	OBL	3.0	No	
6. stinging nettle	Urtica dioica	FAC	10.5	Yes	Yes
7.					
8.					
9.					
10.					
11.					
12.					

83.0 = Total Cover

Sampling Point W2 - Wetland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test:	Do all dominant species have an indicator status of OBL or FACW?			Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	10	10		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	3	X 1	= 3.00
	FACW species	96	X 2	= 192.00
	FAC species	97	X 3	= 291.00
	FACU species	0	X 4	= 0.00
	UPL species	0	X 5	= 0.00
	Column Totals	(A) 196		(B) 486
	Prevalence Index	B/A = 2.48		Is the Prevalence Index ≤ 3.0? Yes ☑ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2 - Wetland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-10	10YR 3/2	100.00					SIL	
10-18	5Y 5/2	85.00	10YR 5/8	15.00	C	M	FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

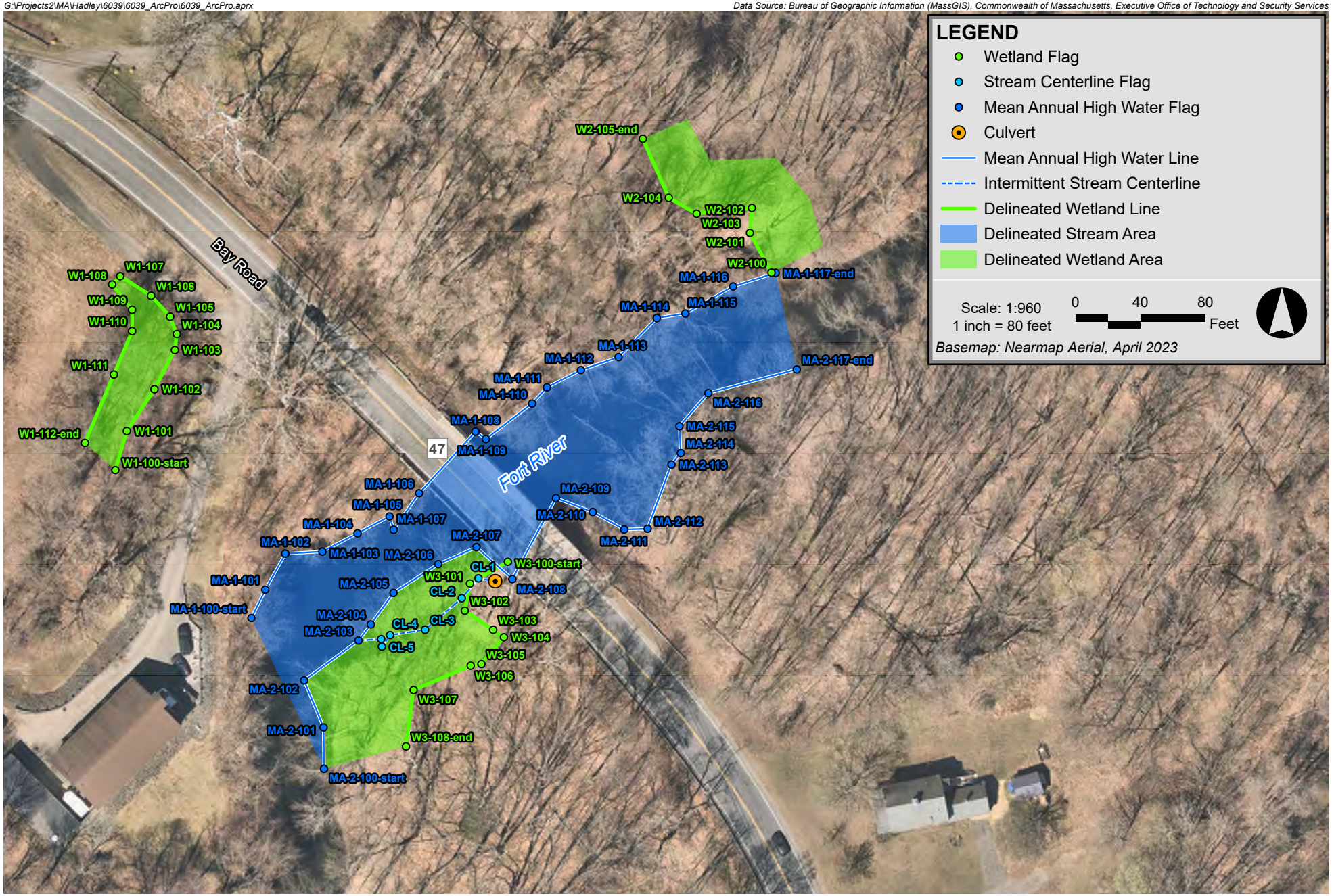
Hydric Soils criterion met? **Yes** ☑ **No** ☐

Attachment D

Wetland Delineation Map

G:\Projects2\MA\Hadley\6039\6039_ArcPro\6039_ArcPro.aprx

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Fort River Bridge Hadley, Massachusetts

Attachment D

Delineated Wetland Resource Areas

ADDENDUM ATTACHMENT 4

Sediment Sampling Summary

January 22, 2025
Project No. 2407720

VIA EMAIL: michael.a.joa@dot.state.ma.us

Michael Joa
Massachusetts Department of Transportation – Highway Division
10 Park Plaza
Boston, MA 02116

Re: Sediment Sampling Summary
Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

Dear Mr. Joa:

This Sediment Sampling Summary letter presents the results of the sediment sampling program for the above referenced project.

Introduction

Bridge No. H-01-005 is an approximately 126-foot long, two-lane bridge with one sidewalk on the north side that carries Bay Road over the Fort River in Hadley, Massachusetts (the Site, Fig. 1). The Massachusetts Department of Transportation (MassDOT) is preparing to dredge sediments as part of a bridge replacement project, including installation of riprap on the upstream side of the bridge and regrading of the riverbed primarily on the downstream side of the bridge. The volume of sediment to be dredged is estimated by MassDOT to be 374 cubic yards. Because this is more than 100 cubic yards, a Sampling and Analysis Plan (SAP) to characterize the sediment to be dredged was prepared by GEI Consultants, Inc. (GEI) and on November 13, 2024 submitted to the Massachusetts Department of Environmental Protection (MassDEP), in accordance with the Water Quality Certificate (WQC) regulations [314 CMR 9.07(2)(b)(5)]. The SAP was approved by MassDEP via email on November 20, 2024.

The purpose of this sampling was to collect and test representative samples to characterize sediment that will be generated during waterway crossing replacements, in compliance with the MassDEP requirements for the Section 401 Water Quality Certification testing criteria. In accordance with the SAP, GEI collected two samples below the sediment surface within the proposed dredge area of the Fort

River. One sample was collected near the upstream abutment, and one sample was collected near the downstream abutment.

Field Program

Sediment sampling was conducted by GEI on November 21, 2024. A total of two sediment samples (SED-2 and SED-1) were collected using hand tools to the anticipated dredge depth of approximately one to four feet, respectively (Fig. 2), and submitted for laboratory analysis. Each sample was collected from the mudline to the bottom of the exploration across the estimated dredge interval.

For both sampling locations, discrete samples for laboratory analysis of volatile organic compounds (VOCs) were selected from the sampling intervals with the highest jar headspace readings using a photoionization detector (PID) and the MassDEP jar headspace method.

GEI did not observe any visual or olfactory evidence of contamination in the sediment samples. Sediment generally consisted of silty sand with gravel at location SED-01 and sand at location SED-02. The sediment logs are in Appendix A**.**

Sediment Analysis

The samples were submitted to ESS Laboratory of Cranston, Rhode Island (ESS), a Massachusetts-certified laboratory, for the following analyses required by the WQC regulations [314 CMR 9.07(2)(b)(6)]: VOCs, extractable petroleum hydrocarbons (EPH) and target polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls by NOAA Summation of Congeners, metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), grain size, total organic carbon (TOC), and percent water.

Sediment Sampling Results

For comparison purposes only, chemical results were compared to Massachusetts Contingency Plan (MCP) Reportable Concentrations for S-1 soils (RCS-1), which only apply to soil and not sediment. Concentrations of PAHs and several metals were detected above laboratory reporting limits in the samples, but they were below their RCS-1 Standards. The analytical results are summarized in Table 1. The associated laboratory data report is in Appendix B. Detected contaminants are listed below.

- PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene in one or both samples.
- Metals including arsenic, chromium, copper, lead, nickel, and zinc in both samples.

Please contact us at 781.721.4000 if you have any questions regarding this letter.

Sincerely,

GEI Consultants, Inc.

Christopher Ragnelli
Senior Project Manager

Ryan Hoffman, P.G., LSP
Vice President

CR/RH:vjb
B:\Working\MASSDOT\2407720 MassDOT Bay Rd (Rte 47) Over Fort River Bridge Hadley\07_Reports\Sediment Sampling Summary\20240122_2407720 Sediment Sampling Summary- Hadley FINAL.docx

Attachments:

Table
Figures
Appendix A Sediment Logs
Appendix B Laboratory Data

cc: Timothy Dexter, MassDOT
Courtney Walker, MassDOT

Table

Table 1. Sediment Laboratory Testing Results

Table 1. Sediment Laboratory Testing Results
Sediment Sampling Summary
Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
Volatile Organic Compounds (VOCs)	8260D Low	mg/kg			NT	NT		NT	NT
1,1,1,2-Tetrachloroethane			0.1	<0.0043			<0.0058		
1,1,1-Trichloroethane			30	<0.0043			<0.0058		
1,1,2,2-Tetrachloroethane			0.005	<0.0043			<0.0058		
1,1,2-Trichloroethane			0.1	<0.0043			<0.0058		
1,1-Dichloroethane			0.4	<0.0043			<0.0058		
1,1-Dichloroethene			3	<0.0043			<0.0058		
1,1-Dichloropropene			NS	<0.0043			<0.0058		
1,2,3-Trichlorobenzene			NS	<0.0043			<0.0058		
1,2,3-Trichloropropane			100	<0.0043			<0.0058		
1,2,4-Trichlorobenzene			2	<0.0043			<0.0058		
1,2,4-Trimethylbenzene			1,000	<0.0043			<0.0058		
1,2-Dibromo-3-chloropropane			10	<0.0043			<0.0058		
1,2-Dibromoethane			0.1	<0.0043			<0.0058		
1,2-Dichlorobenzene			9	<0.0043			<0.0058		
1,2-Dichloroethane			0.1	<0.0043			<0.0058		
1,2-Dichloropropane			0.1	<0.0043			<0.0058		
1,3,5-Trimethylbenzene			10	<0.0043			<0.0058		
1,3-Dichlorobenzene			3	<0.0043			<0.0058		
1,3-Dichloropropane			500	<0.0043			<0.0058		
1,4-Dichlorobenzene			0.7	<0.0043			<0.0058		
1,4-Dioxane			0.2	<0.0861			<0.116		
2,2-Dichloropropane			NS	<0.0043			<0.0058		
2-Chlorotoluene			100	<0.0043			<0.0058		
2-Hexanone			100	<0.0430			<0.0581		
4-Chlorotoluene			NS	<0.0043			<0.0058		
4-Isopropyltoluene			100	<0.0043			<0.0058		
4-Methyl-2-pentanone			0.4	<0.0430			<0.0581		
Acetone			6	<0.0430			<0.0581		
Benzene			2	<0.0043			<0.0058		
Bromobenzene			100	<0.0043			<0.0058		
Bromochloromethane			NS	<0.0043			<0.0058		
Bromodichloromethane			0.1	<0.0043			<0.0058		
Bromoform			0.1	<0.0043			<0.0058		
Bromomethane			0.5	<0.0086			<0.0116		
Carbon disulfide			100	<0.0043			<0.0058		
Carbon tetrachloride			5	<0.0043			<0.0058		
Chlorobenzene			1	<0.0043			<0.0058		

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Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
Chloroethane			100	<0.0086			<0.0116		
Chloroform			0.2	<0.0043			<0.0058		
Chloromethane			100	<0.0086			<0.0116		
cis-1,2-Dichloroethene			0.1	<0.0043			<0.0058		
cis-1,3-Dichloropropene			0.01	<0.0043			<0.0058		
Dibromochloromethane			0.005	<0.0043			<0.0058		
Dibromomethane			500	<0.0043			<0.0058		
Dichlorodifluoromethane			1000	<0.0086			<0.0116		
Diethyl Ether			100	<0.0043			<0.0058		
Di-isopropyl ether			100	<0.0043			<0.0058		
Ethyl tertiary-butyl ether			NS	<0.0043			<0.0058		
Ethylbenzene			40	<0.0043			<0.0058		
Hexachlorobutadiene			30	<0.0043			<0.0058		
Isopropylbenzene			1,000	<0.0043			<0.0058		
Xylene P,M			100	<0.0086			<0.0116		
Methyl Ethyl Ketone (2-Butanone)			4	<0.0430			<0.0581		
Methyl tert-Butyl Ether			0.1	<0.0043			<0.0058		
Methylene chloride			0.1	<0.0215			<0.0290		
Naphthalene			4	<0.0043			<0.0058		
n-Butylbenzene			NS	<0.0043			<0.0058		
n-Propylbenzene			100	<0.0043			<0.0058		
Xylene O			100	<0.0043			<0.0058		
sec-Butylbenzene			NS	<0.0043			<0.0058		
Styrene			3	<0.0043			<0.0058		
tert-Butylbenzene			100	<0.0043			<0.0058		
tertiary-amyl methyl ether			NS	<0.0043			<0.0058		
Tetrachloroethene			1	<0.0043			<0.0058		
Tetrahydrofuran			500	<0.0172			<0.0232		
Toluene			30	<0.0043			<0.0058		
Xylenes, Total			100	<0.0086			<0.0116		
trans-1,2-Dichloroethene			1	<0.0043			<0.0058		
trans-1,3-Dichloropropene			0.01	<0.0043			<0.0058		
Trichloroethene			0.3	<0.0043			<0.0058		
Trichlorofluoromethane			1000	<0.0043			<0.0058		
Vinyl chloride			0.3	<0.0086			<0.0116		
Total VOCs			NS	ND			ND		
Extractable Petroleum Hydrocarbons (EPH)		mg/kg		NT		NT	NT		NT

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Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
C9 to C18 Aliphatic Hydrocarbons	MADEP-EPH		1000		<12.8			<11.6	
C19 to C36 Aliphatic Hydrocarbons	MADEP-EPH		3000		<12.8			<11.6	
C11 to C22 Aromatic Hydrocarbons	EPH8270SIM		1000		<13.0			<11.8	
Benzo(a)anthracene	EPH8270SIM		20		0.025			0.010	
Benzo(a)pyrene	EPH8270SIM		2		0.028			<0.009	
Benzo(b)fluoranthene	EPH8270SIM		20		0.022			<0.009	
Benzo(g,h,i)perylene	EPH8270SIM		1000		0.019			<0.009	
Benzo(k)fluoranthene	EPH8270SIM		200		0.026			<0.009	
Chrysene	EPH8270SIM		200		0.027			0.011	
Dibenzo(a,h)anthracene	EPH8270SIM		2		<0.010			<0.009	
Fluoranthene	EPH8270SIM		1000		0.05			0.014	
Fluorene	EPH8270SIM		1000		<0.010			<0.009	
Indeno(1,2,3-cd)pyrene	EPH8270SIM		20		0.015			<0.009	
2-Methylnaphthalene	EPH8270SIM		0.7		<0.010			<0.009	
Naphthalene	EPH8270SIM		4		<0.010			<0.009	
Phenanthrene	EPH8270SIM		10		0.017			0.037	
Pyrene	EPH8270SIM		1000		0.043			0.029	
Polychlorinated Biphenyls (PCBs)	8082A Cong	mg/kg		NT		NT	NT		NT
BZ#8			NS		<0.00033			<0.00032	
BZ#18			NS		<0.00033			<0.00032	
BZ#28			NS		<0.00033			<0.00032	
BZ#44			NS		<0.00033			<0.00032	
BZ#52			NS		<0.00033			<0.00032	
BZ#66			NS		<0.00033			<0.00032	
BZ#101			NS		<0.00033			<0.00032	
BZ#105			NS		<0.00033			<0.00032	
BZ#118			NS		<0.00033			<0.00032	
BZ#128			NS		<0.00033			<0.00032	
BZ#138			NS		<0.00033			<0.00032	
BZ#153			NS		<0.00033			<0.00032	
BZ#170			NS		<0.00033			<0.00032	
BZ#180			NS		<0.00033			<0.00032	
BZ#187			NS		<0.00033			<0.00032	
BZ#195			NS		<0.00033			<0.00032	
BZ#206			NS		<0.00033			<0.00032	
BZ#209			NS		<0.00033			<0.00032	
Total PCBs			1		ND			ND	
Total Metals		mg/kg		NT	NT		NT	NT	

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				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
Arsenic	6010D		20			3.96			5.69
Cadmium	6010D		80			<0.10			<0.10
Chromium (Total)	6010D		100			6.32			7.46
Copper	6010D		NS			7.65			5.95
Lead	6010D		200			6.55			3.94
Mercury	7471B		20			<0.010			<0.010
Nickel	6010D		700			4.58			5.04
Zinc	6010D		1000			19.2			20.4
Grain Size Analysis	ASTM D2216/D6913			NT			NT		
% Total Gravel	-	%	NS		21.7	NT		44.4	NT
% Coarse Sand	-	%	NS		13.9			19	
% Medium Sand	-	%	NS		34.3			28.7	
% Fine Sand	-	%	NS		21.1			6.7	
% Total Fines	-	%	NS		9.0			1.2	
General Chemistry									
Total Organic Carbon	LK	mg/kg	NS	NT	4,560	NT	NT	1,600	NT
Moisture, Percent	2540G	%	NS	NT	20	NT	NT	15	NT
Solids, Percent	2540G	%	NS	83	80	100	92	85	100

General Notes:

1. In general, analytes detected in at least one sample are reported here. For a complete list of analytes see the laboratory data sheets.
2. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.
3. MCP = 310 CMR 40.0000 Massachusetts Contingency Plan with revisions effective March 1, 2024
4. Reportable Concentrations (e.g., RCS-1) where identified, are cited from the MCP.
5. NS = No MCP standard or disposal facility criteria
6. ND = Not detected above laboratory reporting limit
7. NT = Not tested
8. mg/kg = milligrams per kilogram.
9. SED-1-COMP and SED-2-COMP for were oven dried at 60 degrees Celsius prior to digesting and relogged as samples SED-1-COMP-OVEN DRIED and SED-2-COMP-OVEN DRIED, respectively.

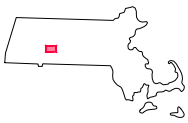
Figures

Figure 1. Site Location Map

Figure 2. Sediment Sampling Locations

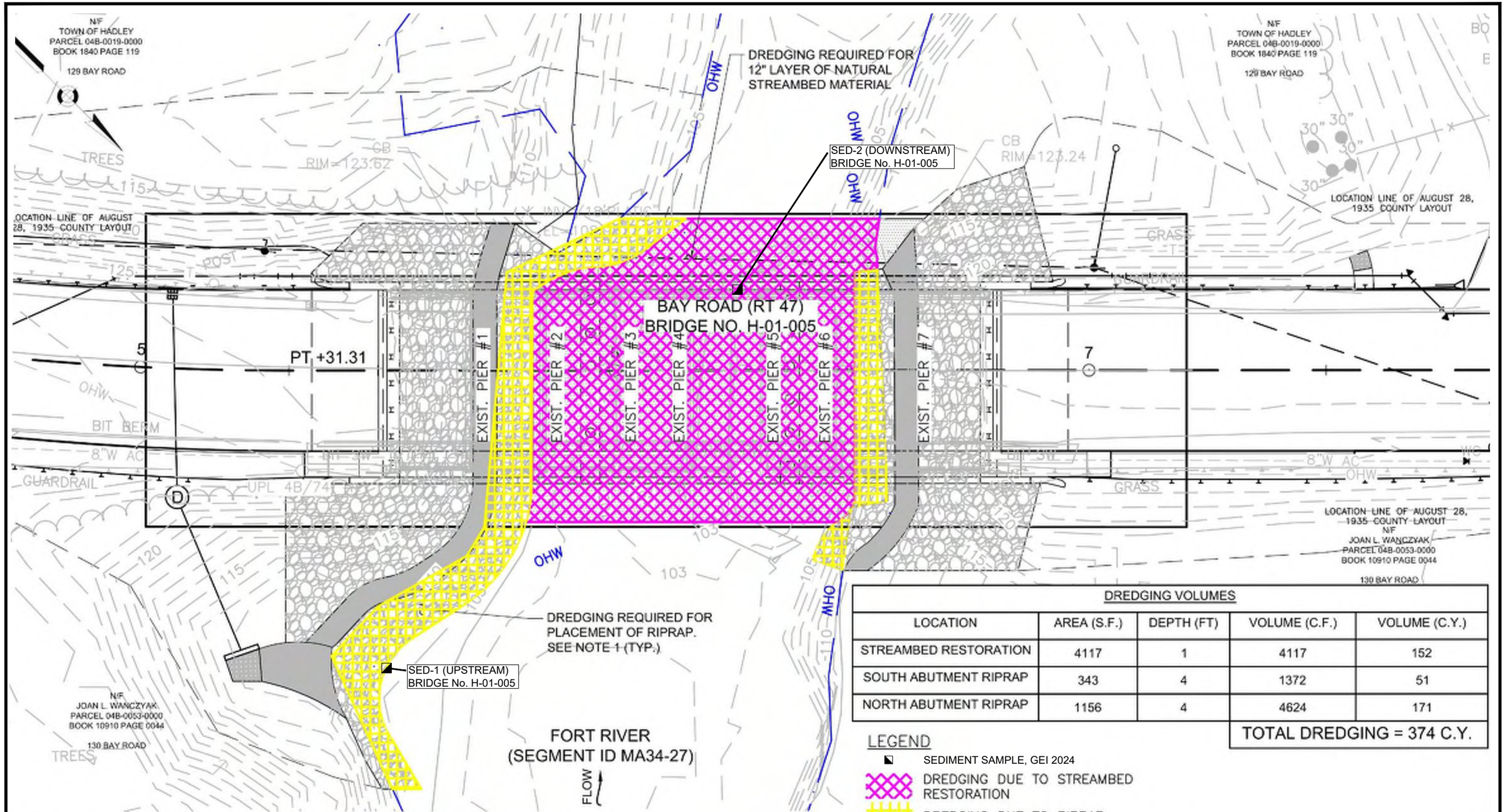


This Image is from U.S.G.S. Topographic 7.5 Minute Series
Mount Holyoke, MA, CT Quadrangle, 2024.
Datum is North American Vertical Datum of 1988 (NAVD88).
Contour Interval is 10 Feet.



Sediment Sampling Summary Letter Hadley Bridge No. H-01-005 Improvements Bay (Rte. 47) Road Over Fort River Hadley, Massachusetts	GEI Consultants	SITE LOCATION MAP
Massachusetts Department of Transportation Boston, Massachusetts	Project 2407720	January 2025 Fig. 1

B:\Working\MASSDOT\2407720 MassDOT Bay Rd (Rte 47) Over Fort River Bridge Hadley\00_CAD\Figures\Gt\2407720-01



DREDGING VOLUMES

LOCATION	AREA (S.F.)	DEPTH (FT)	VOLUME (C.F.)	VOLUME (C.Y.)
STREAMBED RESTORATION	4117	1	4117	152
SOUTH ABUTMENT RIPRAP	343	4	1372	51
NORTH ABUTMENT RIPRAP	1156	4	4624	171
			TOTAL DREDGING = 374 C.Y.	

LEGEND

- SEDIMENT SAMPLE, GEI 2024
- DREDGING DUE TO STREAMBED RESTORATION
- DREDGING DUE TO RIPRAP

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH 6" NATURAL STREAMBED COBBLE & GRAVEL TO FILL VOIDS (TYP.)

SOURCE:

1. BASE PLAN FROM *"DREDGING LOCATION PLAN, BAY ROAD (ROUTE 47) OVER FORT RIVER (segment ID MA 34-27) HADLEY, MA,"* EXHIBIT NO. 10 OF 17 PREPARED BY BENESCH.

0 20 40
SCALE, FEET

Sediment Sampling Summary Letter
Hadley Bridge No. H-01-005 Improvements
Bay (Rte. 47) Road Over Fort River
Hadley, Massachusetts

Massachusetts Department of Transportation
Boston, Massachusetts

GEI Consultants

SEDIMENT SAMPLING LOCATIONS

Project 2407720 | January 2025 | Fig. 2

CLINGEN, PAUL B:\Working\MASSDOT\2407720 MassDOT Bay Rd (Rte 47) Over Fort River Bridge Hadley\00_CAD\Figures\Gt\2407720-02.dwg - 12/20/2024

Appendix A Sediment Logs

SEDIMENT SAMPLE INFORMATION

LOCATION:

GROUND SURFACE EL. (ft): NM | **DATE START/END:** 11/21/2024 - 11/21/2024

VERTICAL DATUM: NA | **DRILLING COMPANY:** NA

TOTAL DEPTH (ft): 4.0 | **SAMPLER NAME:** Ben Johnson and Asa Burrows-Crane

LOGGED BY: B. Johnson | **RIG TYPE:** Hand Auger

BORING SED-1

DRILLING INFORMATION

HAMMER TYPE: NA | **CASING I.D./O.D.:** NA / NA | **CORE BARREL TYPE:**

AUGER I.D./O.D.: NA / NA | **DRILL ROD O.D.:** NM | **CORE BARREL I.D./O.D.** NA / NA

DRILLING METHOD: Hand Auger

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 1	12/12		PID: S1 (0-12") = 0.80 ppmv	SILTY SAND WITH GRAVEL	S1 (0-12") SILTY SAND WITH GRAVEL (SM): ~65% fine to coarse sand, ~20% subrounded gravel up to 0.25", ~15% nonplastic fines, brown with orange stains.
	1	S2	1 to 2	12/12		PID: S2 (12-24") = 0.99 ppmv		S2 (12-24") SILTY SAND WITH GRAVEL (SM): ~60% fine to coarse sand, ~20% subrounded gravel up to 0.5", ~20% nonplastic fines, tan to orange.
	2	S3	2 to 3	12/12		PID: S3 (24-36") = 0.96 ppmv		S3 (24-36") Similar to S2 (12-24").
	3	S4	3 to 4	12/12		PID: S4 (36-48") = 0.96 ppmv		S4 (36-48") SILTY SAND WITH GRAVEL (SM): ~55% fine to coarse sand, ~20% subrounded gravel up to 0.5", ~25% nonplastic fines.
	4							END OF BORING 4'.

NOTES: Sediment Sample. Environmental grab and composite samples collected. Soil samples screened in the field for VOCs using a PID with 10.6 eV lamp, calibrated to an isobutylene standard.

PROJECT NAME: MassDOT Bay Road (Rte 47) Over Fort River Bridge Hadley

CITY/STATE: Hadley, MA

GEI PROJECT NUMBER: 2407720

GEI Consultants

GEI WOBURN STD 1-LOCATION-LAYER NAME HADLEY BORING LOGS.GPJ 12/20/24

SEDIMENT SAMPLE INFORMATION

LOCATION:

GROUND SURFACE EL. (ft): NM | **DATE START/END:** 11/21/2024 - 11/21/2024

VERTICAL DATUM: NA | **DRILLING COMPANY:** NA

TOTAL DEPTH (ft): 1.0 | **SAMPLER NAME:** Ben Johnson and Asa Burrows-Crane

LOGGED BY: B. Johnson | **RIG TYPE:** Hand Auger

BORING SED-2

DRILLING INFORMATION

HAMMER TYPE: NA | **CASING I.D./O.D.:** NA / NA | **CORE BARREL TYPE:**

AUGER I.D./O.D.: NA / NA | **DRILL ROD O.D.:** NM | **CORE BARREL I.D./O.D.** NA / NA

DRILLING METHOD: Hand Auger

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	0	S1	0 to 1	12/12		PID: S1 (0-12") = 3.30-4.68 ppmv	Sand	S1 (0-12") WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM): ~60% fine to coarse sand, ~30% subrounded gravel up to 1.5", ~10% nonplastic fines, brown. Contains brick.
	1							END OF BORING 1'.
	2							
	3							
	4							

NOTES: Sediment Sample. Environmental grab and composite samples collected. Soil samples screened in the field for VOCs using a PID with 10.6 eV lamp, calibrated to an isobutylene standard.

PROJECT NAME: MassDOT Bay Road (Rte 47) Over Fort River Bridge Hadley

CITY/STATE: Hadley, MA

GEI PROJECT NUMBER: 2407720

GEI Consultants

GEI WOBURN STD 1-LOCATION-LAYER NAME HADLEY BORING LOGS.GPJ 12/20/24

Appendix B Laboratory Data

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Chris Ragnelli
GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801

RE: Hadley Bridge Rehabilitation - 401WQ (2407720)
ESS Laboratory Work Order Number: 24K1020

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 8:12 pm, Dec 05, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

CTS - Cranston, RI	Grain Size Analysis, Water Content

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

SAMPLE RECEIPT

The following samples were received on November 22, 2024 for the analyses specified on the enclosed Chain of Custody Record.

Samples 24K1020-01 and 24K1020-03 for Metals were oven dried at 60 degrees Celsius prior to digestion and relogged in as samples 24K1020-05 and 24K1020-06. This was done to increase the dry weight of the sample digested which decreases variability of results and lowers the detection limits for samples with high water content.

Low Level VOA vials were frozen by ESS Laboratory on November 22, 2024 at 19:18.

Lab Number	Sample Name	Matrix	Analysis
24K1020-01	2407720-SED-2-COMP	Sediment	2540G, 8082A Cong, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
24K1020-02	2407720-SED-2-GRAB	Sediment	8260D Low
24K1020-03	2407720-SED-1-COMP	Sediment	2540G, 8082A Cong, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
24K1020-04	2407720-SED-1-GRAB	Sediment	8260D Low
24K1020-05	2407720-SED-2-COMP - OVEN DRIED	Sediment	6010D, 7471B
24K1020-06	2407720-SED-1-COMP - OVEN DRIED	Sediment	6010D, 7471B

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

PROJECT NARRATIVE

Volatile Organics Low Level

D4K0471-CCV1 **Calibration required quadratic regression (Q).**
1,4-Dioxane (119% @ 80-120%), Bromoform (111% @ 40-160%), Tertiary-amyl methyl ether (111% @ 80-120%)

D4K0471-CCV1 **Continuing Calibration %Diff/Drift is above control limit (CD+).**
2,2-Dichloropropane (22% @ 20%)

DK42542-BS1 **Blank Spike recovery is above upper control limit (B+).**
2,2-Dichloropropane (136% @ 70-130%)

DK42542-BSD1 **Blank Spike recovery is above upper control limit (B+).**
2,2-Dichloropropane (134% @ 70-130%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010D - ICP
6020B - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260D - VOA
8270E - SVOA
8270E SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 19-2.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40
Percent Solids: 85
Initial Volume: 25.2g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/25/24 11:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (11.6)	---	MADEP-EPH	---	1	JDN	11/26/24 22:42	D4K0476	DK42507
C19-C36 Aliphatics1	ND (11.6)	---	MADEP-EPH	---	1	JDN	11/26/24 22:42	D4K0476	DK42507
C11-C22 Unadjusted Aromatics1	ND (11.6)	---	EPH8270	---	1	IBM	11/26/24 20:45	D4K0487	DK42507
C11-C22 Aromatics1,2	ND (11.8)	---	EPH8270	---		TJ	12/03/24 11:42	---	[CALC]
2-Methylnaphthalene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Acenaphthene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Naphthalene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Phenanthrene	**0.037** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Acenaphthylene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Anthracene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(a)anthracene	**0.010** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(a)pyrene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(b)fluoranthene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(g,h,i)perylene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(k)fluoranthene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Chrysene	**0.011** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Dibenzo(a,h)Anthracene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Fluoranthene	**0.014** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Fluorene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Indeno(1,2,3-cd)Pyrene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Pyrene	**0.029** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*86 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*100 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*98 %*		*40-140*
Surrogate: O-Terphenyl	*111 %*		*40-140*

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40
Percent Solids: 85

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**15** (1)	---	2540G	---	1	CCP	11/22/24 22:30	%	DK42233
Total Organic Carbon (Average)	**1600** (500)	---	LK	---	1	CCP	12/04/24 14:24	mg/kg	[CALC]

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Grain Size	**See Attached** (N/A)	---		---				%	
Water Content	**See Attached** (N/A)	---		---				%	

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40
Percent Solids: 85
Initial Volume: 30g
Final Volume: 2ml
Extraction Method: 3540C

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 12/2/24 11:35

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#18	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#28	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#44	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#52	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#66	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#101	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#105	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#118	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#128	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#138	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#153	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#170	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#180	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#187	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#195	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#206	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#209	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*78 %*		*30-150*

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-GRAB
Date Sampled: 11/21/24 14:41
Percent Solids: 92
Initial Volume: 4.7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1,1-Trichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1,2,2-Tetrachloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1,2-Trichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1-Dichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1-Dichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1-Dichloropropene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,3-Trichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,3-Trichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,4-Trichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,4-Trimethylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dibromo-3-Chloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dibromoethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,3,5-Trimethylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,3-Dichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,3-Dichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,4-Dichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,4-Dioxane	ND (0.116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2,2-Dichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2-Butanone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2-Chlorotoluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2-Hexanone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
4-Chlorotoluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
4-Isopropyltoluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-GRAB
Date Sampled: 11/21/24 14:41
Percent Solids: 92
Initial Volume: 4.7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
4-Methyl-2-Pentanone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Acetone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Benzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromochloromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromodichloromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromoform	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromomethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Carbon Disulfide	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Carbon Tetrachloride	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chloroethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chloroform	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chloromethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
cis-1,2-Dichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
cis-1,3-Dichloropropene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Dibromochloromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Dibromomethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Dichlorodifluoromethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Diethyl Ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Di-isopropyl ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Ethyl tertiary-butyl ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Ethylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Hexachlorobutadiene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Isopropylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Methyl tert-Butyl Ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Methylene Chloride	ND (0.0290)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-GRAB
Date Sampled: 11/21/24 14:41
Percent Solids: 92
Initial Volume: 4.7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Naphthalene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
n-Butylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
n-Propylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
sec-Butylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Styrene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
tert-Butylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Tertiary-amyl methyl ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Tetrachloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Tetrahydrofuran	ND (0.0232)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Toluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
trans-1,2-Dichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
trans-1,3-Dichloropropene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Trichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Trichlorofluoromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Vinyl Chloride	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Xylene O	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Xylene P,M	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Xylenes (Total)	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*116 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*87 %*		*70-130*
Surrogate: Dibromofluoromethane	*109 %*		*70-130*
Surrogate: Toluene-d8	*97 %*		*70-130*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50
Percent Solids: 80
Initial Volume: 24.4g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/25/24 11:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (12.8)	---	MADEP-EPH	---	1	JDN	11/26/24 23:16	D4K0476	DK42507
C19-C36 Aliphatics1	ND (12.8)	---	MADEP-EPH	---	1	JDN	11/26/24 23:16	D4K0476	DK42507
C11-C22 Unadjusted Aromatics1	ND (12.8)	---	EPH8270	---	1	IBM	11/26/24 21:25	D4K0487	DK42507
C11-C22 Aromatics1,2	ND (13.0)	---	EPH8270	---		TJ	12/03/24 12:10	---	[CALC]
2-Methylnaphthalene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Acenaphthene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Naphthalene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Phenanthrene	**0.017** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Acenaphthylene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Anthracene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(a)anthracene	**0.025** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(a)pyrene	**0.028** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(b)fluoranthene	**0.022** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(g,h,i)perylene	**0.019** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(k)fluoranthene	**0.026** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Chrysene	**0.027** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Dibenzo(a,h)Anthracene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Fluoranthene	**0.050** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Fluorene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Indeno(1,2,3-cd)Pyrene	**0.015** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Pyrene	**0.043** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*83 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*99 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*96 %*		*40-140*
Surrogate: O-Terphenyl	*103 %*		*40-140*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50
Percent Solids: 80

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**20** (1)	---	2540G	---	1	CCP	11/22/24 22:30	%	DK42233
Total Organic Carbon (Average)	**4560** (500)	---	LK	---	1	CCP	12/04/24 13:01	mg/kg	[CALC]

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Grain Size	**See Attached** (N/A)	---		---				%	
Water Content	**See Attached** (N/A)	---		---				%	

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50
Percent Solids: 80
Initial Volume: 30.6g
Final Volume: 2ml
Extraction Method: 3540C

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 12/2/24 11:35

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#18	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#28	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#44	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#52	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#66	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#101	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#105	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#118	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#128	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#138	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#153	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#170	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#180	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#187	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#195	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#206	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#209	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*78 %*		*30-150*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-GRAB
Date Sampled: 11/21/24 15:51
Percent Solids: 83
Initial Volume: 7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1,1-Trichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1,2,2-Tetrachloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1,2-Trichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1-Dichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1-Dichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1-Dichloropropene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,3-Trichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,3-Trichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,4-Trichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,4-Trimethylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dibromo-3-Chloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dibromoethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,3,5-Trimethylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,3-Dichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,3-Dichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,4-Dichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,4-Dioxane	ND (0.0861)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2,2-Dichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2-Butanone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2-Chlorotoluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2-Hexanone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
4-Chlorotoluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
4-Isopropyltoluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-GRAB
Date Sampled: 11/21/24 15:51
Percent Solids: 83
Initial Volume: 7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
4-Methyl-2-Pentanone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Acetone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Benzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromochloromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromodichloromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromoform	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromomethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Carbon Disulfide	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Carbon Tetrachloride	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chloroethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chloroform	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chloromethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
cis-1,2-Dichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
cis-1,3-Dichloropropene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Dibromochloromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Dibromomethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Dichlorodifluoromethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Diethyl Ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Di-isopropyl ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Ethyl tertiary-butyl ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Ethylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Hexachlorobutadiene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Isopropylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Methyl tert-Butyl Ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Methylene Chloride	ND (0.0215)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-GRAB
Date Sampled: 11/21/24 15:51
Percent Solids: 83
Initial Volume: 7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Naphthalene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
n-Butylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
n-Propylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
sec-Butylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Styrene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
tert-Butylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Tertiary-amyl methyl ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Tetrachloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Tetrahydrofuran	ND (0.0172)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Toluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
trans-1,2-Dichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
trans-1,3-Dichloropropene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Trichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Trichlorofluoromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Vinyl Chloride	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Xylene O	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Xylene P,M	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Xylenes (Total)	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*111 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*83 %*		*70-130*
Surrogate: Dibromofluoromethane	*108 %*		*70-130*
Surrogate: Toluene-d8	*99 %*		*70-130*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP - OVEN DRIED
Date Sampled: 11/21/24 14:40
Percent Solids: 100

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-05
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	IV / FV	Batch
Arsenic	**5.69** (0.39)	---	6010D	---	1	KJB	12/02/24 12:06	5.14 100	DK42713
Cadmium	ND (0.10)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Chromium	**7.46** (0.39)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Copper	**5.95** (0.97)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Lead	**3.94** (1.95)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Mercury	ND (0.010)	---	7471B	---	1	AFV	11/26/24 21:02	2.04 40	DK42622
Nickel	**5.04** (0.97)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Zinc	**20.4** (0.97)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP - OVEN DRIED
Date Sampled: 11/21/24 15:50
Percent Solids: 100

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-06
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	IV / FV	Batch
Arsenic	**3.96** (0.38)	---	6010D	---	1	KJB	12/02/24 12:08	5.21 100	DK42713
Cadmium	ND (0.10)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Chromium	**6.32** (0.38)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Copper	**7.65** (0.96)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Lead	**6.55** (1.92)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Mercury	ND (0.010)	---	7471B	---	1	AFV	11/26/24 21:04	2.05 40	DK42622
Nickel	**4.58** (0.96)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Zinc	**19.2** (0.96)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713

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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch DK42622 - 7471B										
Blank										
Mercury	ND	0.032	mg/kg wet							
LCS										
Mercury	23.9	3.09	mg/kg wet	24.90		96	80-120			
LCS Dup										
Mercury	23.5	2.96	mg/kg wet	24.90		94	80-120	2	30	
Batch DK42713 - 3050B										
Blank										
Arsenic	ND	0.97	mg/kg wet							
Cadmium	ND	0.24	mg/kg wet							
Chromium	ND	0.97	mg/kg wet							
Copper	ND	2.42	mg/kg wet							
Lead	ND	4.83	mg/kg wet							
Nickel	ND	2.42	mg/kg wet							
Zinc	ND	2.42	mg/kg wet							
LCS										
Arsenic	125	3.28	mg/kg wet	280.0		45	32-110			
Cadmium	87.0	0.82	mg/kg wet	210.0		41	33-110			
Chromium	126	3.28	mg/kg wet	225.0		56	50-110			
Copper	128	8.20	mg/kg wet	290.0		44	33-110			
Lead	149	16.4	mg/kg wet	350.0		43	31-110			
Nickel	52.9	8.20	mg/kg wet	95.00		56	48-111			
Zinc	212	8.20	mg/kg wet	500.0		42	30-110			
LCS Dup										
Arsenic	106	2.99	mg/kg wet	280.0		38	32-110	17	30	
Cadmium	76.4	0.75	mg/kg wet	210.0		36	33-110	13	30	
Chromium	120	2.99	mg/kg wet	225.0		53	50-110	5	30	
Copper	112	7.46	mg/kg wet	290.0		39	33-110	13	30	
Lead	130	14.9	mg/kg wet	350.0		37	31-110	14	30	
Nickel	51.0	7.46	mg/kg wet	95.00		54	48-111	4	30	
Zinc	188	7.46	mg/kg wet	500.0		38	30-110	12	30	
Volatile Organics Low Level										
Batch DK42542 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							

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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0500	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0500	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0500	mg/kg wet							
Acetone	ND	0.0500	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0050	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0250	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0200	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0516*		mg/kg wet	*0.05000*		*103*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0432*		mg/kg wet	*0.05000*		*86*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0514*		mg/kg wet	*0.05000*		*103*	*70-130*			
Surrogate: Toluene-d8	*0.0489*		mg/kg wet	*0.05000*		*98*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	0.0605	0.0050	mg/kg wet	0.05000		121	70-130			
1,1,1-Trichloroethane	0.0561	0.0050	mg/kg wet	0.05000		112	70-130			
1,1,2,2-Tetrachloroethane	0.0528	0.0050	mg/kg wet	0.05000		106	40-160			
1,1,2-Trichloroethane	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
1,1-Dichloroethane	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
1,1-Dichloroethene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			
1,1-Dichloropropene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
1,2,3-Trichlorobenzene	0.0586	0.0050	mg/kg wet	0.05000		117	70-130			
1,2,3-Trichloropropane	0.0508	0.0050	mg/kg wet	0.05000		102	70-130			
1,2,4-Trichlorobenzene	0.0607	0.0050	mg/kg wet	0.05000		121	70-130			
1,2,4-Trimethylbenzene	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
1,2-Dibromo-3-Chloropropane	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
1,2-Dibromoethane	0.0561	0.0050	mg/kg wet	0.05000		112	70-130			
1,2-Dichlorobenzene	0.0552	0.0050	mg/kg wet	0.05000		110	70-130			
1,2-Dichloroethane	0.0489	0.0050	mg/kg wet	0.05000		98	70-130			
1,2-Dichloropropane	0.0515	0.0050	mg/kg wet	0.05000		103	70-130			
1,3,5-Trimethylbenzene	0.0567	0.0050	mg/kg wet	0.05000		113	70-130			
1,3-Dichlorobenzene	0.0555	0.0050	mg/kg wet	0.05000		111	70-130			

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
1,3-Dichloropropane	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
1,4-Dichlorobenzene	0.0543	0.0050	mg/kg wet	0.05000		109	70-130			
1,4-Dioxane	1.16	0.100	mg/kg wet	1.000		116	70-130			
2,2-Dichloropropane	0.0678	0.0050	mg/kg wet	0.05000		136	70-130			B+
2-Butanone	0.268	0.0500	mg/kg wet	0.2500		107	40-160			
2-Chlorotoluene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130			
2-Hexanone	0.286	0.0500	mg/kg wet	0.2500		114	40-160			
4-Chlorotoluene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
4-Isopropyltoluene	0.0548	0.0050	mg/kg wet	0.05000		110	70-130			
4-Methyl-2-Pentanone	0.257	0.0500	mg/kg wet	0.2500		103	40-160			
Acetone	0.286	0.0500	mg/kg wet	0.2500		114	40-160			
Benzene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
Bromobenzene	0.0558	0.0050	mg/kg wet	0.05000		112	70-130			
Bromochloromethane	0.0523	0.0050	mg/kg wet	0.05000		105	70-130			
Bromodichloromethane	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
Bromoform	0.0597	0.0050	mg/kg wet	0.05000		119	40-160			
Bromomethane	0.0540	0.0100	mg/kg wet	0.05000		108	40-160			
Carbon Disulfide	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
Carbon Tetrachloride	0.0593	0.0050	mg/kg wet	0.05000		119	70-130			
Chlorobenzene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130			
Chloroethane	0.0573	0.0100	mg/kg wet	0.05000		115	40-160			
Chloroform	0.0499	0.0050	mg/kg wet	0.05000		100	70-130			
Chloromethane	0.0415	0.0100	mg/kg wet	0.05000		83	40-160			
cis-1,2-Dichloroethene	0.0515	0.0050	mg/kg wet	0.05000		103	70-130			
cis-1,3-Dichloropropene	0.0571	0.0050	mg/kg wet	0.05000		114	40-160			
Dibromochloromethane	0.0601	0.0050	mg/kg wet	0.05000		120	40-160			
Dibromomethane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130			
Dichlorodifluoromethane	0.0336	0.0100	mg/kg wet	0.05000		67	40-160			
Diethyl Ether	0.0524	0.0050	mg/kg wet	0.05000		105	70-130			
Di-isopropyl ether	0.0525	0.0050	mg/kg wet	0.05000		105	70-130			
Ethyl tertiary-butyl ether	0.0637	0.0050	mg/kg wet	0.05000		127	70-130			
Ethylbenzene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130			
Hexachlorobutadiene	0.0578	0.0050	mg/kg wet	0.05000		116	40-160			
Isopropylbenzene	0.0623	0.0050	mg/kg wet	0.05000		125	70-130			
Methyl tert-Butyl Ether	0.0558	0.0050	mg/kg wet	0.05000		112	70-130			
Methylene Chloride	0.0501	0.0250	mg/kg wet	0.05000		100	70-130			
Naphthalene	0.0581	0.0050	mg/kg wet	0.05000		116	40-160			
n-Butylbenzene	0.0556	0.0050	mg/kg wet	0.05000		111	70-130			
n-Propylbenzene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130			
sec-Butylbenzene	0.0531	0.0050	mg/kg wet	0.05000		106	70-130			
Styrene	0.0546	0.0050	mg/kg wet	0.05000		109	40-160			
tert-Butylbenzene	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
Tertiary-amyl methyl ether	0.0615	0.0050	mg/kg wet	0.05000		123	70-130			
Tetrachloroethene	0.0541	0.0050	mg/kg wet	0.05000		108	70-130			

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Tetrahydrofuran	0.0518	0.0200	mg/kg wet	0.05000		104	70-130			
Toluene	0.0518	0.0050	mg/kg wet	0.05000		104	70-130			
trans-1,2-Dichloroethene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
trans-1,3-Dichloropropene	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
Trichloroethene	0.0510	0.0050	mg/kg wet	0.05000		102	70-130			
Trichlorofluoromethane	0.0489	0.0050	mg/kg wet	0.05000		98	40-160			
Vinyl Chloride	0.0525	0.0100	mg/kg wet	0.05000		105	70-130			
Xylene O	0.0551	0.0050	mg/kg wet	0.05000		110	70-130			
Xylene P,M	0.111	0.0100	mg/kg wet	0.1000		111	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0493*		mg/kg wet	*0.05000*		*99*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0468*		mg/kg wet	*0.05000*		*94*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0503*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: Toluene-d8	*0.0500*		mg/kg wet	*0.05000*		*100*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0596	0.0050	mg/kg wet	0.05000		119	70-130	1	20	
1,1,1-Trichloroethane	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	0.8	20	
1,1,2,2-Tetrachloroethane	0.0528	0.0050	mg/kg wet	0.05000		106	40-160	0.1	20	
1,1,2-Trichloroethane	0.0501	0.0050	mg/kg wet	0.05000		100	70-130	0.9	20	
1,1-Dichloroethane	0.0508	0.0050	mg/kg wet	0.05000		102	70-130	2	20	
1,1-Dichloroethene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130	0.6	20	
1,1-Dichloropropene	0.0500	0.0050	mg/kg wet	0.05000		100	70-130	0.9	20	
1,2,3-Trichlorobenzene	0.0571	0.0050	mg/kg wet	0.05000		114	70-130	2	20	
1,2,3-Trichloropropane	0.0510	0.0050	mg/kg wet	0.05000		102	70-130	0.3	20	
1,2,4-Trichlorobenzene	0.0587	0.0050	mg/kg wet	0.05000		117	70-130	3	20	
1,2,4-Trimethylbenzene	0.0548	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,2-Dibromo-3-Chloropropane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	3	20	
1,2-Dibromoethane	0.0555	0.0050	mg/kg wet	0.05000		111	70-130	1	20	
1,2-Dichlorobenzene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	4	20	
1,2-Dichloroethane	0.0483	0.0050	mg/kg wet	0.05000		97	70-130	1	20	
1,2-Dichloropropane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	2	20	
1,3,5-Trimethylbenzene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,3-Dichlorobenzene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130	3	20	
1,3-Dichloropropane	0.0515	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
1,4-Dichlorobenzene	0.0528	0.0050	mg/kg wet	0.05000		106	70-130	3	20	
1,4-Dioxane	1.24	0.100	mg/kg wet	1.000		124	70-130	6	20	
2,2-Dichloropropane	0.0670	0.0050	mg/kg wet	0.05000		134	70-130	1	20	B+
2-Butanone	0.268	0.0500	mg/kg wet	0.2500		107	40-160	0.06	20	
2-Chlorotoluene	0.0522	0.0050	mg/kg wet	0.05000		104	70-130	4	20	
2-Hexanone	0.289	0.0500	mg/kg wet	0.2500		116	40-160	1	20	
4-Chlorotoluene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	3	20	
4-Isopropyltoluene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	3	20	
4-Methyl-2-Pentanone	0.266	0.0500	mg/kg wet	0.2500		107	40-160	4	20	
Acetone	0.278	0.0500	mg/kg wet	0.2500		111	40-160	3	20	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Benzene	0.0498	0.0050	mg/kg wet	0.05000		100	70-130	1	20	
Bromobenzene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130	2	20	
Bromochloromethane	0.0517	0.0050	mg/kg wet	0.05000		103	70-130	1	20	
Bromodichloromethane	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Bromoform	0.0595	0.0050	mg/kg wet	0.05000		119	40-160	0.3	20	
Bromomethane	0.0523	0.0100	mg/kg wet	0.05000		105	40-160	3	20	
Carbon Disulfide	0.0521	0.0050	mg/kg wet	0.05000		104	70-130	1	20	
Carbon Tetrachloride	0.0586	0.0050	mg/kg wet	0.05000		117	70-130	1	20	
Chlorobenzene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Chloroethane	0.0547	0.0100	mg/kg wet	0.05000		109	40-160	5	20	
Chloroform	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
Chloromethane	0.0396	0.0100	mg/kg wet	0.05000		79	40-160	5	20	
cis-1,2-Dichloroethene	0.0501	0.0050	mg/kg wet	0.05000		100	70-130	3	20	
cis-1,3-Dichloropropene	0.0554	0.0050	mg/kg wet	0.05000		111	40-160	3	20	
Dibromochloromethane	0.0587	0.0050	mg/kg wet	0.05000		117	40-160	2	20	
Dibromomethane	0.0497	0.0050	mg/kg wet	0.05000		99	70-130	1	20	
Dichlorodifluoromethane	0.0317	0.0100	mg/kg wet	0.05000		63	40-160	6	20	
Diethyl Ether	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
Di-isopropyl ether	0.0507	0.0050	mg/kg wet	0.05000		101	70-130	3	20	
Ethyl tertiary-butyl ether	0.0627	0.0050	mg/kg wet	0.05000		125	70-130	1	20	
Ethylbenzene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Hexachlorobutadiene	0.0565	0.0050	mg/kg wet	0.05000		113	40-160	2	20	
Isopropylbenzene	0.0612	0.0050	mg/kg wet	0.05000		122	70-130	2	20	
Methyl tert-Butyl Ether	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	2	20	
Methylene Chloride	0.0491	0.0250	mg/kg wet	0.05000		98	70-130	2	20	
Naphthalene	0.0587	0.0050	mg/kg wet	0.05000		117	40-160	1	20	
n-Butylbenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	3	20	
n-Propylbenzene	0.0534	0.0050	mg/kg wet	0.05000		107	70-130	2	20	
sec-Butylbenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	3	20	
Styrene	0.0534	0.0050	mg/kg wet	0.05000		107	40-160	2	20	
tert-Butylbenzene	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
Tertiary-amyl methyl ether	0.0606	0.0050	mg/kg wet	0.05000		121	70-130	2	20	
Tetrachloroethene	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	5	20	
Tetrahydrofuran	0.0544	0.0200	mg/kg wet	0.05000		109	70-130	5	20	
Toluene	0.0508	0.0050	mg/kg wet	0.05000		102	70-130	2	20	
trans-1,2-Dichloroethene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	0.9	20	
trans-1,3-Dichloropropene	0.0483	0.0050	mg/kg wet	0.05000		97	70-130	2	20	
Trichloroethene	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	1	20	
Trichlorofluoromethane	0.0480	0.0050	mg/kg wet	0.05000		96	40-160	2	20	
Vinyl Chloride	0.0511	0.0100	mg/kg wet	0.05000		102	70-130	3	20	
Xylene O	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	2	20	
Xylene P,M	0.110	0.0100	mg/kg wet	0.1000		110	70-130	1	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0493*		mg/kg wet	*0.05000*		*99*	*70-130*			

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Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Surrogate: 4-Bromofluorobenzene	*0.0474*		mg/kg wet	*0.05000*		*95*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0506*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: Toluene-d8	*0.0496*		mg/kg wet	*0.05000*		*99*	*70-130*			
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK42507 - 3546										
Blank										
C19-C36 Aliphatics1	ND	10.0	mg/kg wet							
C9-C18 Aliphatics1	ND	10.0	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.79*		mg/kg wet	*2.000*		*90*	*40-140*			
Blank										
C11-C22 Unadjusted Aromatics1	ND	10.0	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*1.99*		mg/kg wet	*2.000*		*99*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.85*		mg/kg wet	*2.000*		*92*	*40-140*			
Surrogate: O-Terphenyl	*1.95*		mg/kg wet	*2.000*		*97*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.008	mg/kg wet							
Acenaphthene	ND	0.008	mg/kg wet							
Acenaphthylene	ND	0.008	mg/kg wet							
Anthracene	ND	0.008	mg/kg wet							
Benzo(a)anthracene	ND	0.008	mg/kg wet							
Benzo(a)pyrene	ND	0.008	mg/kg wet							
Benzo(b)fluoranthene	ND	0.008	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.008	mg/kg wet							
Benzo(k)fluoranthene	ND	0.008	mg/kg wet							
Chrysene	ND	0.008	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.008	mg/kg wet							
Fluoranthene	ND	0.008	mg/kg wet							
Fluorene	ND	0.008	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.008	mg/kg wet							
Naphthalene	0.008	0.008	mg/kg wet							
Phenanthrene	ND	0.008	mg/kg wet							
Pyrene	ND	0.008	mg/kg wet							
LCS										
C19-C36 Aliphatics1	15.6	10.0	mg/kg wet	16.00		98	40-140			
C9-C18 Aliphatics1	10.5	10.0	mg/kg wet	12.00		87	40-140			
Surrogate: 1-Chlorooctadecane	*1.84*		mg/kg wet	*2.000*		*92*	*40-140*			
LCS										
C11-C22 Unadjusted Aromatics1	30.3	10.0	mg/kg wet	34.00		89	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK42507 - 3546										
Surrogate: 2-Bromonaphthalene	*2.03*		mg/kg wet	*2.000*		*101*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.88*		mg/kg wet	*2.000*		*94*	*40-140*			
Surrogate: O-Terphenyl	*2.27*		mg/kg wet	*2.000*		*113*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	1.64	0.040	mg/kg wet	2.000		82	40-140			
Acenaphthene	1.71	0.040	mg/kg wet	2.000		86	40-140			
Acenaphthylene	1.98	0.040	mg/kg wet	2.000		99	40-140			
Anthracene	1.79	0.040	mg/kg wet	2.000		90	40-140			
Benzo(a)anthracene	1.88	0.040	mg/kg wet	2.000		94	40-140			
Benzo(a)pyrene	1.95	0.040	mg/kg wet	2.000		98	40-140			
Benzo(b)fluoranthene	2.16	0.040	mg/kg wet	2.000		108	40-140			
Benzo(g,h,i)perylene	1.85	0.040	mg/kg wet	2.000		92	40-140			
Benzo(k)fluoranthene	1.98	0.040	mg/kg wet	2.000		99	40-140			
Chrysene	1.92	0.040	mg/kg wet	2.000		96	40-140			
Dibenzo(a,h)Anthracene	1.87	0.040	mg/kg wet	2.000		94	40-140			
Fluoranthene	1.80	0.040	mg/kg wet	2.000		90	40-140			
Fluorene	1.86	0.040	mg/kg wet	2.000		93	40-140			
Indeno(1,2,3-cd)Pyrene	1.83	0.040	mg/kg wet	2.000		92	40-140			
Naphthalene	1.44	0.040	mg/kg wet	2.000		72	40-140			
Phenanthrene	1.82	0.040	mg/kg wet	2.000		91	40-140			
Pyrene	1.85	0.040	mg/kg wet	2.000		93	40-140			
LCS Dup										
C19-C36 Aliphatics1	15.2	10.0	mg/kg wet	16.00		95	40-140	3	25	
C9-C18 Aliphatics1	10.3	10.0	mg/kg wet	12.00		86	40-140	2	25	
Surrogate: 1-Chlorooctadecane	*1.80*		mg/kg wet	*2.000*		*90*	*40-140*			
LCS Dup										
C11-C22 Unadjusted Aromatics1	28.8	10.0	mg/kg wet	34.00		85	40-140	5	25	
Surrogate: 2-Bromonaphthalene	*2.01*		mg/kg wet	*2.000*		*100*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.90*		mg/kg wet	*2.000*		*95*	*40-140*			
Surrogate: O-Terphenyl	*2.14*		mg/kg wet	*2.000*		*107*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	1.62	0.040	mg/kg wet	2.000		81	40-140	1	30	
Acenaphthene	1.68	0.040	mg/kg wet	2.000		84	40-140	2	30	
Acenaphthylene	1.93	0.040	mg/kg wet	2.000		96	40-140	3	30	
Anthracene	1.75	0.040	mg/kg wet	2.000		88	40-140	2	30	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK42507 - 3546										
Benzo(a)anthracene	1.82	0.040	mg/kg wet	2.000		91	40-140	4	30	
Benzo(a)pyrene	1.86	0.040	mg/kg wet	2.000		93	40-140	5	30	
Benzo(b)fluoranthene	2.05	0.040	mg/kg wet	2.000		102	40-140	5	30	
Benzo(g,h,i)perylene	1.71	0.040	mg/kg wet	2.000		85	40-140	8	30	
Benzo(k)fluoranthene	1.97	0.040	mg/kg wet	2.000		98	40-140	1	30	
Chrysene	1.86	0.040	mg/kg wet	2.000		93	40-140	4	30	
Dibenzo(a,h)Anthracene	1.77	0.040	mg/kg wet	2.000		89	40-140	5	30	
Fluoranthene	1.74	0.040	mg/kg wet	2.000		87	40-140	3	30	
Fluorene	1.80	0.040	mg/kg wet	2.000		90	40-140	4	30	
Indeno(1,2,3-cd)Pyrene	1.73	0.040	mg/kg wet	2.000		87	40-140	6	30	
Naphthalene	1.42	0.040	mg/kg wet	2.000		71	40-140	1	30	
Phenanthrene	1.77	0.040	mg/kg wet	2.000		88	40-140	3	30	
Pyrene	1.84	0.040	mg/kg wet	2.000		92	40-140	0.5	30	
Classical Chemistry										
Batch DL40242 - General Preparation										
Blank										
Total Organic Carbon (1)	ND	500	mg/kg							
Total Organic Carbon (2)	ND	500	mg/kg							
LCS										
Total Organic Carbon (1)	8970	500	mg/kg	10010		90	80-120			
Total Organic Carbon (2)	9130	500	mg/kg	10010		91	80-120			
LCS Dup										
Total Organic Carbon (1)	9200	500	mg/kg	10010		92	80-120	3	25	
Total Organic Carbon (2)	8750	500	mg/kg	10010		87	80-120	4	25	
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
Blank										
BZ#101	ND	0.00027	mg/kg wet							
BZ#101 [2C]	ND	0.00027	mg/kg wet							
BZ#105	ND	0.00027	mg/kg wet							
BZ#105 [2C]	ND	0.00027	mg/kg wet							
BZ#118	ND	0.00027	mg/kg wet							
BZ#118 [2C]	ND	0.00027	mg/kg wet							
BZ#128	ND	0.00027	mg/kg wet							
BZ#128 [2C]	ND	0.00027	mg/kg wet							
BZ#138	ND	0.00027	mg/kg wet							
BZ#138 [2C]	ND	0.00027	mg/kg wet							
BZ#153	ND	0.00027	mg/kg wet							
BZ#153 [2C]	ND	0.00027	mg/kg wet							
BZ#170	ND	0.00027	mg/kg wet							

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
BZ#170 [2C]	ND	0.00027	mg/kg wet							
BZ#18	ND	0.00027	mg/kg wet							
BZ#18 [2C]	ND	0.00027	mg/kg wet							
BZ#180	ND	0.00027	mg/kg wet							
BZ#180 [2C]	ND	0.00027	mg/kg wet							
BZ#187	ND	0.00027	mg/kg wet							
BZ#187 [2C]	ND	0.00027	mg/kg wet							
BZ#195	ND	0.00027	mg/kg wet							
BZ#195 [2C]	ND	0.00027	mg/kg wet							
BZ#206	ND	0.00027	mg/kg wet							
BZ#206 [2C]	ND	0.00027	mg/kg wet							
BZ#209	ND	0.00027	mg/kg wet							
BZ#209 [2C]	ND	0.00027	mg/kg wet							
BZ#28	ND	0.00027	mg/kg wet							
BZ#28 [2C]	ND	0.00027	mg/kg wet							
BZ#44	ND	0.00027	mg/kg wet							
BZ#44 [2C]	ND	0.00027	mg/kg wet							
BZ#52	ND	0.00027	mg/kg wet							
BZ#52 [2C]	ND	0.00027	mg/kg wet							
BZ#66	ND	0.00027	mg/kg wet							
BZ#66 [2C]	ND	0.00027	mg/kg wet							
BZ#8	ND	0.00027	mg/kg wet							
BZ#8 [2C]	ND	0.00027	mg/kg wet							
Surrogate: Tetrachloro-m-xylene	*0.00239*		mg/kg wet	*0.003333*		*72*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00242*		mg/kg wet	*0.003333*		*73*	*30-150*			
LCS										
BZ#101	0.00233	0.00027	mg/kg wet	0.003333		70	40-140			
BZ#101 [2C]	0.00241	0.00027	mg/kg wet	0.003333		72	40-140			
BZ#105	0.00296	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#105 [2C]	0.00270	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#118	0.00270	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#118 [2C]	0.00245	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#128	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#128 [2C]	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#138	0.00269	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#138 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#153	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#153 [2C]	0.00247	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#170	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#170 [2C]	0.00260	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#18	0.00291	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#18 [2C]	0.00288	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#180	0.00260	0.00027	mg/kg wet	0.003333		78	40-140			

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
BZ#180 [2C]	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#187	0.00244	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#187 [2C]	0.00244	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#195	0.00254	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#195 [2C]	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#206	0.00248	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#206 [2C]	0.00252	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#209	0.00239	0.00027	mg/kg wet	0.003333		72	40-140			
BZ#209 [2C]	0.00243	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#28	0.00254	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#28 [2C]	0.00279	0.00027	mg/kg wet	0.003333		84	40-140			
BZ#44	0.00246	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#44 [2C]	0.00244	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#52	0.00289	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#52 [2C]	0.00292	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#66	0.00257	0.00027	mg/kg wet	0.003333		77	40-140			
BZ#66 [2C]	0.00246	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#8	0.00250	0.00027	mg/kg wet	0.003333		75	40-140			
BZ#8 [2C]	0.00280	0.00027	mg/kg wet	0.003333		84	40-140			
Surrogate: Tetrachloro-m-xylene	*0.00247*		mg/kg wet	*0.003333*		*74*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00247*		mg/kg wet	*0.003333*		*74*	*30-150*			
LCS Dup										
BZ#101	0.00228	0.00027	mg/kg wet	0.003333		69	40-140	2	30	
BZ#101 [2C]	0.00236	0.00027	mg/kg wet	0.003333		71	40-140	2	30	
BZ#105	0.00273	0.00027	mg/kg wet	0.003333		82	40-140	8	30	
BZ#105 [2C]	0.00256	0.00027	mg/kg wet	0.003333		77	40-140	5	30	
BZ#118	0.00245	0.00027	mg/kg wet	0.003333		74	40-140	9	30	
BZ#118 [2C]	0.00239	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#128	0.00259	0.00027	mg/kg wet	0.003333		78	40-140	0.01	30	
BZ#128 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#138	0.00258	0.00027	mg/kg wet	0.003333		77	40-140	4	30	
BZ#138 [2C]	0.00249	0.00027	mg/kg wet	0.003333		75	40-140	2	30	
BZ#153	0.00242	0.00027	mg/kg wet	0.003333		73	40-140	8	30	
BZ#153 [2C]	0.00243	0.00027	mg/kg wet	0.003333		73	40-140	2	30	
BZ#170	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#170 [2C]	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#18	0.00283	0.00027	mg/kg wet	0.003333		85	40-140	3	30	
BZ#18 [2C]	0.00280	0.00027	mg/kg wet	0.003333		84	40-140	3	30	
BZ#180	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#180 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#187	0.00237	0.00027	mg/kg wet	0.003333		71	40-140	3	30	
BZ#187 [2C]	0.00239	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#195	0.00246	0.00027	mg/kg wet	0.003333		74	40-140	3	30	

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
BZ#195 [2C]	0.00249	0.00027	mg/kg wet	0.003333		75	40-140	4	30	
BZ#206	0.00239	0.00027	mg/kg wet	0.003333		72	40-140	3	30	
BZ#206 [2C]	0.00242	0.00027	mg/kg wet	0.003333		73	40-140	4	30	
BZ#209	0.00233	0.00027	mg/kg wet	0.003333		70	40-140	2	30	
BZ#209 [2C]	0.00238	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#28	0.00250	0.00027	mg/kg wet	0.003333		75	40-140	2	30	
BZ#28 [2C]	0.00277	0.00027	mg/kg wet	0.003333		83	40-140	0.6	30	
BZ#44	0.00240	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#44 [2C]	0.00240	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#52	0.00282	0.00027	mg/kg wet	0.003333		85	40-140	2	30	
BZ#52 [2C]	0.00288	0.00027	mg/kg wet	0.003333		86	40-140	1	30	
BZ#66	0.00256	0.00027	mg/kg wet	0.003333		77	40-140	0.2	30	
BZ#66 [2C]	0.00244	0.00027	mg/kg wet	0.003333		73	40-140	0.8	30	
BZ#8	0.00244	0.00027	mg/kg wet	0.003333		73	40-140	3	30	
BZ#8 [2C]	0.00274	0.00027	mg/kg wet	0.003333		82	40-140	2	30	
Surrogate: Tetrachloro-m-xylene	*0.00232*		mg/kg wet	*0.003333*		*70*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00235*		mg/kg wet	*0.003333*		*71*	*30-150*			

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Notes and Definitions

Z-08	See Attached
U	Analyte included in the analysis, but not detected
Q	Calibration required quadratic regression (Q).
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
B+	Blank Spike recovery is above upper control limit (B+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Thielsch
DIVISION OF THE RISE GROUP

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
cts.thielsch.com
Let's Build a Solid Foundation

Client Information:		Project Information:	
ESS Laboratory		**24K1020**	
Cranston, RI		**PO# 2407720**	
401-467-7181		Project Number:	24K1020
Project Contact:	ESS Project Management	Summary Page:	1 of 1
Collected By:	Client	Report Date:	12/3/2024

LABORATORY TESTING DATA SHEET, Report No.: 7424-L-276

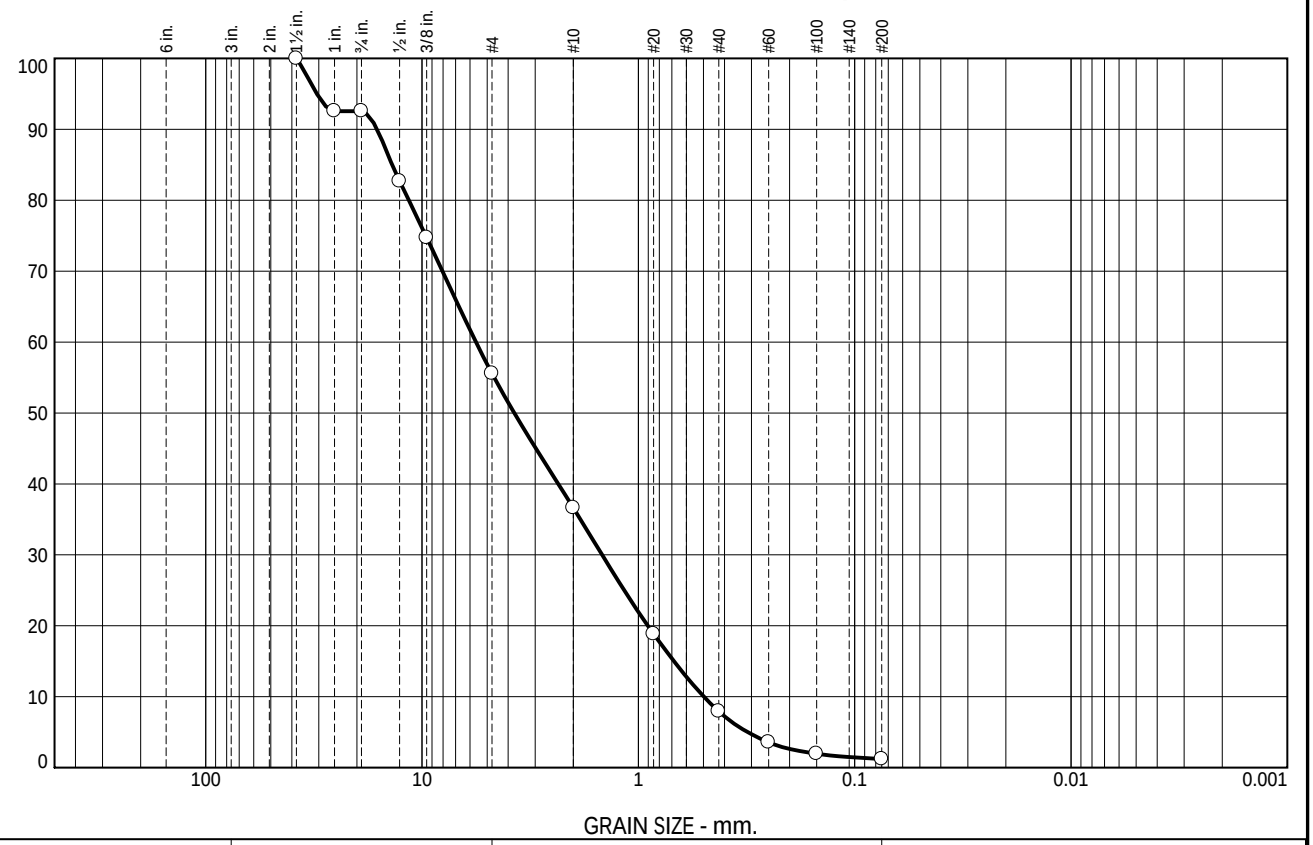
Material Source	Sample ID	Depth (ft)	Laboratory No.	Identification Tests									Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Rcvd Moisture Content %	LL %	PL %	OD LL	Gravel %	Sand %	Fines %	Org. %	pH	g_d MAX (pcf) W_{opt} (%)	g_d MAX (pcf) W_{opt} (%) (Corr.)	Dry unit wt. (pcf)	Test Moisture Content %	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318			D6913			D2974	D4792	D1557								
Sediment	24K1020-01	-	24K1020-01	14.2				44.4	54.4	1.2											Brown poorly graded sand with gravel
Sediment	24K1020-03	-	24K1020-03	18.7				21.7	69.3	9.0											Brown well-graded sand with silt and gravel

Date Received: **11/25/2024** Reviewed By: Date Reviewed: **12/3/2024**

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These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.4	37.0	19.0	28.7	6.7	1.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	92.6		
3/4"	92.6		
1/2"	82.7		
3/8"	74.7		
#4	55.6		
#10	36.6		
#20	18.8		
#40	7.9		
#60	3.6		
#100	2.0		
#200	1.2		

* (no specification provided)

Source of Sample: Sediment Depth: -
Sample Number: 24K1020-01

Soil Description
Brown poorly graded sand with gravel

Atterberg Limits
PL= NP LL= NV PI= NP

Coefficients
D_{90}= 16.1344 D_{85}= 13.7439 D_{60}= 5.6325
D_{50}= 3.7451 D_{30}= 1.4712 D_{15}= 0.6846
D_{10}= 0.4982 C_u= 11.31 C_c= 0.77

Classification
USCS= SP AASHTO= A-1-a

Remarks

Date: 12.2.24

Thielsch Engineering Inc.
Cranston, RI

Client: ESS Laboratory
Project: 24K1020
PO# 2407720
Project No: 24K1020

Fig. 24K1020-01

Tested By: MCS/AB/SBR Checked By: Kris Roland

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.3	18.4	13.9	34.3	21.1	9.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	96.7		
1/2"	89.8		
3/8"	86.6		
#4	78.3		
#10	64.4		
#20	45.1		
#40	30.1		
#60	19.3		
#100	12.8		
#200	9.0		

* (no specification provided)

Source of Sample: Sediment Depth: -
Sample Number: 24K1020-03

Soil Description
Brown well-graded sand with silt and gravel

Atterberg Limits
PL= NP LL= NV PI= NP

Coefficients
D_{90}= 12.8915 D_{85}= 8.2352 D_{60}= 1.6158
D_{50}= 1.0513 D_{30}= 0.4232 D_{15}= 0.1850
D_{10}= 0.0934 C_u= 17.30 C_c= 1.19

Classification
USCS= SW-SM AASHTO= A-1-b

Remarks

Date: 12.2.24

Thielsch Engineering Inc.
Cranston, RI

Client: ESS Laboratory
Project: 24K1020
PO# 2407720
Project No: 24K1020

Fig. 24K1020-03

Tested By: MCS/AB/SBR Checked By: Kris Roland

Proposal No. 608460-130088

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GEI Consultants, Inc. - TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24K1020
Date Received: 11/22/2024
Project Due Date: 12/3/2024
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 2.3 Iced with: ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? (Yes) / No
    ESS Sample IDs: 1, 3
    Analysis: Grain Size
    TAT: 5 days
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? (Yes) / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: 11/22/24 Time: 1918 By: TS

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	618861	Yes	N/A	Yes	Driller Jar	NP	
1	618863	Yes	N/A	Yes	8 oz jar	NP	
1	618864	Yes	N/A	Yes	8 oz jar	NP	
1	618865	Yes	N/A	Yes	8 oz jar	NP	
2	618853	Yes	N/A	Yes	VOA Vial	MeOH	
2	618855	Yes	N/A	Yes	VOA Vial	DI Water	
2	618856	Yes	N/A	Yes	VOA Vial	DI Water	
2	618859	Yes	N/A	Yes	4 oz. Jar	NP	
3	618862	Yes	N/A	Yes	Driller Jar	NP	
3	618866	Yes	N/A	Yes	8 oz jar	NP	
3	618867	Yes	N/A	Yes	8 oz jar	NP	
3	618868	Yes	N/A	Yes	8 oz jar	NP	
4	618854	Yes	N/A	Yes	VOA Vial	MeOH	
4	618857	Yes	N/A	Yes	VOA Vial	DI Water	
4	618858	Yes	N/A	Yes	VOA Vial	DI Water	
4	618860	Yes	N/A	Yes	4 oz. Jar	NP	

2nd Review
Were all containers scanned into storage/lab? Initials
Are barcode labels on correct containers? (Yes) / No

Proposal No. 608460-130088

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GEI Consultants, Inc. - TB

ESS Project ID: 24K1020

Date Received: 11/22/2024

Are all Flashpoint stickers attached/container ID # circled?	Yes / No / NA
Are all Hex Chrome stickers attached?	Yes / No / NA
Are all QC stickers attached?	Yes / No / NA
Are VOA stickers attached if bubbles noted?	Yes / No / NA

Completed By: _____ Date & Time: 11/22/24 1901

Revlewed By: _____ Date & Time: 11/22/24 1918.

Chain-of-Custody Record

Laboratory: ESS

Laboratory Job # (Lab use only) 24K1020

GEI Consultants
400 Unicorn Park Drive
Woburn, MA 01801
PH: 781.721.4000

Project Information

Project Name: Hadley Bridge Rehabilitation

Project Location: Hadley, MA

Project Number: 2407720

Project Manager: Chris Ragnelli
781-721-4128 cragnelli@geiconsultants.com

Send Report to: Chris Ragnelli, Adam Grossman
labdata@geiconsultants.com
agrossman@geiconsultants.com

MCP PRESUMPTIVE CERTAINTY AND MCP ANALYTICAL METHODS REQUIRED: (YES) NO

STATE AND FEDERAL REGULATORY REQUIREMENTS/REPORT LIMITS

State/Federal Program: (MA) 401WQC Other _____ NH RI CT NY ME

MA MCP Criteria are Method 1 S-1 and GW-2/GW-3. Circle if GW-1 is required.

Sample Handling

Samples Field Filtered: YES NO (NA)

Sampled Shipped With Ice: (YES) NO

Lab Sample Number	GEI Sample ID	Collection Date	Collection Time	Matrix	No. of Bottles	Sampler(s) Initials	Preservative	Volatile organic compounds (VOCs)	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc	Polycyclic aromatic hydrocarbons (PAHs)	Polychlorinated biphenyls (PCBs) by NOMA Summation of Congeners	Extractable petroleum hydrocarbons (EPH) – fractions only	Total organic carbon (TOC)	Percent water	Toxicity Characteristic Leaching Procedure	Grain size distribution		Sample Specific Remarks
							DI H2O / MeOH	Analysis										
1	2407720-SED-2-COMP	11/21/2024	14:40	SD	4	BCJ	none		x	x	x	x	x	x	x	x		
2	2407720-SED-2-GRAB	11/21/2024	14:41	SD	4	BCJ	none	x										
3	2407720-SED-1-COMP	11/21/2024	15:50	SD	4	BCJ	none		x	x	x	x	x	x	x	x		
4	2407720-SED-1-GRAB	11/21/2024	15:51	SD	4	BCJ	none	x										

Relinquished by sampler: (signature)	Date:	Time:	Received by: (signature)
1.	11/21/2024	18:45	1. GEI Fridge
Relinquished by sampler: (signature) 2. GEI Fridge	11/22/24	14:20	2.
Relinquished by: (signature) 3.	11/22/24	1420	3. 11/22/24 1420
Relinquished by: (signature) 4. 2.3 ice	11/22/24	1722	4.
Relinquished by: (signature) 5.	Date:	Time:	Received by: (signature) 5.

Turnaround Time (Business days):

Normal __x__ 4-Day ____ 3-Day ____
2-Day ____ 1-Day ____ Other ____

Before submitting rush turnaround samples, you **must** notify the laboratory to confirm that the TAT can be achieved.

Additional Requirements/Comments/Remarks:

Run TCLP if 20x rule exceeded

Sample Matrix Abbreviations: SO = Soil GW = Groundwater SW = Surface Water SD = Sediment CO = Concrete PC = Paint Chip CLK = Caulk

ADDENDUM ATTACHMENT 5

Stormwater Management Memo

To: MassDOT

Date: February 20, 2025

Project #: 608460

From: Benesch

Re: *Bay Road (Route 47) over Fort River*

This Stormwater Management Memorandum has been prepared to show compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Water Quality Certification Regulations (314 CMR 9.00) to support the Project's Section 401 Water Quality Certificate Application.

Project Description

The Applicant, MassDOT, is proposing Project 608460 to construct a bridge replacement (the Project) located in Hadley, MA. As proposed, the Project consists of replacing two integral abutments and two pipe pile bents with reinforced concrete pile caps. New riprap will be installed at the base of the south and north abutment walls. The entire bridge superstructure will be replaced and widened using precast concrete deck beams. The proposed Bay Road roadway section on the bridge will provide two 12-foot wide lanes (one in each direction) of vehicular traffic with 5-foot wide outside shoulders, as well as a sidewalk on the east side of the bridge. A terrestrial wildlife passage is proposed adjacent to the south abutment, and a drainage channel is proposed southeast of the bridge.

Existing and Proposed Drainage Conditions

The proposed project area is approximately 740 ft of Bay Road (Route 47) and the Bay road bridge over the Fort river. In this area Bay Road is approximately 28 - 34 ft wide. The Fort River flows in the southwesterly direction. The channel width at the bridge varies approximately from 40-70 ft. Existing drainage structures in the project area include 1 deep sump catch basin and 1 drainage outfall. This outfall discharges into the Fort River. According to the FEMA Flood Insurance Rate Map (Community-Panel Number 2501630002B), this area of the Fort River lies within a 100-year flood zone. At the bridge the 100-year flood is at an elevation of 123 ft.

The project will include construction of new drainage structures, the restoration and relocation of existing outfall, the construction of a drainage channel, and an increase in impervious surface area of 2900 sf. This increase is required to provide ADA compliant cement concrete sidewalk along the bridge, and to widen Bay Road to accommodate two 12 ft lanes with 5 ft shoulders. On the South side of the bridge, one deep sump catch basin will be constructed as well as a drainage manhole. An outfall with a concrete headwall and drainage channel is proposed southeast of the bridge. The proposed deep sump catch basin and the proposed drainage manhole will be connected with 12" RCP. The proposed drainage manhole and the relocated outfall will be connected with 12" CMP. The existing catch basin will be removed. At the relocated outfall, a 195 sf drainage channel is proposed.

BMP Stormwater Management Alternatives

Many Stormwater Control Measures (SCMs) were considered, however were not considered feasible for this project. The project will improve the existing conditions by providing pre-treatment to roadway runoff prior to being outlet to the river and maintaining existing drainage patterns with existing conditions. The following were considered:

- Deep-Sump Catch Basins – the catch basin proposed as part of this project will have a deep-sump. The deep-sump catch basin will be used to replace the existing corrugated pipe (without sump or structure) that conveys water to an existing outlet.

- Sediment Forebay/Infiltration Basin – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, forebays and infiltration basins with check dams were not considered feasible or effective. A stone apron, however, is provided at the proposed outlet location to prevent erosion and reduce water velocities. The stone apron transitions to a streambed material drainage channel to aid in temperature reduction of runoff before discharge into the river.

- Open-Graded Friction Course – the design coordinated with and approved by the MassDOT Pavement Management Section does not include open-graded friction course pavement. At this stage of design, it is not feasible to change the pavement design.

- Pavement Disconnection – The existing site relies primarily on "country drainage" or sheet flow to convey water away from the roadway. Some widening of the roadway is proposed (described in Section 2.3 above), however the existing pavement disconnection was maintained to the maximum extent practicable for the site. Bridge scuppers are not proposed on this bridge, therefore all roadway drainage within the project site will either exit the roadway to natural vegetated areas or be pre-treated within a deep-sump catch basin prior to being outlet to the river.

- Leaching Basins – due to the existing site topography and proximity of the toe of slope with the river bank, a leaching basin was not considered for the project site.

- Subsurface Infiltration System – due to the scope of this project, existing site topography, proximity of the toe of slope with the river bank and existing right-of-way, a subsurface infiltration system was not considered feasible for the project.

- Porous Pavement – the design coordinated with and approved by the MassDOT Pavement Section does not include porous pavement. Since this project is primarily a roadway project, porous pavement was not considered. Also, the proposed pedestrian sidewalk is limited to the length of the bridge and will be made of cement concrete.

- Stormwater Wetland Stormwater Control Measures (SCM) – due to the scope of this project, existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, stormwater wetland SCMs were not considered feasible for this project. Although not a constructed stormwater wetland, numerous upland plantings are being proposed as part of the project in order to improve the banks compared to the existing condition. There is also a streambed material drainage channel proposed between the drainage outfall location and the river bank.

Massachusetts Department of Environmental Protection (MassDEP) – Stormwater Management Standards

As demonstrated below, the proposed Project complies with the MassDEP Stormwater Management Standards (the Standards). Under the Stormwater Management Standards, the Project is considered a redevelopment project because it involves maintenance and improvement of an existing roadway. The existing bridge superstructure will be replaced and widened, new abutments will be installed along with new rip-rap. Two 12' wide lanes, 5' wide outside shoulders, and a 5'-6" cement concrete sidewalk along the bridge is also proposed. The Project has been designed to meet the Stormwater Management Standards to the maximum extent practicable and to improve upon existing conditions.

Standard 1: No New Untreated Discharges

No new stormwater conveyance (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The Project has been designed to comply with Standard 1 fully.

An existing stormwater outfall was relocated and restored from the southwest side of the bridge to the southeast side. The outfall was moved to reduce impact to Bordering Vegetated Wetlands. A flared pipe end outfall with cement concrete headwall will be constructed at the new outfall, as well as a 38 sf area of stone for pipe ends. Adjacent to the stone for pipe ends a 195 SF drainage channel of streambed material is proposed. The purpose of the drainage channel and stone pipe end is to prevent erosion to the Fort River and Bordering Vegetated Wetlands. The proposed stone pipe end will act as an energy dissipator for outflowing stormwater. The drainage channel will allow for temperature reduction before discharging to the river.

See Standard 4 for the water quality treatment provided by the Project.

Standard 2: Peak Rate Attenuation

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

The Project has been designed to comply with Standard 2 to the maximum extent practicable. Table 1 includes a summary of impervious cover impacts, which can be used as a metric to understand impacts to peak discharge rates following development.

Table 1: Existing and proposed impervious cover

Existing Impervious Area (sq. ft)	Proposed Impervious Area (sq. ft)	Change In Impervious Area (sq. ft)	Percent Increase in Impervious Area (%)
22,700	25,600	2900	12%

The existing and proposed Peak Discharge Rates are shown below in Table 2. Due to the change in the location of drainage outlets/structures, the proposed DP-2 represents approximately the sum of the existing DP-2, DP-3, DP-4 and DP-5 areas. As reflected in Table 2, there are minor increases in peak discharge rates for each of the design storms due to the increased impervious area required to meet MassDOT design standards and ADA criteria of two 12' lanes, 5' shoulders and a 5'-6" sidewalk. The proposed catch basin and restored outfall will allow for the collected stormwater from proposed DP-1 to be discharged to the Fort River. There is likely no flooding concern as prior precipitation would have also previously drained directly to the Fort River as well.

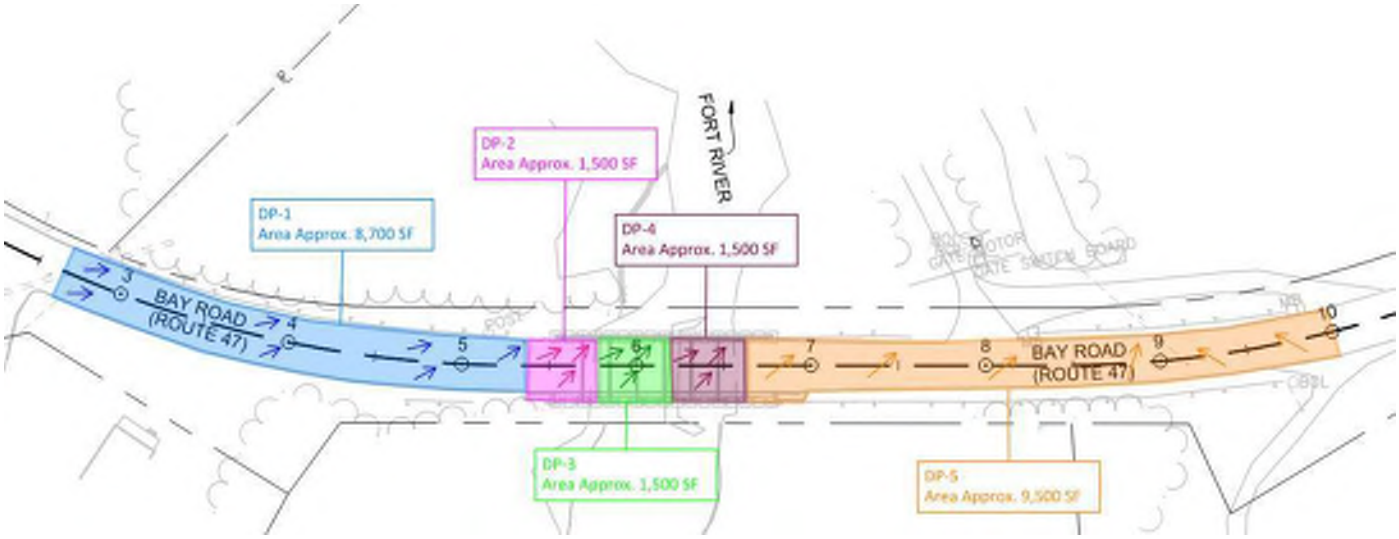
Although there is an increase in impervious, and therefore peak discharge rates, the overall drainage patterns of the site will be improved compared to the existing condition. The direct outlets to the Fort River (via bridge scuppers) will be eliminated. All stormwater drainage will either flow through the proposed deep sump catch basin or via overland flow from country drainage.

Table 2: Peak Discharge Rates (cfs)

Design Point	Existing			Proposed		
	2-year	10-year	100-year	2-year	10-year	100-year
DP-1	0.06	0.09	0.18	0.06	0.09	0.16
DP-2	0.01	0.02	0.03	0.13	0.19	0.36
DP-3	0.01	0.02	0.03	N/A	N/A	N/A
DP-4	0.01	0.02	0.03	N/A	N/A	N/A
DP-5	0.07	0.10	0.20	N/A	N/A	N/A
TOTALS	0.16	0.25	0.47	0.19	0.28	0.52

Following this page are images representing the existing and proposed drainage patterns of the project site, as well as a sample calculation showing how the peak discharge rates were calculated for DP-1.

EXISTING DRAINAGE PATTERNS OF PROJECT SITE:



PROPOSED DRAINAGE PATTERNS OF PROJECT SITE:



SAMPLE CALCULATIONS FOR PEAK DISCHARGE RATES:

Rational Method: $Q = C_a CiA$

Q = peak discharge (cfs)
C = runoff coefficient
C_a = 1.0 for 2-10 year storm; 1.25 for 100 year storm (PDDG Exhibit 8-10)
i = avg rainfall intensity (in/hr) for a storm duration equal to time of concentration (T_c) 5 min
A = drainage area (acres)

Use NOAA Atlas 14 (hdsc.nws.noaa.gov/pfds/pfds_map_cont.html) to find rainfall intensity at the project site for 2-, 10-, and 100-year storms at a duration of 5 min.
$i_{2\text{-year}}$ = 0.388 in/hr $i_{10\text{–year}}$ = 0.572 in/hr $i_{100\text{-year}}$ = 0.864 in/hr

Runoff Coefficient for Surfaces (PDGG Exhibit 8-9)
Pavement: C = 0.75 – 0.95 (say 0.83)

E.g.: Existing Discharge Rates for DP-1

Total Area A_{te} = 8700 sf
Pervious Area A_{pe} = 0 sf
Impervious Area A_{ie} = 8700 sf

Discharge rates as a factor of rainfall intensity:

$$Q_{2-year} = (0.83)\left(0.388\frac{in}{hr}\right)(8700\ sf)\left(\frac{1\ acre}{43{,}560\ sf}\right) = 0.06\ cfs$$

$$Q_{10-year} = (0.83)\left(0.572\frac{in}{hr}\right)(0.199\ acres) = 0.09\ cfs$$

$$Q_{100-year} = (1.25)(0.83)\left(0.864\frac{in}{hr}\right)(0.199\ acres) = 0.18\ cfs$$

E.g.: Proposed Discharge Rates for DP-1

Total Area A_{tp} = 8000 sf
Pervious Area A_{pp} = 0 sf
Impervious Area A_{ip} = 8000 sf

Discharge rates as a factor of rainfall intensity:

$$Q_{2-year} = (0.83)\left(0.388\frac{in}{hr}\right)(8000\ sf)\left(\frac{1\ acre}{43{,}560\ sf}\right) = 0.06\ cfs$$

$$Q_{10-year} = (0.83)\left(0.572\frac{in}{hr}\right)(0.184\ acres) = 0.09\ cfs$$

$$Q_{100-year} = (1.25)(0.83)\left(0.864\frac{in}{hr}\right)(0.184\ acres) = 0.16\ cfs$$

Standard 3: Stormwater Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater management practices and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil types. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The Project has been designed to comply with Standard 3 to the maximum extent practicable. The purpose of this standard is to replenish groundwater by ensuring that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions. The relocation of the existing outfall will include the construction of a shallow-sloped drainage channel. This channel will be constructed of streambed material and will allow for similar infiltration as the existing outfall.

With the elimination of the bridge scuppers, 4,500 SF (the sum of existing DP-2, DP-3 & DP-4) of impervious area will flow via country drainage away from the roadway instead of directly into the River below the existing bridge deck. Additionally, the 2,900 SF area of proposed increased impervious (as a result of MassDOT design standards and ADA criteria), will flow away from the roadway via country drainage. This is a total of 7,400 SF of impervious being directed to country drainage with the potential for groundwater recharge.

Standard 4: Water Quality

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a) *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
b) *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
c) *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

The Project has been designed to comply with Standard 4 to the maximum extent practicable.

Many Stormwater Control Measures (SCMs) were considered, however were not considered feasible for this project. The project will improve the existing conditions by providing pre-treatment of roadway runoff prior to being outlet to the river and maintaining existing drainage patterns with existing conditions. The following were considered:

- Deep-Sump Catch Basins – the catch basin proposed as part of this project will have a deep-sump. The deep-sump catch basin will be used to replace the existing corrugated pipe (without sump or structure) that conveys water to an existing outlet and provide 25% pre-treatment TSS removal.
- Sediment Forebay/Infiltration Basin – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, forebays and infiltration basins with check dams were not considered feasible or effective. A stone apron, however, is provided at the

proposed outlet location to prevent erosion and reduce water velocities. The stone apron transitions to a streambed material drainage channel to aid in temperature reduction of runoff before discharge into the river.

- Open-Graded Friction Course – the design coordinated with and approved by the MassDOT Pavement Management Section does not include open-graded friction course pavement.
- Pavement Disconnection – The existing site relies primarily on "country drainage" or sheet flow to convey water away from the roadway. Some widening of the roadway is proposed, however the existing pavement disconnection was maintained to the maximum extent practicable for the site. Bridge scuppers are not proposed on this bridge, therefore all roadway drainage within the project site will either exit the roadway to natural vegetated areas or be pre-treated within a deep-sump catch basin prior to being outlet to the river.
- Leaching Basins – due to the existing site topography and proximity of the toe of slope with the river bank, a leaching basin was not considered for the project site.
- Subsurface Infiltration System – due to existing site topography, proximity of the toe of slope with the river bank and existing right-of-way, a subsurface infiltration system was not considered feasible for the project.
- Porous Pavement – the design coordinated with and approved by the MassDOT Pavement Section does not include porous pavement. Since this project is primarily a roadway project, porous pavement was not considered. Also, the proposed pedestrian sidewalk is limited to the length of the bridge and will be made of cement concrete.
- Stormwater Wetland Stormwater Control Measures (SCM) – due to existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, stormwater wetland SCMs were not considered feasible for this project. Although not a constructed stormwater wetland, numerous upland plantings are being proposed as part of the project in order to improve the banks compared to the existing condition. There is also a streambed material drainage channel proposed between the drainage outfall location and the river bank.

After considering the above SCMs, a total of 25% TSS removal will be implemented for the drainage area captured by the deep sump catch basin. All remaining drainage will flow via country drainage prior to reaching the Fort River.

A Long-Term Pollution Prevention Plan (LTPPP) has been developed for the project in compliance with Standard 4. The Standard 9 section of this document includes this LTPPP.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

For Land Uses with Higher Potential Pollutant Loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all LUHPPLs cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from LUHPPLs shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Standard 5 does not apply to the Project. There are no Land Uses with Higher Potential Pollutant Loads within the project area.

Standard 6: Critical Areas

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a)1 or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The Project has been designed to comply with Standard 6 to the maximum extent practicable. Figure 3 shows the Critical Areas in the vicinity of the project site. The Fort River is considered a Coldwater Fishery. The relocated outfall will discharge into a drainage channel which will dissipate energy and aid in the lowering of stormwater temperatures. The proposed catch basin on this project will have a deep sump for sediment collection prior to entering the existing stormwater system.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The Project is considered a redevelopment and has been designed to comply with the Stormwater Management Standards to the maximum extent practicable.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls

A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The Project has been designed to comply with Standard 8 fully.

The implementation of erosion and sediment (E&S) controls during construction is considered a standard practice for all MassDOT projects. E&S controls will be installed before any land disturbance begins for the Project and will remain in place for the duration of the Project. The E&S controls for the Project are shown on the project plans. These control measures include the use of compost filter tubes along project limits, as well as catch basin silt sacks in the existing catch basin in the project area. The project disturbs less than 1 acre and therefore does not require filing for NPDES Construction General Permit Coverage.

Standard 9: Operation and Maintenance Plan

A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Project has been designed to comply with Standard 9 fully.

MassDOT O&M plans are implemented on a programmatic level by each MassDOT district. Each MassDOT district office is responsible for providing operation and maintenance for the MassDOT stormwater management systems within their respective jurisdictions. Appendix B includes the O&M Plan for this project.

Long-term pollution prevention for the Project includes litter pick-up, inspection and maintenance of stormwater assets, maintenance of landscaped areas, snow and ice management, street sweeping, prohibition of illicit discharges, and spill prevention and response.

Standard 10: Prohibition of Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

The Project has been designed to comply with Standard 10 fully.

Illicit Discharge Statement

The project's stormwater management system, as shown on the plans submitted with this report, have been designed in full compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or resolved through MassDOT's Illicit Discharge Detention and Elimination (IDDE) Program.

ADDENDUM ATTACHMENT 6

O&M Plan and LTPPP

Bay Road (Route 47) over Fort River

Stormwater Management System Operation and Maintenance Plan and Long-Term Pollution Prevention Plan

Hadley, MA

PREPARED FOR



10 Park Plaza
Boston, MA 02116

PREPARED BY

Benesch
50 Redfield Street
Boston, MA, 02122

01/17/2024

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1

Stormwater Management System Operation and Maintenance (O&M) Plan

This Stormwater Management System Operation and Maintenance (O&M) Plan describes the approach for inspection and maintenance of drainage infrastructure and structural stormwater control measures (SCMs) to minimize contaminant loading for Bay Road (Route 47) over Fort River, town of Hadley MA. In general, inspection and maintenance activities will be conducted consistent with the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4) and MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit.

This document has been prepared per the requirements of Massachusetts Department of Environmental Protection (MassDEP) Regulations 310 CMR 10.05 (6)(k)(9) and satisfies the requirements of Massachusetts Stormwater Standard 9.

1.1 Responsible Party

In accordance with MassDOT procedures, the MassDOT District 2 office located in Northampton, MA, is responsible for the maintenance of all stormwater management systems on MassDOT roads within the project area.

Questions or concerns regarding activities associated with this O&M Plan should be addressed to MassDOT's District 2 office located at 811 North King Street, Northampton, MA 01060, phone (857)-368-2000 during regular weekday hours, or to MassDOT's Highway Operations Center located in South Boston, MA at (800) 227-0608 during all other times and days, including weekends and holidays.

1.2 Inspection and Maintenance Measures and Record-Keeping

See the Utility Plans for the proposed stormwater system within the project limits. The stormwater management system covered by this O&M Plan consists of the following measures:

- The construction of 1 deep sump catch basin, 1 drain manhole, 1 outfall relocation, and a 195 SF drainage channel.

MassDOT uses a performance-based inspection and maintenance program for SCMs and catch basins. For SCMs, MassDOT's overall approach is to inspect SCMs, and based on the results of the inspections, perform maintenance to preserve functionality. For catch basins, MassDOT's overall approach is to perform maintenance at an interval that maintains the functionality of the catch basin (e.g., sump is less than 50% full of sediment). Catch basin inspections, including documentation of sediment accumulation, and maintenance will generally occur simultaneously.

MassDOT's O&M program is data driven. Inspections and maintenance are recorded by personnel using hand-held tablets in the field to document sediment accumulation, maintenance action performed, and follow-up actions needed. Data are recorded in MassDOT's asset management system which is accessible in the field (mobile) or the office (desktop).

The table below summarizes data that is generally collected for each asset type. For all assets, the inspector and inspection date are recorded. Photo documentation of structure condition is taken and attached to the inspection record.

Inspection Form	Applicable Stormwater Assets	Information Collected
Inlets	› Catch basins › Outlet control structures	› Sediment accumulation › Trash/Debris accumulation › Signs of contamination › Frame and grate condition › Overall structure condition
SCMs	Consistent with the MassDOT Stormwater Design Guide (SDG), SCM categories include: › Infiltration SCMs › Stormwater wetland SCMs › Bioretention SCMs › Other SCMs	› SCM accessibility › Presence of standing water › Level of erosion › Sediment accumulation › Trash/Debris accumulation › Vegetation condition › Overall SCM condition
Storm Discharge Points	› Outlets to SCMs	› Presence of flow › Signs of contaminated flow › Sediment accumulation › Level of erosion › Pipe condition › Scour protection condition › Overall structure condition

Inspection and maintenance records can be made available using the asset management system through request with the MassDOT District 2 Environmental Engineer. Records will be kept for at least three years. Representatives of the Hadley Conservation Commission(s), MassDEP, and US EPA may obtain access to these records, upon request. Additionally,

MassDOT will allow members and agents of MassDEP and the Conservation Commission(s) to enter and inspect the premises, upon request, to evaluate and ensure that the Operation and Maintenance Plan requirements for each SCM are being followed.

Maintenance actions will not occur at any set frequency, but rather will be based on condition and impact to functionality. Maintenance to be performed on the stormwater system includes: Removing and disposing of trash, sediment, debris, and root intrusions, cleaning out of sumps at an interval to maintain functionality, jetting and repairing pipes, a d repairing damaged or eroded areas.

Based on the results of the inspection, repairs will be made in accordance with MassDOT standard practices. Maintenance will be prioritized given the urgency of the required maintenance and availability of staff, contracts, etc. Maintenance may require contracting if existing contracts are unavailable to perform the work. More intensive remedial activities may require permitting and/or an engineering solution.

MassDOT will continue to strive to meet DEP's frequencies listed in Volume 2, Chapter 2 of the DEP Stormwater Handbook until a programmatic operation and maintenance plan is established, which will supersede this project specific O&M plan. Per the Stormwater Handbook, deep sump catch basins are to be inspected four times per year and cleaned four times per year or whenever the depth of deposits are greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

1.3 Erosion and Sediment Control Measures during Maintenance Activities

For maintenance activities that could result in discharges of sediments or other contaminants into wetlands, waterways, or other resource areas regulated under 310 CMR 10.00, the responsible maintenance personnel will employ measures to prevent migration of these sediments/contaminants. Such temporary measures may include, but are not necessarily limited to, the use of siltation barriers, catch basin silt sacks/filter bags, pipe plugs, cofferdams deployed within the stormwater structure, turbidity curtains, or other practices designed to prevent such discharges.

Where maintenance occurs in areas that are confined, with no risk of discharge to adjacent water bodies, no special measures may be needed. Examples include, but are not limited to: (1) cleaning of a forebay under dry conditions when the work can be completed and exposed surfaces stabilized prior to placing it back into service; and (2) catch basin cleaning where the activity is limited to removing material from a sump below the elevation of the outlet pipe.

1.4 O&M Budget

MassDOT performs maintenance for stormwater management systems as part of their routine operation and maintenance budget for roadways and bridges. Budgets are managed at the district level and vary by fiscal year, depending on funding sources.

2

Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan (LTPPP) describes the approach for pollution prevention and related maintenance activities for Bay Road (Route 47) over Fort River Hadley, MA. In general, long-term pollution prevention and related maintenance activities will be conducted consistent with:

- The National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4),
- MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit, and
- Measures outlined in MassDOT's Stormwater Management Plan (SWMP).

This LTPPP satisfies the requirements related to pollution prevention under Massachusetts Stormwater Standards 4, 5, 6, and 10.

2.1 Practices for Long-Term Pollution Prevention

For the facilities covered, long-term pollution prevention includes the following measures.

2.1.1 Litter Pick-up

MassDOT will conduct litter pick-up from the stormwater management facilities in conjunction with routine road maintenance activities.

2.1.2 Inspection and Maintenance of Stormwater Assets

MassDOT will conduct inspection and maintenance of drainage infrastructure and the stormwater control measures (SCMs) in accordance with the O&M Plan, as described in Section 1.

2.1.3 Maintenance of Landscaped Areas

Routine mowing will be conducted according to standard MassDOT practices. SCM basin bottoms and embankments designed to impound water should be mowed as required to prevent establishment of woody vegetation.

Except in rare circumstances, MassDOT does not use fertilizers, herbicides, and pesticides for the maintenance of facilities. Exceptions include using fertilizer to ensure the survival of new plantings and herbicides to control invasive plants. Use of fertilizers and herbicides is reviewed and approved by the MassDOT Landscape Design Section and District 2 Environmental Engineer prior to application. Local Conservation Commission review may also be required.

2.1.4 Snow and Ice Management

Snow and Ice Management will be conducted consistent with the practices outlined in the MassDOT Snow and Ice Control Program Environmental Status and Planning Report (ESPR), formerly known as the Snow and Ice Control Generic Environmental Impact Report (GEIR).

In accordance with the Snow and Ice Control ESPR, no sand is used on MassDOT properties for snow and ice control. The exception to this rule is within reduced salt areas where high sodium levels have been found in drinking water sources.

The Fort River is a coldwater fishery and there are two Zone 1 Wellhead Protection Areas (WPAs) that intersect the project, and the entire site is in a Zone II WPA and are considered Critial Areas per 314 CMR 9.02. The use of salt for the deicing of impervious surfaces within the project site must be minimized within WPAs and coldwater fisheries.

2.1.5 Street Sweeping

Routine highway cleaning, with a brush-type street sweeper, will be conducted in accordance with standard MassDOT practices. Sweeping will occur annually in the Spring.

2.1.6 Prohibition of Illicit Discharges

The MassDEP Stormwater Management Standard 10 prohibits illicit discharges to the stormwater management system. Illicit discharges are discharges that do not consist entirely of stormwater, except for certain specified non-stormwater discharges.

In accordance with the existing MS4 permit and anticipated TS4 permit requirements, examples of discharges from the following sources are not considered illicit discharges:

- Firefighting activities*
- Foundation drains
- Water line flushing
- Footing drains
- Landscape irrigation
- Individual residential car washing
- Uncontaminated groundwater
- Rising groundwater
- Diverted stream flows
- Flows from riparian habitats/wetlands
- Potable water sources
- Dechlorinated swimming pool water
- Street wash waters
- Wash water from residential buildings (no detergents)
- Condensation from air conditioning units
- Run-on from private driveways caused by precipitation
- Lawn watering
- Water from crawl space pumps

*Water from firefighting activities is allowed and need only be addressed where they are identified as significant sources of pollutants to waters of the United States.

Based on plan review and confirmation in the field, there are no known or proposed illicit connections associated with the Bay Road (Route 47) Over Fort River. Should an interconnection to the stormwater management system be identified, the MassDOT PM will coordinate with the District Permits Engineer to confirm if the connections are authorized. For unauthorized connections, the MassDOT PM and/or MassDOT Environmental Services Section will investigate the connections and if they are determined to be illicit, the connections will be managed through MassDOT's Illicit Discharge Detection and Elimination (IDDE) program and/or through other agencies.

ADDENDUM ATTACHMENT 7

Revised Relevant Project Special Provisions or Special Provisions Not Previously Provided

ITEM 751.7 COMPOST BLANKET SQUARE YARD

REV. 2024.08.10 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS

The work under this Item shall conform to the relevant provisions of Subsection 751 and M1.06.0 Compost of the Standard Specifications and the following:

Work shall consist of furnishing and pneumatically applying compost as a thin mulch blanket (1/2-1 inch depth) over prepared soil to provide temporary soil stabilization and organic matter for plant growth.

SUBMITTALS AND MATERIALS

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance.

Contractor shall submit to the Engineer samples and certified test results no sooner than 60 days prior to application of compost. Vender certification that material delivered meets the test results shall be submitted if requested.

Compost shall meet the requirements for M1.06.0: Compost, Type 2, as referenced in the MassDOT– Highway Division Standard Specifications for Highways and Bridges, Division III: Materials Specifications, latest edition.

The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. Soil preparation shall be as specified under the applicable item for soil placement or for seeding. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Compost blanket shall be pneumatically applied (blown on) to a minimum depth of one half to one inch. Where shown on the plans or when directed by the Engineer depth may be increased to provide berms for sediment control or to otherwise prevent slope erosion.

When compost blanket is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost blanket, as specified under the relevant item for seeding.

When compost blanket is proposed for areas with planting, compost (and seed if applicable) shall be applied after planting. If compost and seed occur prior to planting, areas shall be regraded and compost and seed reapplied to the satisfaction of the Engineer and at the Contractor’s expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.7 will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost blanket shall be compensated under the applicable item for placement of loam, sand, ordinary borrow, wetland soil, topsoil rehandled and spread, tilled existing soil, or other specified substrate.

Seeding, if utilized, will be compensated for under the appropriate seeding items.

ITEM 755.45 INLAND WETLAND RESTORATION SQUARE YARD

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS) NOTE TO CONTRACTS: the below includes site specific notes regarding an existing intermittent stream

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit. Included as part of the work is the restoration of the existing intermittent stream within the limits of the inland wetland restoration.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Geotextile Fabric for Temporary Soil Protection shall be as specified under that item.

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

Wetland Mix – Part Shade
Seeding Rate: Species ecotype shall be as native to New England region as possible.
Apply this mix at 20 lbs PLS/acre.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

Plant species and sizes to be included in the Restoration Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT

Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item and shall include grading related to restoring the existing intermittent stream within the limits of wetland restoration to pre-construction condition.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall be seeded with mulch as specified below. Seeding shall immediately follow soil preparation.

Seeding with Mulch

Upon approval of prepared soil, area shall be seeded. Seeding may be hand broadcast with straw mulch applied or hydroseeded per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Compost shall be pneumatically applied (blown on) to a depth of one half to one inch at the same time that seed is broadcast such that seed is covered by a light application of compost.

When planting occurs on projects with compost topdressing and seed application, planting shall occur prior to application of compost and seed. Otherwise, compost and seed shall be re-applied to the satisfaction of the Engineer and at not cost to the contract.

Seed tags shall be submitted at time of seeding.

Planting

Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist or the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND SEED ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing

well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.

- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required, including restoration of the existing intermittent stream to pre-construction conditions.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

ITEM 765.451 PART SHADE ROADSIDE MIX SY
ITEM 765.555 WETLAND MIX – PART SHADE SY

Work under this item shall consist of furnishing and applying the mix(es) specified below at the quantity required.

SUBMITTALS

1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.

2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.

3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.

4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

   Number of tags submitted must correspond to number of bags delivered.

   Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include: variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

   A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

5) Verification of Seed Delivery. Prior to payment, contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company letterhead or a bill of lading. Supplier verification must include all information requested on

the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance. Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section

6) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

SEEDING SEASON

The appropriate seeding seasons are:

Spring: April 1 - May 15
Fall: October 1 - December 1 for dormant seeding

PERMANENT SEED MIX(ES)

Seed Mix(es) shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

Application Rate Mix

Wetland Mix – Part Shade: 20 lbs/acre PLS. No cover crop shall be applied.
Part Shade Roadside Mix: 20 lbs/acre PLS. No cover crop shall be applied.

Any species substitutions shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

50% Increase Adjustment for Field Conditions

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season
  OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Part Shade Roadside Mix and Wetland Mix Part Shade will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Part Shade Roadside Mix and Wetland Mix Part Shade will be paid at the contract unit price per pound of Pure Live Seed delivered and complete in place and upon approval of all Seed Submittal Documentation. Overseeding required to correct poor germination or establishment shall be incidental to the item.

NATIVE SEED WORKSHEET

Project Description: _____ Project No: _____

Contractor:_____ Contract No: _____

Seed Mix Number & Description: _____

Contractor: Complete Prior To Ordering

Pounds of Seed Required Per Contract:

_____lbs./acre for _____Acre(s) OR _____ SY

Additional 50% increase if required (out of season or seeding over compost blanket):

_____**lbs. Total Seed Required**

Calculated Quantity for **P**ure **L**ive **S**eed (PLS[1]):

_____ **Total Pounds PLS**

Engineer: Verification at Time of Application

Number pounds delivered to site[2]: _____ Date(s): _____

Actual Seed Bag Tag/s Received or photo documented by Engineer: _____

[1] PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).
*[2]Quantity delivered should match pounds **Total Pounds PLS** and **Verification of Seed Delivery**. Pounds should be shown on each Seed Tag.*

SUPPLIER VERIFICATION OF SEED DELIVERY FOR MASSDOT PROJECTS

Date_____

We hereby certify that (*Seed Supplier*):_____

Furnished to (*Contractor*): _____

For use on: (*Project Description*)_____

Project #: _____ Contract #:_____

Pounds of Pure Live Seed: _____

Of Mix (*Description*):_____

Lot Number _____

The material was delivered on (*Date*)_____.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): _____ Title: _____

Supplier:_____

Signature and Seal:_____

Part Shade Roadside Mix Seed Mix:

Botanical Name	Common Name	% Mix By Weight (PLS)	Approx. Cost 2021
Grass			
Festuca rubra	Creeping Red Fescue	26.0%	$0.51
Elymus virginicus	Virginia Wild Rye	24.0%	$1.44
Schizachyrium scoparium	Little Blue Stem	22.5%	$4.50
Panicum virgatum	Switch Grass	10.0%	$1.00
Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	7.0%	$1.26
Agrostis perennans	Upland Bentgrass	2.0%	$0.30
Carex vulpinoidea	Fox Sedge	2.0%	$0.92
Juncus effusus	Soft Rush	0.2%	$0.09
		93.7%	**$10.01**
Herb/Forb			
Chamaecrista fasciculata	Partridge Pea	3.0%	$0.18
Penstemon digitalis	Beard-tongue	1.0%	$1.71
Zizia aurea	Golden Alexanders	0.3%	$0.79
Solidago bicolor	White Goldenrod	0.2%	$0.68
Solidago caesia	Woodland Goldenrod	0.2%	$0.90
Rudbeckia hirta - VT ecotype	Black-eyed Susan - VT ecotype	0.2%	$0.04
Aster novae-angliae	New England Aster	0.2%	$0.97
Solidago odora	Licorice Scented Goldenrod	0.2%	$0.80
Aster divaricatus	White Wood Aster	0.2%	$0.79
Heliopsis helianthoides	Ox-Eye Sunflower	0.2%	$0.08
Pycnanthemum tenuifolium	Slender Mountain Mint	0.2%	$0.30
Monarda fistulosa	Wild Bergamot	0.1%	$0.11
Eupatorium perfoliatum	Boneset	0.1%	$1.24
Aster lateriflorus	Calico Aster	0.1%	$0.40
Oenothera fruticosa var. fruticosa	Sundrops	0.1%	$0.36
		6.3%	**$9.36**
Seeding Rate: 15.0 lbs PLS/Acre		**100.0%**	**$19.37**

Wetland Mix – Part Shade Seed Mix:

	Botanical Name	Common Name	%PLS By Weight
Grass			
	Poa palustris	Fowl Bluegrass	25.00%
	Elymus riparius	Riverbank Wild Rye	19.00%
	Carex lurida	Shallow Sedge	17.00%
	Carex vulpinoidea	Fox Sedge	10.00%
	Cinna arundinacea	Sweet Woodreed	5.00%
	Sparganium eurycarpum	Giant Bur Reed Eco PA	4.00%
	Carex scoparia	Broom sedge	4.00%
	Carex lupulina	Hop Sedge	4.00%
	Scirpus polyphyllus	Many Leaved Bulrush	3.00%
	Juncus effusus	Soft Rush	2.50%
	Carex intumescens	Bladder Sedge	2.00%
	Sparganium americanum	Burrweed	2.00%
	Scirpus cyperinus	Woolgrass	1.00%
	Carex crinita	Fringed Sedge	1.00%
	Juncus tenuis	Path Rush	0.50%
			100.00%

ITEM 767.122 SEDIMENT BARRIER – COIR LOG FOOT

The work under this item shall conform to the relevant provisions of Subsections 101, 120, 170, and 751 of the Standard Specifications and the following:

Sediment Barrier - Coir Log shall be used in wet locations where the barrier will not require removal; when barrier is placed immediately adjacent to existing wetlands; as a check dam in swales; in locations as shown on the Drawings; and/or in locations required by the Engineer.

Permits, Codes and Regulations: The Contractor shall comply with all rules, regulations, laws and ordinances of the City/Town and State, and all other authorities having jurisdiction over the Project site. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Department.

MATERIALS

Coir Log: Coir Log shall be biodegradable coir fiber cylindrical bundles. Inner core shall be 100 percent unsorted, well-cleaned, coir fiber uniformly distributed along the length of the log. The stuffed density of the coir fiber shall be a minimum of 9 pounds per cubic foot.

Outer netting shall be constructed from a minimum 3-ply high strength coir bristle twine. The netting shall have 2-inch by 2-inch rhombic openings with hand-knotted junctions. The average breaking strength of the coir twine shall be a minimum of 80 pounds. Production tolerance for all the above parameters shall not exceed plus or minus 10 percent.

Coir log diameter shall be sized as shown on the drawings. Typical lengths are supplied in 10 foot or 20-foot increments. Coir logs or coir netting may not be cut to decrease length and shall maintain the physical properties as supplied by the Manufacturer.

Notched Wood Stakes: Stakes shall be oak or southern pine with dimensions as shown on the Drawings. Stakes shall be free from knots and other defects which would cause splitting and shall have a downward-angled notch as shown in the drawing.

Coconut Fiber Cord: Coconut fiber cord shall be two-ply braided cord with a breaking strength of 80 pounds, minimum 0.25-inch diameter.

Delivery, Storage and Handling: Protect materials from deterioration during delivery and while stored at site.

CONSTRUCTION METHODS

General: Prior to initial placement of the coir log sediment barrier, the Contractor and the Engineer shall review locations specified on the plans and adjust placement, if required, to ensure that the coir log positioning and configuration will provide maximum sediment capture. Coir log sediment barrier(s) shall be in place prior to excavation work and no work shall take place outside the coir log barrier(s).

Installation: Coir logs shall be staked and secured as shown on the Drawings, as specified herein, and/or as recommended by the Manufacturer. The Contractor shall remove all underlying vegetation or debris to ensure that each coir log is securely in contact with soil, such that there is no flow beneath the log.

When used as a check dam barrier in a swale, the coir log shall be centered in the low point of the swale, perpendicular to the flow, with ends extending upslope. The log check dam barrier shall extend such that the log top elevation at the center of the swale is lower than the lowest elevation at the end log, to ensure that sediment-laden runoff will flow either through or over the coir log but not around it. The coir log check dam barrier shall have length such that no seams occur in the swale.

Notched wood stakes shall be driven parallel on both sides of the coir log at a typical spacing of 5 feet on center, unless site conditions warrant a closer spacing distance to ensure logs are firmly secured to the underlying soil. Stakes shall not extend more than 1 foot beyond the top of the log. Coir twine shall lash the logs to notched stakes in a cross-lashing fashion between stakes, throughout the length of the log barrier.

When utilizing multiple logs for sediment control, each coir log shall be laced together end-to-end (creating a seam) with coir twine to create a continuous length. End-to-end lacing may be completed before or after placement, to facilitate handling.

Maintenance: Maintenance of the coir log sediment barrier shall be per the Stormwater Pollution Prevention Plan (SWPPP).

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. The Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract. Under no condition shall sediment be allowed to accumulate more than 4 inches above the original ground line.

If a breach or other failure of the barrier occurs, the barrier shall be immediately restored. Repair shall include replacement of entire defective segments or for short breaches, revetment with additional coir logs, set directly adjacent to the downslope side of the breech. Revetment coir logs must overlap breech by a minimum of 2 feet on each side. The Engineer must approve breech repair means and methods as well as outcome.

If the coir log sediment barrier is damaged by equipment or undergoes a significant washout or other major failure, the Contractor shall replace the component in its entirety, at the discretion and approval of the Engineer. Any delay in maintaining the barrier shall be cause to immediately suspend the work as provided for in Subsection 8.09: Delay and Suspension of Work.

Disposition/Removal**:** For naturalized areas, coir logs and wooden stakes may be left in place to decompose on-site. For areas where, in the determination of the Engineer, aesthetics are a concern, logs, errant coir fiber material, and stakes may require removal.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.122 Sediment Barrier - Coir Log will be measured for payment by the FOOT, complete in place and will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for coir log(s) follow-up maintenance and repairs, or disposal (if required), but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 983.521 STREAMBED RESTORATION CUBIC YARD

DESCRIPTION

This work shall consist of removing, stockpiling, and replacing river bed material in the proposed bridge replacement and the upstream and downstream approaches in the limits of work. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, rougness, shape, profile, and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel.

The Contractor shall coordinate with his/her subcontractors to ensure all required equipment is available on-site to complete the work in this manner. The streambed restoration is required to comply with environmental permits issued for the project. MassDOT Environmental Services will provide a Fluvial Geomorphologist (Geomorphologist) to provide a pre-construction meeting, on-site oversight during construciton, and assistance during streambed restoration construction to ensure the restoration is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an initial (virtual or inperson) meeting with MassDOT's Geomorphologist, Contractor, and Resident Engineer. At this meeting, the Geomorphologist will provide an overview of the restoration work. The Contractor should be prepared to discuss the anticipated means, methods, and schedule.

Process Approval:

In lieu of a mockup, the Contractor shall schedule an onsite meeting to discuss the streambed restoration with the Geomorphologist and respective parties from MassDOT. The Geomorphologist shall be onsite during initial streambed restoration. The Contractor shall provide the Geomorphologist adequate access to observe, direct, and inspect the channel restoration work throughout the duration of the removal, stockpile, and reinstallation of the existing streambed material. If material is being brought to the site for streambed restoration, the Contractor shall provide the Geomorphologist with photographs to see the material.

MATERIAL

The stremabed material excavated from the existing streambed shall be removed and regraded to create a smooth streambed. The excavated streambed material shall also be reused to fill the voids in the proposed riprap placed below the ordinary high water/bank line within the area of streambed restoration.

In the event that the excavated material is not suitable or there is not enough available suitable material, additional streambed restoration material shall be locally sourced that matches the composition of the existing native river bed. The following gradation sampled from a similar streambed surface shall be used as a guide.

Stream Bed Material Gradation

Particle	Percent (%) Composition
+ 3" diameter	0
Gravel	21.7
Sand	69.3
Fines	9

The streambed material shall be approved by the Resident Engineer and Geomorphologist prior to use.

Related Items

Riprap Stone shall conform to the requirements of Item 983. and shall be paid for under that item.

CONSTRUCTION

Channel

The streambed material shall be reinstalled over riprap (MassDOT Item 983.522, as depicted on the plans, to an average thickness of 1 foot, with variations in thickness as necessary to replicate existing channel conditions. The initial placement of streambed material shall fill the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

Reinstallation of the stockpiled streambed material shall be placed on top of the riprap to restore streambed habitat and fish passage. The streambed materials shall be installed during normal low water conditions behind cofferdams in accordance with the environmental permits.

Completion

Once all material has been placed in the stream channel and approved by the Geomorphologist and Resident Engineer, the Contractor shall remove the cofferdams in such a way as to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed shall maintain the general configuration of the existing streambed bedform and there shall be minimal subsurface flow upon final inspection by the Resident Engineer and Geomorphologist. The project must be passable by fish and other aquatic organims following construction.

The streambed restoration to be measured for payment will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Resident Engineer and Geomorphologist.

BASIS OF PAYMENT

The accepted streambed restoration will be paid for on a lump sum basis. Payment will be full compensation for excavating, stockpiling, transporting, and placing the material specified and for furnishing all labor, tools, equipment, testing, and incidentals necessary to complete the work.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

SPECIAL PROVISION ATTACHMENTS

TURTLE PROTECTION PLAN

WOOD TURTLE (*Glyptemys insculpta*) PROTECTION PLAN

General

This section outlines the requirements of the Natural Heritage and Endangered Species Program (NHESP) of the Division of Fisheries and Wildlife (DFW) for projects that occur in the vicinity of high-priority wood turtle (*Glypemys insculpta*) populations. The requirements consist of monitoring and protecting turtles during the replacement of the Bay Road Bridge over the Fort River in Hadley, Massachusetts (MassDOT Project 608460/NHESP File: 23-6213)

One Time Sweeps – Prior to Vegetation Clearing and In-water Cofferdam Installation

The Turtle Monitor (the Monitor) shall be a MassDOT biologist (David J. Paulson, (857) 262-3378, david.j.paulson@dot.state.ma.us; or a representative from MassDOT Wildlife and Endangered Species Unit) approved by the Natural Heritage and Endangered Species Program (NHESP). The Monitor shall obtain a scientific collecting permit from the NHESP to handle wood turtles. The Monitor shall visit the site prior to the start of work, and the Contractor and/or Resident Engineer shall coordinate this site visit with the Monitor at least 60 days prior to construction commencement. The Monitor shall sweep the site prior to any site clearing, grubbing, earth disturbance, or site preparations. The Monitor shall inspect vegetation within 200' of the stream, prior to the establishment of the limit of work line and Turtle Exclusion Fence Barrier.

In addition, the Monitor shall provide a sweep of the site prior to any work in water. The Monitor shall inspect all areas of land under water where cofferdams are to be installed, paying close attention to overhanging banks and in water coarse woody debris.

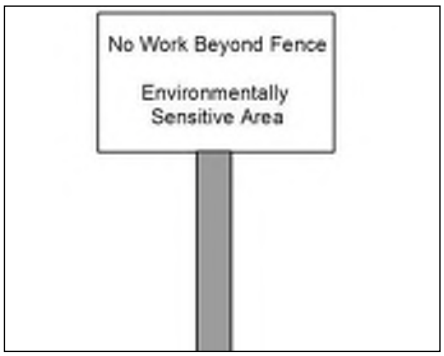
The Monitor shall visually sweep the described areas immediately before machines enter the area and relocate any turtles to suitable habitat immediately beyond the construction site. The Monitor shall provide contact information to the project supervisor in the event a wood turtle is discovered on-site. The Monitor may visit the site on only one day if the vegetation clearing and in-water work are initiated on the same day. Upon completion of the monitoring, the Monitor shall provide the NHESP with a summary of activities at the construction site. This report shall include the number and duration of visits and rare species observation forms for all state-listed species encountered. In the event of finding an injured turtle, the turtle shall be transported to a suitable veterinarian. In the event of finding a turtle with a radio transmitter, the NHESP and the contact on the transmitter shall be alerted immediately.

Additionally, since the road will remain open to traffic during construction, the Resident Engineer trained by a qualified MassDOT Biologist shall provide a sweep of the site prior to each workday and relocate any turtles to suitable habitat immediately beyond the construction site. In the event a wood turtle is discovered on site, the Registered Engineer must contact the Monitor. Contact information of the Monitor will be provided to the Resident Engineer.

All state-listed species encountered in or near the project shall be reported to the NHESP through a Rare Animal/Plan Observation Report with the required supporting materials within 10 days of the observation. No state-listed species may be removed from the project site unless under the direct supervision of the Monitor or the NHESP.

Establishment of a Limit of Work Barrier

Following the sweep of the work site, a limit of work barrier shall be installed. This line shall consist of staked compost filter tubes and Turtle Exclusion Fence Barrier (silt fence as the outer boundary) and shall contain signage clearly identifying it as the limits of work in all four quadrants. Refer to the attached sketch for the approximate location of the Turtle Exclusion Fence Barrier.



Example limit of work sign.

Installation of the barrier must be conducted using methods that result in a minimum of disturbance (i.e., hand-dug, "2-man" trencher or auger). It is not appropriate to clear large access paths prior to sweeps for turtle. No clearing may occur outside the limit of work approved by the NHESP without additional review and approval by the NHESP.

1. The barrier must be composed of at least 2 1/2 feet of vertical barrier above ground and an additional 4-6 inches buried below ground.
2. The face of the material must be relatively smooth. Materials commonly used are staked at 6 - 10 foot intervals and include tightly woven geotextile, aluminum flashing, or other such materials stapled or tacked to stakes. Loosely woven geotextile fabrics, hay/straw bales, wattles or tubular materials are not generally sufficient.
3. The bottom of the silt fencing must be carefully buried in a 4-6 inch deep trench. The trench must be backfilled and compacted. If it is not possible to dig a trench, then the bottom of the barrier must be affixed to the surface.
4. If project phasing and the traffic management plan allow, the barrier shall only include a single gap at each limit of the project large enough for vehicle passage to access the construction area. These gaps must be closed each night during the turtle active season (March 15 – October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations. The turtle barrier gate must be keyed into the barrier so that turtles cannot enter the construction area.
5. If hay or straw bales are to be used with silt fencing, they shall be installed on the work-side of the silt fence to avoid turtles using these to breach the barrier.
6. Once installed, the barrier shall be taut between the stakes. Slumps or loose materials will undermine the effectiveness of the barrier. In some circumstances, geotextile fabrics may need to be reinforced with backer material to ensure integrity. Backer material is typically similar to hardware cloth.

Once per week, a person familiar with silt barrier maintenance and installation shall inspect the barrier and facilitate any repairs or alterations. The limit of work barrier should remain taut between stakes and any holes along the bottom repaired. MassDOT shall provide the NHESP with the name and contact information of the Resident Engineer responsible for coordinating necessary sweeps and maintaining appropriate barriers.

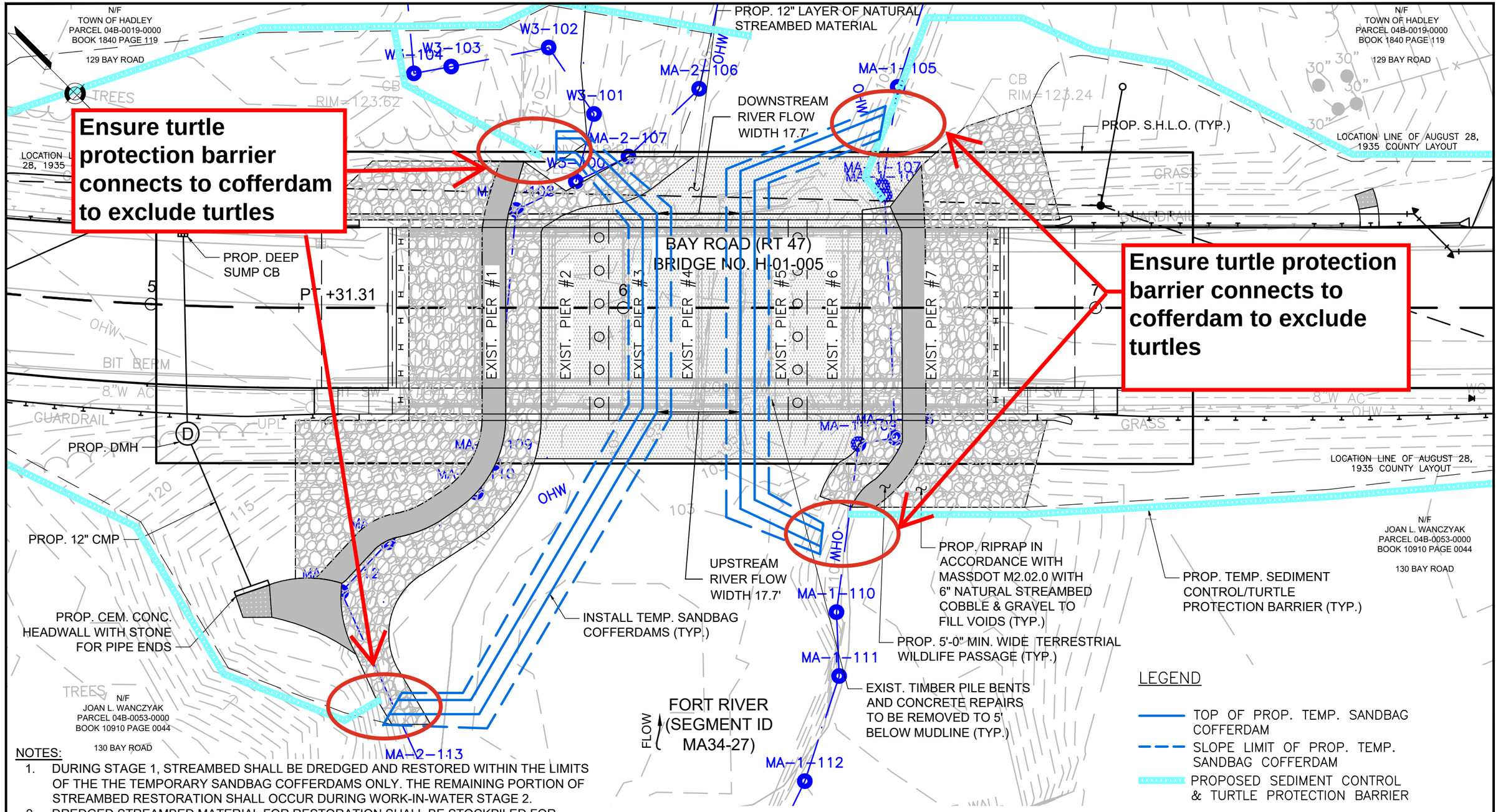
Construction Worker Training:
The Monitor shall provide to the construction foreperson wood turtle identification and handling pamphlets. All construction, landscaping, and other sub-contractors associated with the Project shall be informed in writing of the likely presence of State-listed Species on the Property and what measures (observation and injury protection) should be implemented to minimize direct harm to State-listed Species.

Further, no wildlife shall be removed from the Property without approval of a qualified wildlife biologist or the Division except as necessary to receive veterinary treatment in the case of harm during construction.

This protocol may require only one to three days of labor, including field surveys and correspondence with the NHESP.

Basis of Payment:
There will be no payment for the work conducted by the Turtle Monitor, as the Monitor will be provided to the Contractor as a free service by MassDOT.

Installation of a limit of work barrier, turtle barrier gates, and limit of work signage shall be considered incidental under ITEM 767.121 SEDIMENT CONTROL BARRIER.



NOTES:

1. DURING STAGE 1, STREAMBED SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY. THE REMAINING PORTION OF STREAMBED RESTORATION SHALL OCCUR DURING WORK-IN-WATER STAGE 2.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

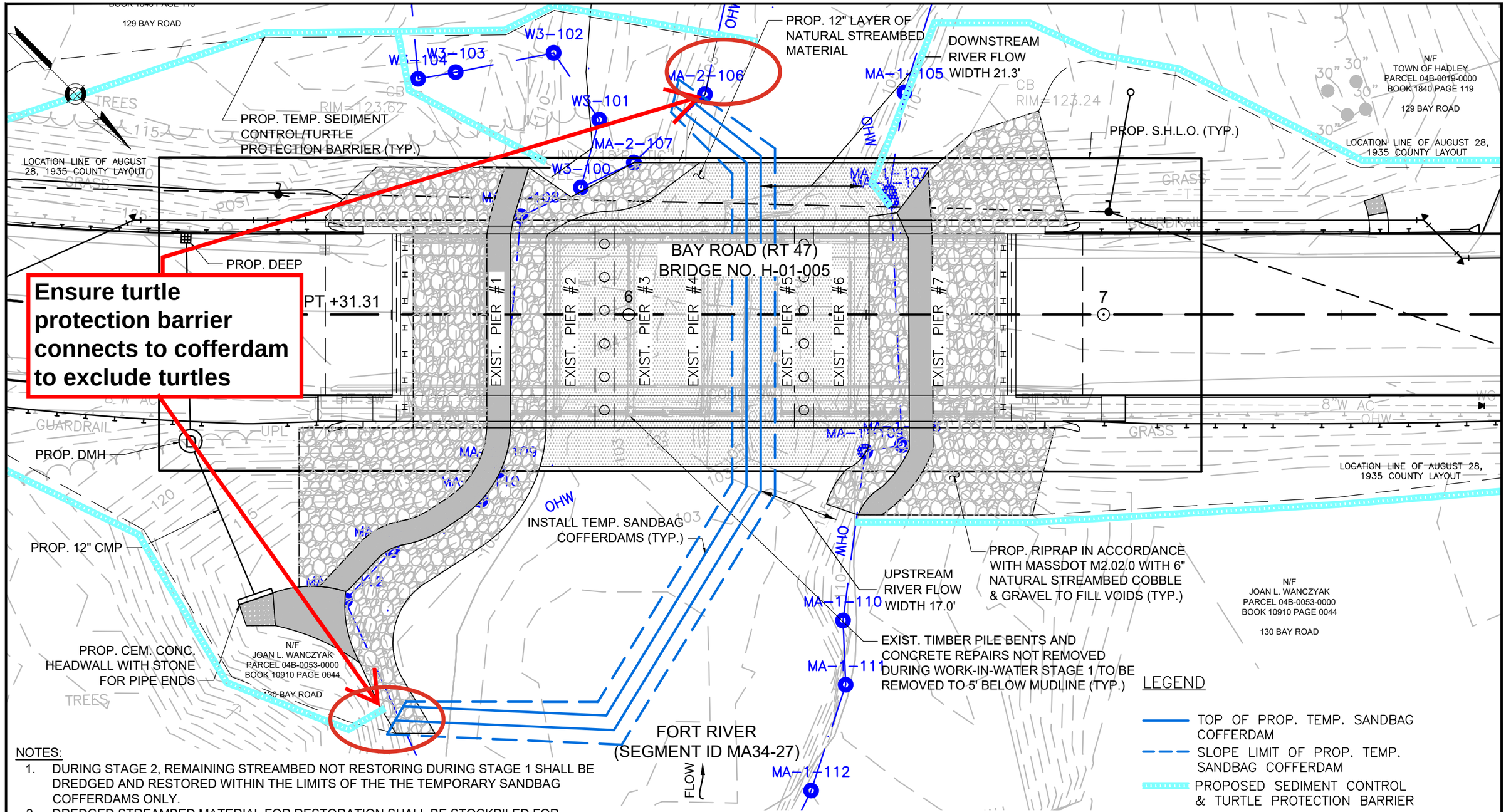
WORK-IN-WATER STAGE 1

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

Turtle Protection Plan Sketch, Page 1
See Turtle Protection Plan Special Provision for details
For further guidance, contact the MassDOT Wildlife Unit
David Paulson, MassDOT Wildlife Unit Supervisor

(david.j.paulson@state.dot.ma.us)



NOTES:

1. DURING STAGE 2, REMAINING STREAMBED NOT RESTORING DURING STAGE 1 SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

WORK-IN-WATER STAGE 2

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

Turtle Protection Plan Sketch, Page 2
See Turtle Protection Plan Special Provision for details
For further guidance, contact the MassDOT Wildlife Unit
David Paulson, MassDOT Wildlife Unit Supervisor

(david.j.paulson@state.dot.ma.us)

HIGHWAY GUARD DETAILS

RIGHT SIDE:
STA. 4+69 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

LEFT SIDE:
STA. 2+80 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

DRAINAGE DETAILS

SEE UTILITY SHEET 16

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS

The gap in the road must be closed at the end of each workday during the turtle active season (March 15 - October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations.

Ensure turtle barrier connects to cofferdams to exclude turtles

Ensure turtle barrier connects to cofferdams to exclude turtles

Turtle Protection Plan Sketch, Page 3
See Turtle Protection Plan Special Provision for detailsßor further guidance, contact the MassDOT Wildlife UnitŸavid Paulson, MassDOT Wildlife Unit Supervisor
david.j.paulson@state.dot.ma.us)

NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.

FOR PROFILE: SEE SHEET NO. 12

0 20 50 100
SCALE: 1" = 20'

CONTINUED ON SHEET NO. 11

608460_HD10-11 (CONST).DWG Plotted on 24-Aug-2021 4:51 PM

HIGHWAY GUARD DETAILS

RIGHT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 9+72	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

LEFT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 7+79	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3
STA. 8+26 TO STA. 9+76	GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

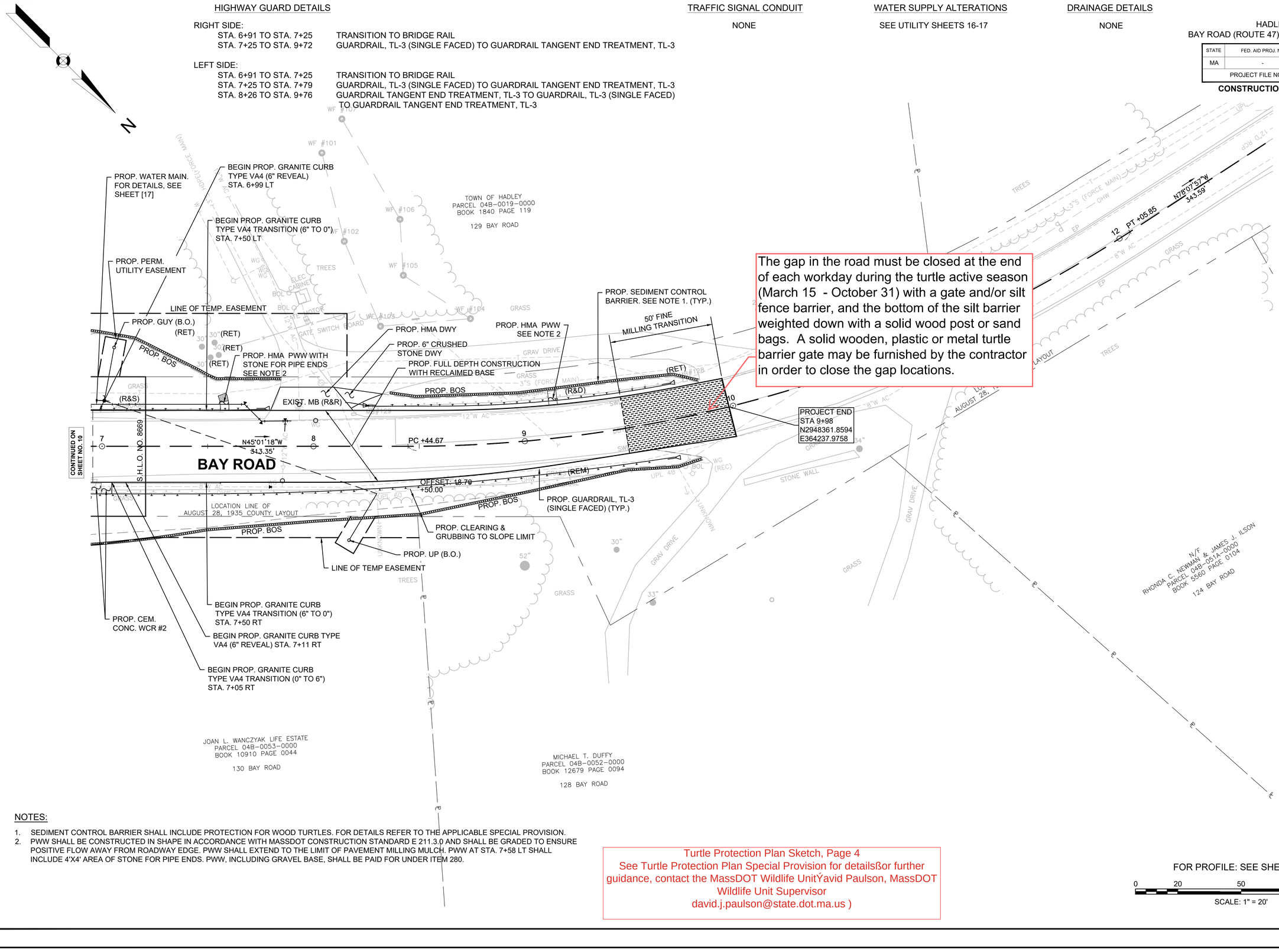
DRAINAGE DETAILS

NONE

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS



The gap in the road must be closed at the end of each workday during the turtle active season (March 15 - October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations.

NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.
2. PWW SHALL BE CONSTRUCTED IN SHAPE IN ACCORDANCE WITH MASSDOT CONSTRUCTION STANDARD E 211.3.0 AND SHALL BE GRADED TO ENSURE POSITIVE FLOW AWAY FROM ROADWAY EDGE. PWW SHALL EXTEND TO THE LIMIT OF PAVEMENT MILLING MULCH. PWW AT STA. 7+58 LT SHALL INCLUDE 4'X4' AREA OF STONE FOR PIPE ENDS. PWW, INCLUDING GRAVEL BASE, SHALL BE PAID FOR UNDER ITEM 280.

Turtle Protection Plan Sketch, Page 4
See Turtle Protection Plan Special Provision for detailsßor further guidance, contact the MassDOT Wildlife UnitŸavid Paulson, MassDOT Wildlife Unit Supervisor
david.j.paulson@state.dot.ma.us)

FOR PROFILE: SEE SHEET NO. 13

0 20 50 100
SCALE: 1" = 20'

608460_HD10-11 (CONST).DWG Plotted on 24-Aug-2021 4:51 PM

ADDENDUM ATTACHMENT 8

NHESP Coordination

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

October 30, 2024

Julia Hoogeboom
10 park plaza
Boston, MA 02116

RE: Applicant: Julia Hoogeboom
Project Location: BAY ROAD (ROUTE 47) OVER THE FORT RIVER
Project Description: 608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER
NHESP File No.: 23-6213

Dear Applicant:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") received the MESA Project Review Checklist and supporting documentation for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

The MESA is administered by the Division, and prohibits the Take of state-listed species. The Take of state-listed species is defined as "in reference to animals…harm…kill…disrupt the nesting, breeding, feeding or migratory activity…and in reference to plants…collect, pick, kill, transplant, cut or process…Disruption of nesting, breeding, feeding, or migratory activity may result from, but is not limited to, the modification, degradation, or destruction of Habitat" of state-listed species (321 CMR 10.02).

The Division has determined that this Project, as currently proposed, will occur **within** the actual habitat of the following species:

Scientific Name	Common Name	Taxonomic Group	State Status
Carex grayi	Gray's Sedge	Plant	Threatened
Glyptemys insculpta	Wood Turtle	Reptile	Special Concern
Gomphurus fraternus	Midland Clubtail	Dragonfly/Damselfly	Endangered
Lota lota	Burbot	Fish	Special Concern

These species and their habitats are protected in accordance with the MESA.

Based on the information provided and the information contained in our database, the Division finds that a portion of this project, as currently proposed, **must be conditioned** to avoid a prohibited Take of state-listed species (321 CMR 10.18(2)(a)). **To avoid a prohibited Take of state-listed species, the conditions attached to this letter must be met.**

Provided the attached conditions are fully implemented and there are no changes to the project plans, this project will not result in a Take of state-listed species. We note that all work is subject to the anti-segmentation provisions (321 CMR 10.16) of the MESA. This determination is a final decision of the Division of Fisheries and Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Melany Cheeseman, Endangered Species Review Assistant, at Melany.Cheeseman@mass.gov, (508) 389-6357.

Sincerely,



Jesse Leddick
Assistant Director

cc: david paulson, Massachusetts Department of Transportation
Julia Hoogeboom, Massachusetts Department of Transportation

Attachment: List of Conditions

List of Conditions

Applicant: Julia Hoogeboom
Project Location: BAY ROAD (ROUTE 47) OVER THE FORT RIVER
Project Description: 608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER
NHESP File No.: 23-6213
Heritage Hub Form ID: RC-88660
Approved Plan: Massachusetts Department of Transportation Plan and Profile of Bay Road (Route 47) Over Fort River (Bridge NO. H-01-005 (C1H))
Plan date: 8/9/21

To avoid a prohibited Take of state-listed species, the following condition(s) must be met:

1. **Turtle Protection Plan:** Prior to the start of work (including vegetation clearing or soil disturbance), the Applicant shall submit a Wood Turtle Protection Plan to the Division for review and written approval. Said Plan shall detail procedures for protecting state-listed turtles during construction, and be prepared and implemented by a qualified, Division-approved wildlife biologist. The Division is available for consultation on Plan development and can provide contact information for qualified biologists. The Division-approved Plan shall be implemented as written; any proposed changes to the Plan must be submitted to the Division for review and written approval prior to implementation of said changes. By December 31st of any year in which work occurs, the qualified biologist shall submit: a) a summary report to the Division detailing project status and compliance with the Plan; and b) any observations of state-listed turtles at https://www.mass.gov/how-to/report-rare-species-vernal-pool-observations.

ADDENDUM ATTACHMENT 9

NOAA Coordination

From: Richards, Todd (FWE)
To: Kautza, Adam (FWE); Burns, Trevor B. (DOT)
Cc: Hoogeboom, Julia A. (DOT); Walker, Courtney L. (DOT); Joa, Michael A. (DOT); Paulson, David J. (DOT)
Subject: Re: MassDOT 608460 Hadley Fort River
Date: Wednesday, January 29, 2025 3:10:25 PM

No TOY restrictions on my part at this location, but I wonder if this is a good test case to review our layers for the SWTAP. This would not be intended to slow things down, but review our data as it relates to infrastructure.

Todd Richards
Assistant Director of Fisheries
Massachusetts Division of Fisheries & Wildlife
email: Todd.Richards@mass.gov
mass.gov/masswildlife | facebook.com/masswildlife

From: Kautza, Adam (FWE) <adam.kautza@mass.gov>
Sent: Wednesday, January 29, 2025 3:07 PM
To: Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Cc: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>; Walker, Courtney L. (DOT) <Courtney.L.Walker@dot.state.ma.us>; Joa, Michael A. (DOT) <Michael.A.Joa@dot.state.ma.us>; Richards, Todd (FWE) <todd.richards@mass.gov>
Subject: Re: MassDOT 608460 Hadley Fort River

Hi Trevor,

The Fort River is a CFR but the proposed work at Bay Road is located pretty far downstream of what would be considered coldwater habitat in this system. I don't think we would ask for a TOY restriction in this case.

Todd may (or may not) want to chime in here based on the other work that is supposed to be happening in and along the Fort River.

Adam Kautza PhD | Coldwater Fisheries Project Leader
Massachusetts Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581
(857) 275-6961
adam.kautza@mass.gov

From: Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>

Sent: Wednesday, January 29, 2025 12:16 PM
To: Kautza, Adam (FWE) <adam.kautza@mass.gov>
Cc: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>; Walker, Courtney L. (DOT) <Courtney.L.Walker@dot.state.ma.us>; Joa, Michael A. (DOT) <Michael.A.Joa@dot.state.ma.us>; Richards, Todd (FWE) <todd.richards@mass.gov>
Subject: MassDOT 608460 Hadley Fort River

Hi Adam ,

MassDOT is proposing a bridge replacement on Bay Road (Route 47) over the Fort River in the town of Hadley (42°19'58.0"N 72°34'43.5"W) , as well as reconstructing the roadway approaches. The project requires work within Waters of the United States, including approximately 1,500 square feet (SF) of permanent waterway impacts, 8,720 SF of temporary waterway impacts, 374 cubic yards of dredging and 940 SF of temporary Bordering Vegetated Wetland impacts.

MassDOT is reaching out to the Massachusetts Division of Fisheries and Wildlife regarding potential Time of Year restrictions and/or in-water sediment management for the species listed in the regulation.

Please let us know if you have any comments or need more information. Attached are plans, maps and NHESPs determination that noted one fish species.

Trevor Burns
Wildlife Biologist
Environmental Services
MassDOT Highway Division

50 Redfield Street, Suite 102
Boston, MA 02122
www.benesch.com
P 617-288-0900

March 4, 2025

Heidi Davis
Senior Environmental Analyst & Highway Unit Supervisor
MassDEP Boston Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: 401 Water Quality Certification for the Replacement of Bridge H-01-005, Bay Road (Route 47) over the Fort River
MassDOT Project File No. 608460
MassDEP 401 WQC Transmittal No. 24-WW26-0055-APP (Combined Fill and Dredge)

Dear Ms. Davis,

Benesch has reviewed the Technical Deficiency Review provided by MassDEP via email on February 25, 2025 regarding the 401 Water Quality Certification for the subject project. Following this page, please find copies of the comments received in the email along with Benesch's response.

Additionally, the following revised attachments have been provided:

- Revised Proposed & Existing Design Exhibits
  - Exhibit 2 of 20 – Plan View
  - Exhibit 14 of 20 – Wetland Mitigation Plan
  - Exhibit 15 of 20 – Wetland Restoration Area Plan View
- Proof of NHESP Approval of Turtle Protection Plan

Should you require additional information, please let me know.

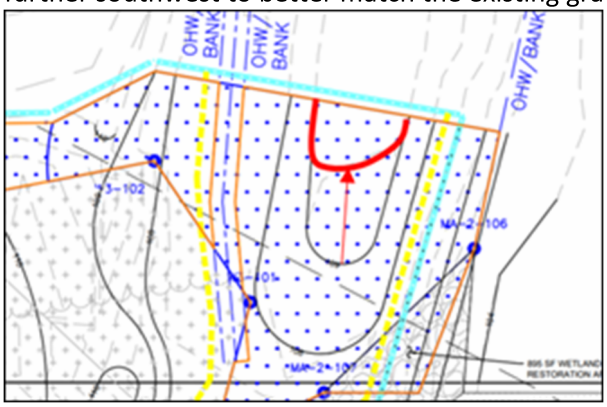
Thank you,

Ashley Bomely, PE

CC: Anthony Christakis, MassDOT
Michael Joa, MassDOT
Courtney Walker, MassDOT
Michael McHugh, DEP WERO
Dan Vasconcelos, USACE
Kevin Newton, USACE
Kayla Loubriel, Hadley Conservation Commission

Comments dated February 25, 2025 from MassDEP:

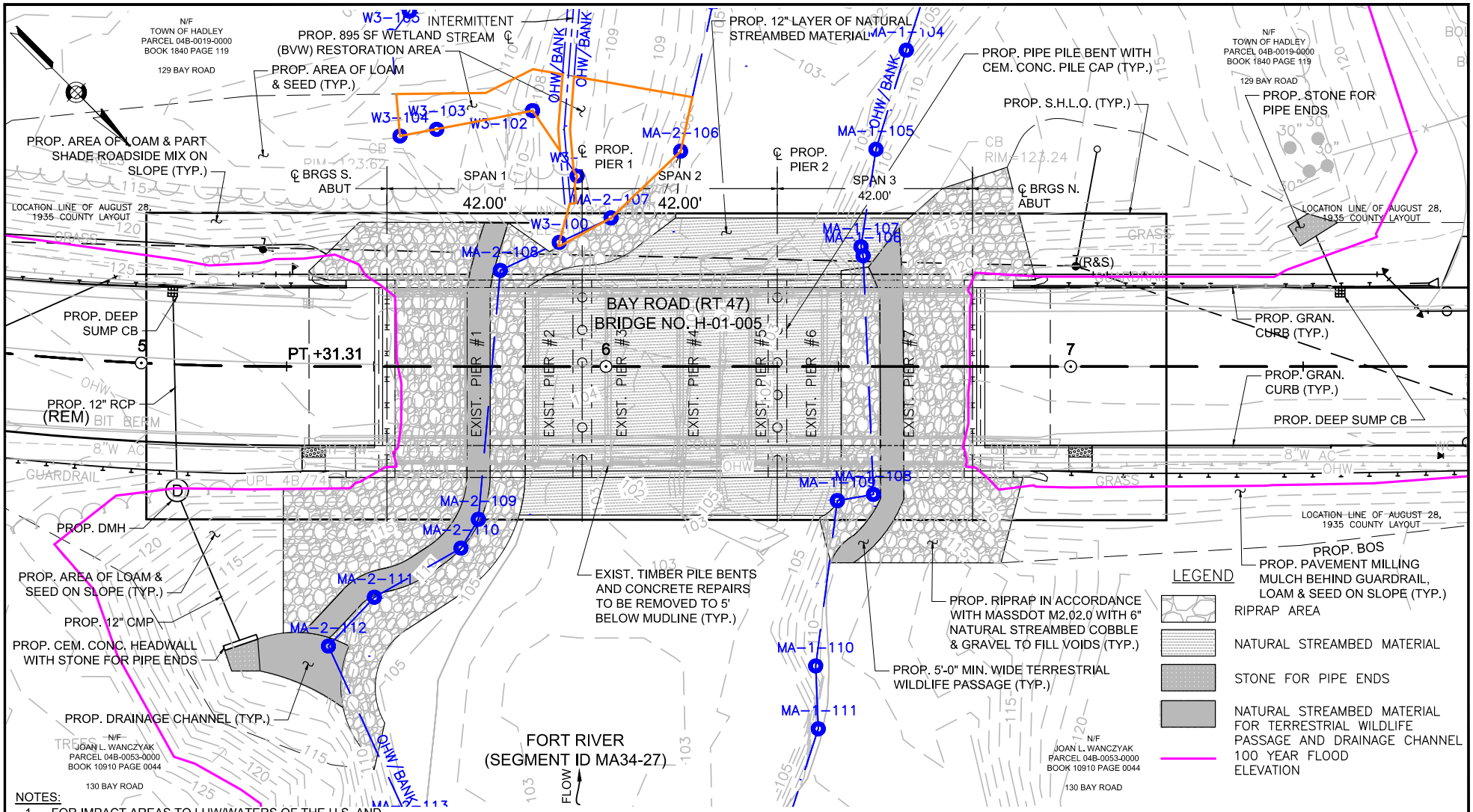
1. Please consider shifting the proposed 109-foot contour that is located west of the intermittent stream further southwest to better match the existing grade (as shown by the red line in the sketch below).



   a. *Benesch Response: Agree, contour has been revised as requested. Exhibit 15 of 20 showing the revised contour has been provided following this letter.*
2. There is a discrepancy between the proposed amount of BVW/vegetated wetland restoration called out on the exhibits (895 square feet (sf)) versus what is listed on the Wetland Impact Area table on Exhibit 14 (940sf). Please confirm which amount is correct.
   a. *Benesch Response: The correct area is 895 square feet. Exhibit 14 of 20 reconciling the two areas has been provided following this letter.*
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   a. *Benesch Response: A deep sump catch basin has been added to the plans. Please note, due to right-of-way constraints, a flared end with a 5' long stone splash pad cannot be incorporated. The catch basin will outlet as a pipe end, however will incorporate a 5' long stone splash pad. Please also note, due to right-of-way constraints, the splash pad will be at a 2H:1V slope to match the proposed grading. Exhibit 2 of 20 showing the deep sump catch basin and splash pad has been provided following this letter.*
4. Please note that proof of NHESP's approval of the turtle protection plan (TPP) must be provided to MassDEP prior to construction. A condition will be included in the WQC if proof is not provided before it's issuance.
   a. *Benesch Response: Correspondence showing NHESP's approval of the TPP has been provided following this letter.*

ATTACHMENT 1

Revised Proposed & Existing Design Exhibits



NOTES:
1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

PLAN VIEW

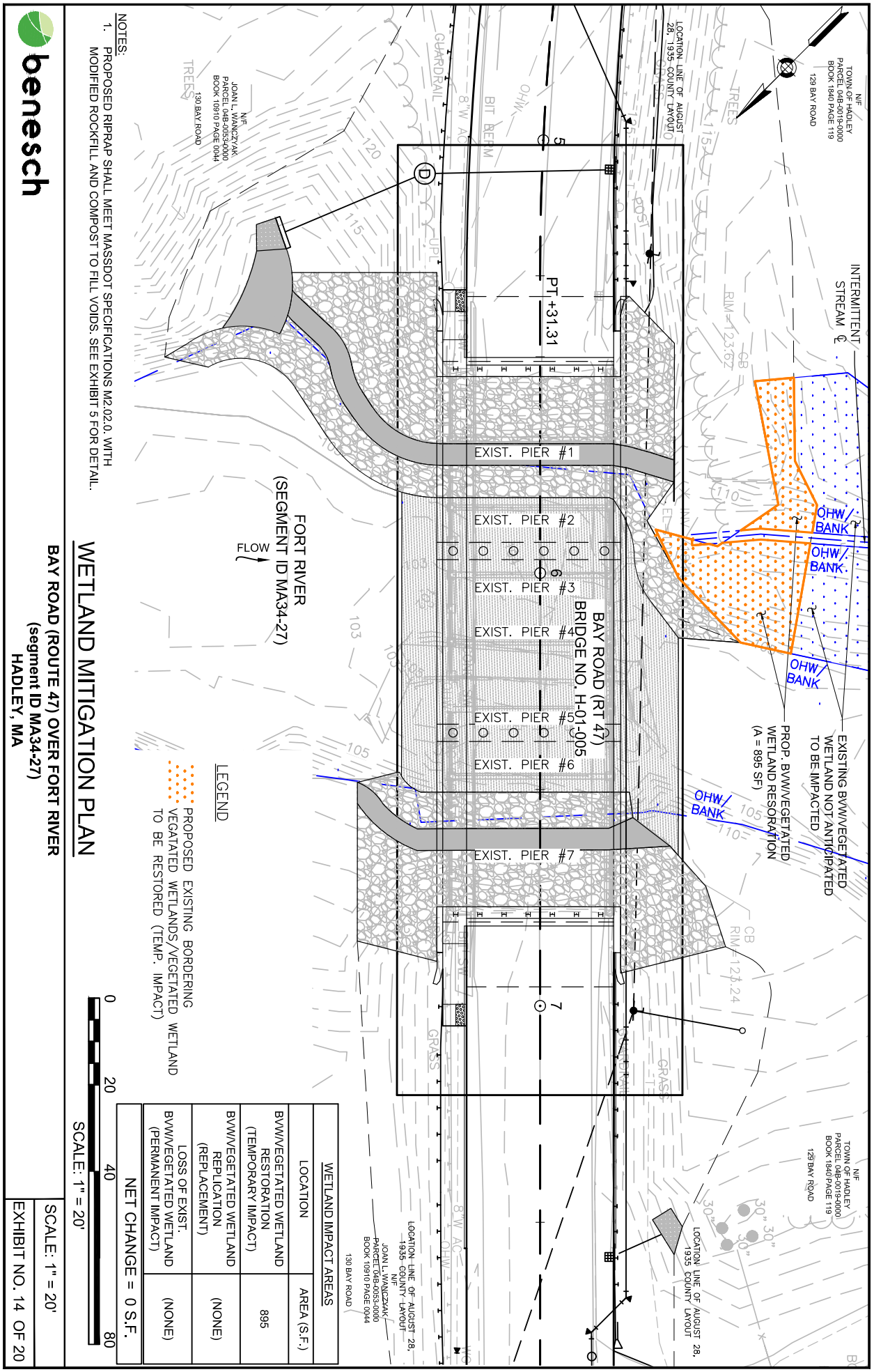
0 20 40 80
SCALE: 1" = 20'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 2 OF 20



NOTES:
1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH MODIFIED ROCKFILL AND COMPOST TO FILL VOIDS. SEE EXHIBIT 5 FOR DETAIL.

WETLAND MITIGATION PLAN

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

WETLAND IMPACT AREAS	
LOCATION	AREA (S.F.)
BVW/VEGETATED WETLAND RESTORATION (TEMPORARY IMPACT)	895
BVW/VEGETATED WETLAND REPLICATION (REPLACEMENT)	(NONE)
LOSS OF EXIST. BVW/VEGETATED WETLAND (PERMANENT IMPACT)	(NONE)
NET CHANGE = 0 S.F.	

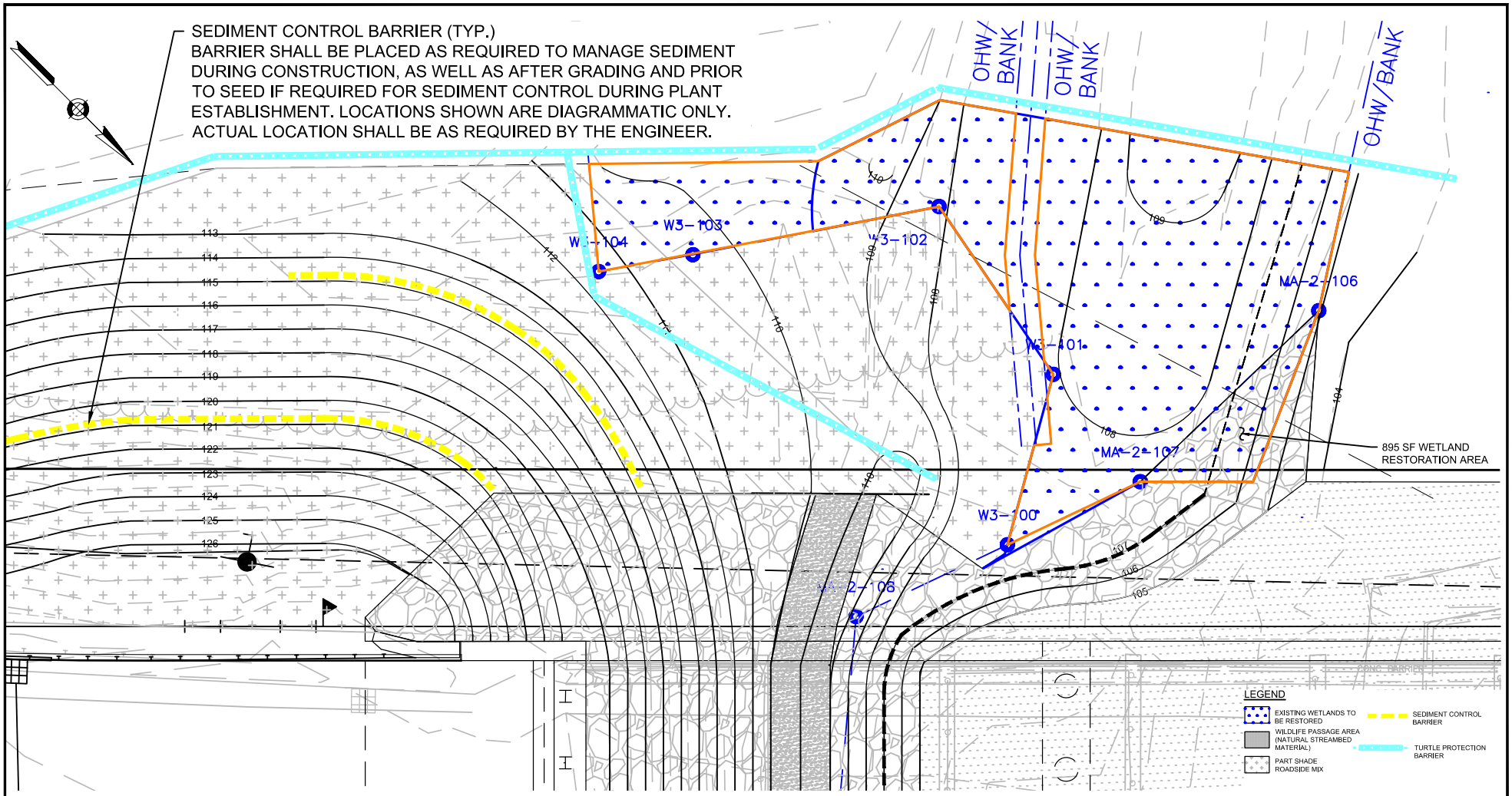
benesch

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EXHIBIT NO. 14 OF 20

Proposal No. 608460-130088

A00828 - 192



WETLAND RESTORATION AREA
PLAN VIEW

0 8 16 24 32

SCALE: 1" = 8'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
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SCALE: 1" = 8'

EXHIBIT NO. 15 OF 20

ATTACHMENT 2

Proof of NHESP Approval of Turtle Protection Plan

From: McGuire, Timothy (FWE)
To: Hoogeboom, Julia A. (DOT)
Cc: Cheeseman, Melany (FWE)
Subject: RE: Turtle Protection Plan, Bay Road over Fort River DOT 608460/NHESP 23-6213
Date: Thursday, December 12, 2024 11:17:15 AM
Attachments: 608460 Hadley Fort River_TPP_23-6213.pdf

Hi Julia,

I have reviewed the attached Turtle Protection Plan. By way of email this TPP is hereby approved. Please feel free to reach out with any questions or concerns.

All the best,

Tim McGuire
Endangered Species Review Biologist
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
Phone: (508) 389-6366 | Email: timothy.mcguire2@mass.gov
mass.gov/masswildlife | facebook.com/masswildlife

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From: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>
Sent: Tuesday, December 10, 2024 10:13 AM
To: McGuire, Timothy (FWE) <Timothy.McGuire2@mass.gov>
Subject: Turtle Protection Plan, Bay Road over Fort River DOT 608460/NHESP 23-6213

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Thank you for your time.
-Julia

Julia Hoogeboom

Wildlife and Endangered Species Coordinator
Environmental Services
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857-772-1749

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March 4, 2025

Heidi Davis
Senior Environmental Analyst & Highway Unit Supervisor
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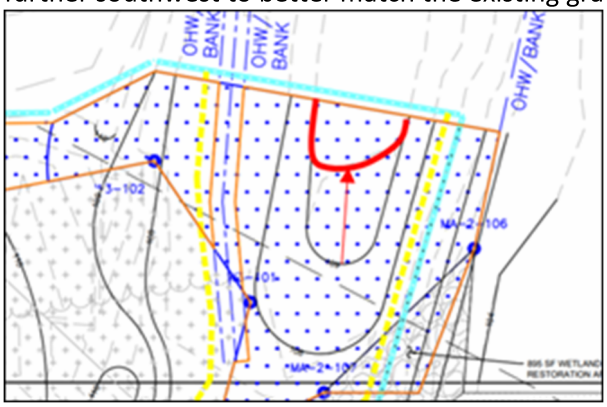
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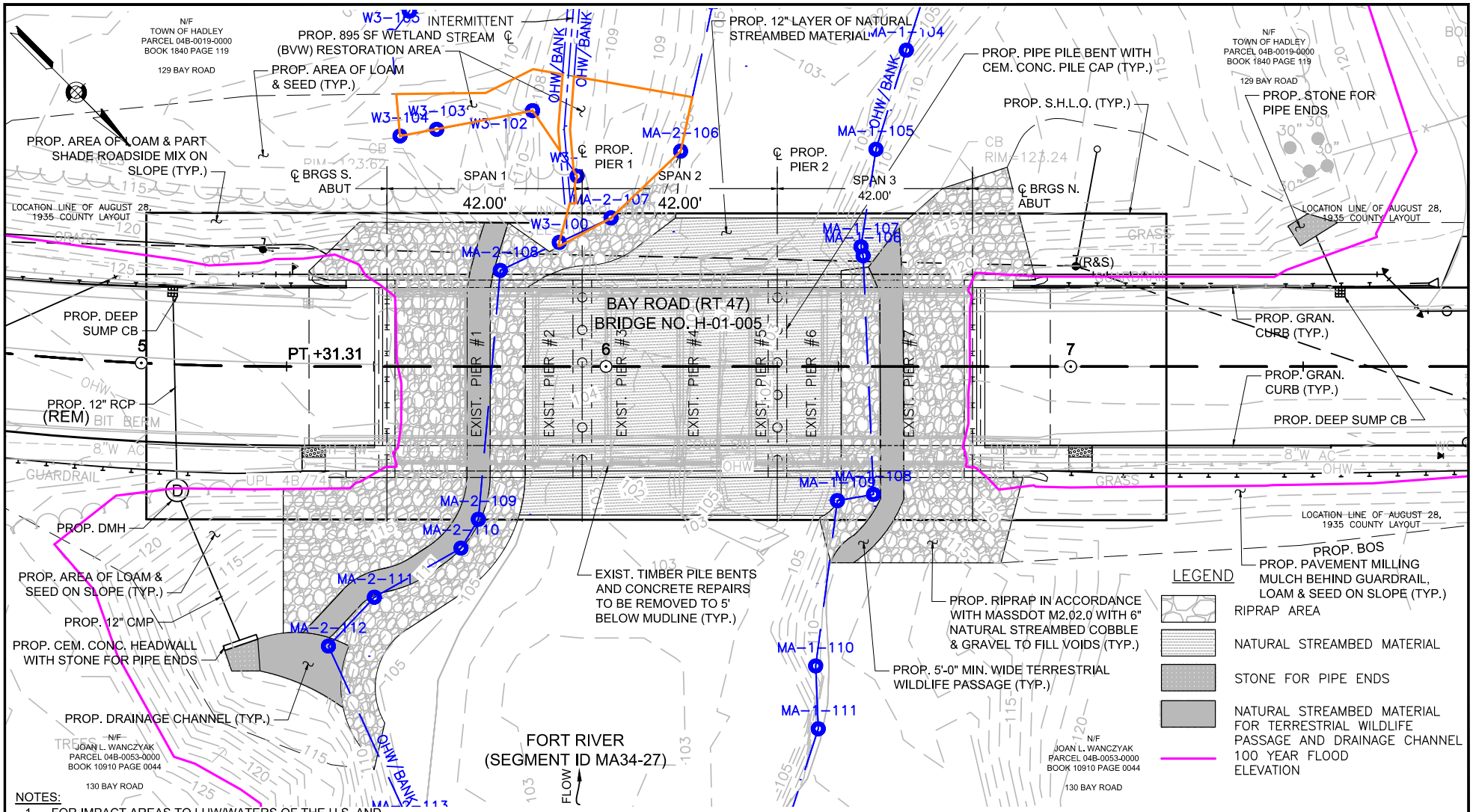
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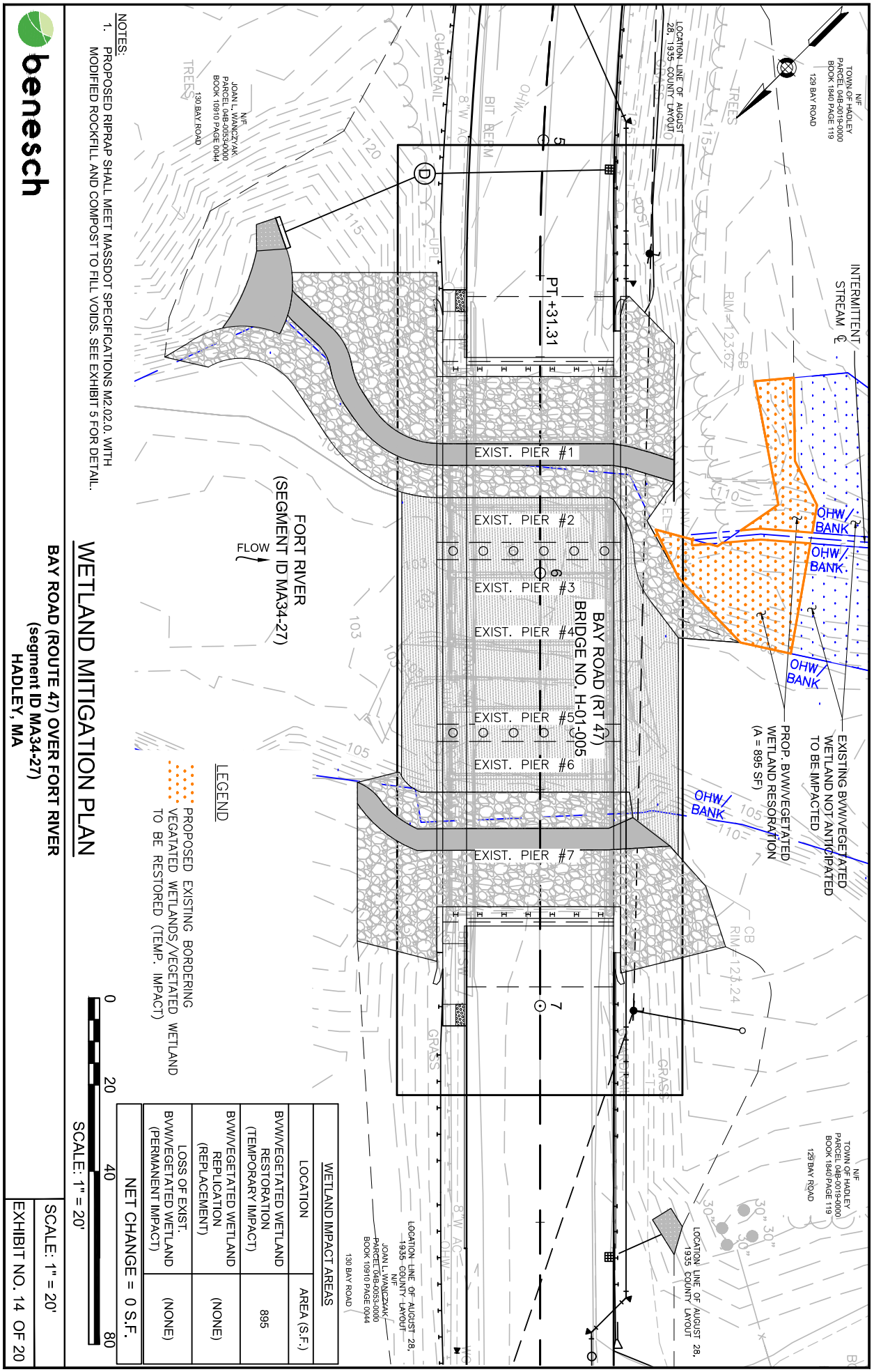
0 20 40 80
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benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

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EXHIBIT NO. 2 OF 20



WETLAND MITIGATION PLAN

BAY ROAD (ROUTE 47) OVER FORT RIVER
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HADLEY, MA

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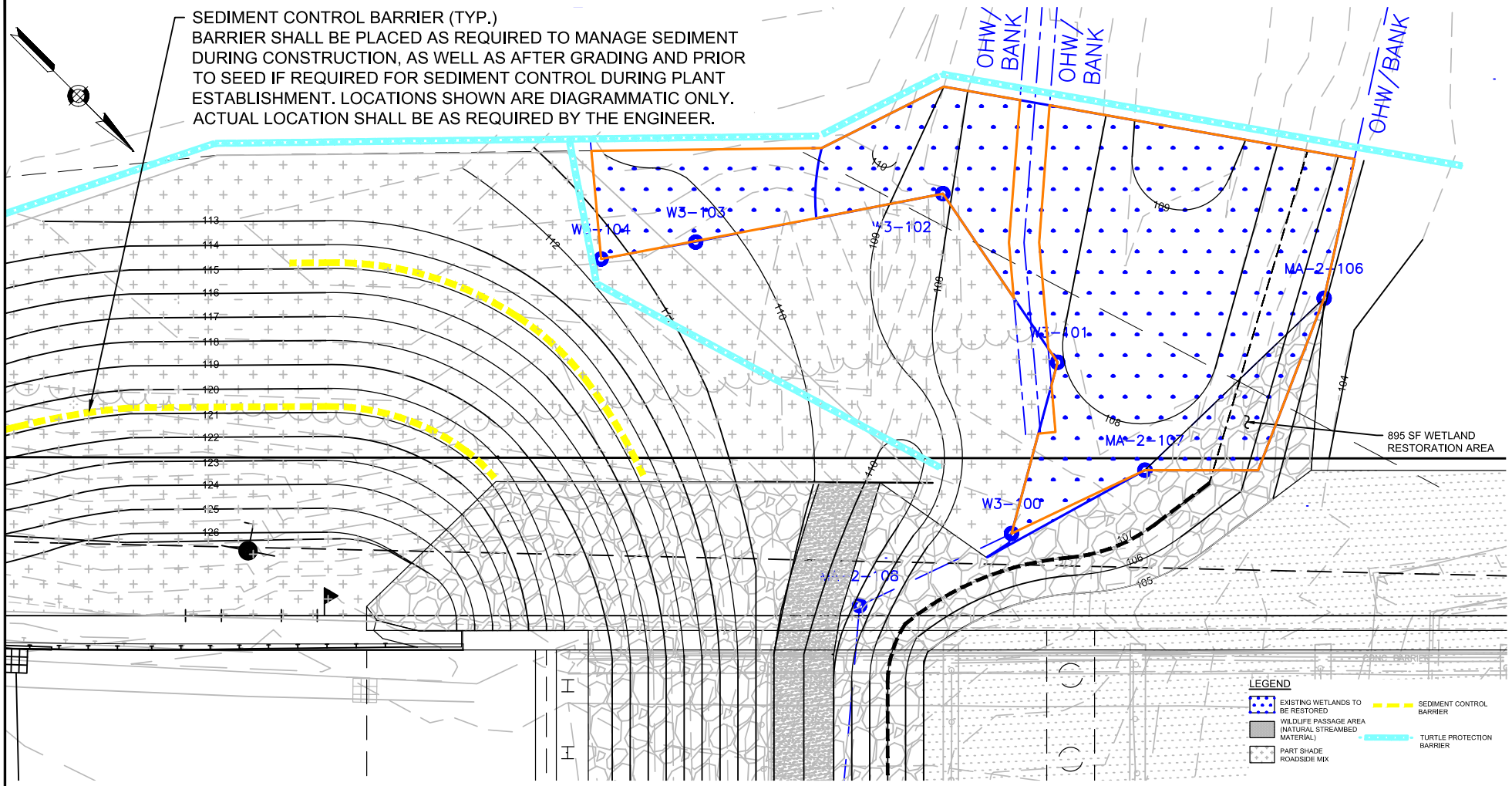
benesch

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EXHIBIT NO. 14 OF 20

Proposal No. 608460-130088

A00828 - 201



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PLAN VIEW

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benesch

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To: Hoogeboom, Julia A. (DOT)
Cc: Cheeseman, Melany (FWE)
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Date: Thursday, December 12, 2024 11:17:15 AM
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Tim McGuire
Endangered Species Review Biologist
Massachusetts Division of Fisheries & Wildlife
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Phone: (508) 389-6366 | Email: timothy.mcguire2@mass.gov
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-Julia

Julia Hoogeboom

Wildlife and Endangered Species Coordinator
Environmental Services
MassDOT Highway Division
857-772-1749

DOCUMENT A00829

Combined

Army Corps of Engineers
Permit Application
and
Massachusetts Department of Environmental Protection
Water Quality Certificate Application

Responses to Administrative Completeness and
Technical Deficiency Review and
Addendum

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benesch

50 Redfield Street, Suite 102
Boston, MA 02122
www.benesch.com
P 617-288-0900

February 20, 2025

Heidi Davis
Senior Environmental Analyst & Highway Unit Supervisor
MassDEP Boston Office
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Boston, MA 02114

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MassDOT Project File No. 608460
MassDEP 401 WQC Transmittal No. 24-WW26-0055-APP (Combined Fill and Dredge)

Dear Ms. Davis,

Benesch has reviewed the Technical Deficiency Letter provided by MassDEP regarding the 401 Water Quality Certification filed on October 7, 2024 for the subject project. Following this page, please find copies of the comments received in the Technical Deficiency Letter along with Benesch's response.

Additionally, the following addendum attachments have been provided:

- Addendum Attachment 1: Summary of Revised Impact Areas
- Addendum Attachment 2: Revised Proposed & Existing Design Exhibits
- Addendum Attachment 3: Wetland Delineation Summary Report, dated 10/22/2024
- Addendum Attachment 4: Sediment Sampling Summary
- Addendum Attachment 5: Stormwater Management Memo
- Addendum Attachment 6: O&M Plan and LTPPP
- Addendum Attachment 7: Revised Relevant Project Special Provisions or Special Provisions Not Previously Provided
- Addendum Attachment 8: NHESP Coordination
- Addendum Attachment 9: NOAA Coordination

Should you require additional information, please let me know.

Thank you,

Ashley Bomely

Ashley Bomely, PE

CC: Anthony Christakis, MassDOT
Michael Joa, MassDOT
Courtney Walker, MassDOT
Michael McHugh, DEP WERO
Dan Vasconcelos, USACE
Kevin Newton, USACE
Kayla Loubriel, Hadley Conservation Commission

Comments dated October 28, 2024 from MassDEP:

Site Plans

1. As discussed during the site visit on October 24, 2024, MassDEP understands the Highway & Bridge Design Plans (the Design Plans), last revised August 9, 2021, and submitted as Attachment M are not the most recent design plans. As such, MassDEP reviewed only the Proposed & Existing Design Exhibits (the Exhibits) in Attachment C. Please note if the Exhibits are intended to be the permitting plans of record, they will need to be revised to depict the entire limit of work similar to the Design Plans.
    a. *Benesch Response: Noted. The permitting plans of record are intended to be the exhibits shown in Attachment C of the original filing. Based on other comments provided by MassDEP, revised exhibits have been provided in Addendum Attachment 1. Additionally, for clarity, the Plan View (Exhibits 1-3) have been revised to depict the full roadway project limits.*
2. The intermittent stream identified in the Wetland Delineation Summary Report as a drainage channel that begins from the stormwater outfall within Bordering Vegetated Wetland (BVW) 3 and depicted on the accompanying figures will need to be added to the Exhibits. The stream exhibited defined bed and bank, and appears to receive hydrology from stormwater, groundwater, and periodic flood flows from the Fort River as evidenced by the presence of large woody debris and alluvial soils.
    a. *Benesch Response: Agree, linework depicting the intermittent stream centerline has been added to the exhibits provided in Addendum Attachment 1. As discussed between Epsilon and MassDEP, the existing channel has a width of 2'-6" as visually observed in the field. The intermittent stream functions as a drainage channel for the existing drainage outlet, as well as a channel for natural upland flow and floodwater when the Fort River elevation rises. In the proposed condition, 21 square feet of the intermittent stream will be permanently impacted and replaced with loam and part shade roadside mix. During construction, 45 square feet of the intermittent stream will be temporarily impacted by the cofferdams and construction access. Impacts were limited as much as possible by designing the proposed grading to meet into existing grades as quickly as possible while still adhering to MassDOT bridge, roadway and guardrail design criteria. Although there are permanent impacts, the intermittent stream will continue to function as it does in the existing condition with the exception of acting as a drainage channel for the existing drainage outlet. The existing drainage outlet is being removed as part of this project and roadway drainage will instead be directed to a new drainage outlet/drainage channel on the upstream side of the bridge. The Contractor shall not permanently impact the intermittent stream until the new drainage outlet is constructed. Since the intermittent stream flows through existing Bordering Vegetated Wetlands/Vegetated Wetland, the restoration of the temporarily impacted intermittent stream is included in the project special provision Item 755.45 – Inland Wetland Restoration.*
3. Please provide hatching differentiating the natural streambed items in the legend and on the plans of Exhibit 1.
    a. *Benesch Response: Agree, hatches have been reconciled for the 12" streambed material being regraded within the Fort River. Please note, the material makeup for both the proposed drainage channel and wildlife passage are intended to match the existing material within the Fort River.*

Potentially Contaminated Soil, Sediment, and Groundwater

4. MassDEP understands sediment sampling is underway, and reserves further comment regarding potentially contaminated soil, sediment, and groundwater management pending the results. Please also note that, although not required for this project based on the anticipated volume of dredged material, MassDEP did not pre-approve a sediment sampling plan.

a. *Benesch Response: The Sediment Sampling Plan was approved by MassDEP on November 20, 2024. The sediment sampling results, dated December 5, 2024, and sediment sampling summary have been included in Addendum Attachment 3.*

5. The narrative states no new streambed material is anticipated to be imported onto the site, as the dredged material will be reused as much as possible. As the due diligence review and specifications indicate the potential for contaminated soil, sediment, and/or groundwater, please note MassDEP will require sampling of dredged material to determine its suitability for reuse as a condition in the WQC.
    a. *Benesch Response: The sediment sampling, dated December 5, 2024, has been included in Addendum Attachment 3. Per the sediment sample results, there are concentrations of polycyclic aromatic hydrocarbons (PAHs) and metals detected above laboratory reporting limits in the samples collected. The samples were taken within areas of proposed dredging. While the material is proposed to be dredged, as described in the original filing, the material is proposed to be reused in the existing location, however graded to different elevations. The dredged material will not be relocated to other portions of the site with lesser contaminant concentrations.*

Construction and Design

6. Given the steep banks of the Fort River in each quadrant, please describe and if needed depict how equipment will access the river, including whether any temporary grading of the banks of proposed.
    a. *Benesch Response: Exact construction equipment will be determined by the Contractor as part of their means and methods. Access is anticipated to occur from the southwest and southeast bridge quadrants. The existing southwest quadrant was regraded to accommodate Contractor access as part of prior bridge repairs and the upland slope was restored in place upon completion of the repairs. The existing southeast quadrant has more gradual slopes than the other quadrants. The Contractor may also elect to use a small crane for the placement of materials and/or equipment below the bridge.*
7. Per 314 CMR 9.06 (1) and (2), please describe and if needed depict specific efforts to avoid and minimize temporary impacts to the BVW and intermittent stream. It must be demonstrated that the proposed extent of the temporary impacts of required to complete the work.
    a. *Benesch Response: As shown on Exhibits 11 and 12 of 20 in Addendum Attachment 2, temporary sandbag cofferdams will be utilized as part of the staged work-in-water and extend into the existing limits of the BVW. The cofferdams are located to allow for installation of the proposed riprap in the dry. Additionally, due to the proposed approximately 15" rise in the profile (shown in the proposed profile on Exhibit 7 of 20 in Addendum Attachment 2), regrading of all quadrants is required to blend the required vertical clearances and 1.5:1 slope of the riprap below the bridge into the existing banks. Sediment control barriers are utilized to capture upland construction related sediments prior to flowing through the existing BVW. As part of the proposed work, the Contractor shall restore 895 SF of the impacted existing BVW. The proposed grading within the area of restoration was optimized to stay as close as possible to existing slopes while still accommodating the 15" profile rise previously mentioned. As discussed in the field, the intermittent stream identified in the Wetland Delineation Summary Report primarily conveys discharge from an existing stormwater outfall, as well as accommodating flood flows from the Fort River during flood events. At no time during construction will the intermittent stream be blocked from accommodating flood flows that overtop the berm between the Fort River and intermittent stream. The temporary sandbag cofferdams have been shown to not preclude stormwater from the existing outfall from flowing towards the intermittent stream, however please note this outfall will be removed as part of the proposed work. As previously mentioned, the grading of the area of BVW restoration is as close as possible to the existing grades and would therefore minimize impacts to the beginning of the intermittent stream. As part of the regrading of the southwest quadrant, 18 LF of the intermittent stream bank will be permanently impacted and replaced with loam and part shade roadside seed mix. The portion of*

the intermittent stream that will be permanently impacted appears to primarily function as the drainage channel for the existing stormwater outfall. Since the existing outfall will be removed, this function is no longer necessary for the intermittent stream and therefore the 18 LF of bank will not be restored as a drainage channel.

8. If the intermittent stream will be impacted by the project activities, please provide a plan to restore it to pre-construction conditions following completion of the work. In particular, the stream restoration should maintain the existing functions relative to receiving periodic flood flows from the Fort River as identified in Comment 2.
    a. *Benesch Response: Linework for the centerline and bank lines of the intermittent stream have been included on the exhibits in Addendum Attachment 2. Proposed grading in the vicinity of the intermittent stream is shown on Exhibit 15 of 20. No additional provisions beyond the BVW Restoration specification (Item 755.45) are anticipated. Please note, the specifications have been updated since the original filing to account for the intermittent stream. The revised relevant special provisions are included in Addendum Attachment 7.*
9. Please note that laydown areas and dewatering areas will also need to be identified in the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan, and the Control of Water Plan that will be conditioned in the WQC. Given the space constraints at this site, MassDEP recommends identifying these areas now during the design phase.
    a. *Benesch Response: The exact location for sedimentation basins as part of the dewatering will be determined by the Contractor as part of their means and methods. Once determined by the Contractor, this information shall be provided to MassDEP.*
10. Please clarify whether the existing catch basin and stormwater outfall will remain active during construction. If they will remain active and the project activities will impact the outfall and receiving intermittent stream, please describe how the construction period stormwater at the outfall will be managed until it is relocated.
    a. *Benesch Response: The existing catch basin and stormwater outfall will remain active until the completion of the new stormwater outfall in the northeast quadrant of the bridge. The switchover to the new stormwater outfall is anticipated to occur during the first stage of construction.*
11. The proposed limits of riprap in the river end abruptly at its ends. Please evaluate tapering the riprap into the bank to avoid creating areas of scour.
    a. *Benesch Response: Riprap has been tapered differently into the bank and all impact areas recalculated. The change resulted in an increase of 46 SF of permanent impacts to Land-Under-Water. A summary of all changes to impact areas since the original filing is provided in Addendum Attachment 1.*
12. Section 2.4 of the narrative states no trees are proposed to be removed. Please clarify, as it appears work will require tree removal, and tree plantings are proposed following the work. Please also provide an evaluation as to whether areas of rip rap proposed along the banks could also be revised to modified rock fill and seeded and/or planted.
    a. *Benesch Response: As mentioned in Section 2.4 of the Narrative in the original filing, clearing and grubbing is proposed to occur within the limits of slope grading. Per MassDOT standards specifications, tree and stump removal within areas designated as clearing and grubbing are incidental to the clearing and grubbing work. Details for the riprap have been revised above the bank line to include modified rockfill, compost and seeding to fill in the voids of the riprap. The riprap detail is provided on Exhibit 5 of 20 in Addendum Attachment 2. Due to the proximity of the bridge structure, no plantings are proposed within the areas of riprap, however numerous upland plantings are proposed as part of this project. The proposed upland plantings and landscaping notes are provided on Exhibits 17 through 20 of 20.*

13. Details for the streambed restoration need to include a specification for construction of a low-flow channel.
    a. *Benesch Response: Item 983.521 – Streambed Restoration has been provided in Addendum Attachment 7.*
14. Please provide the values used to calculate the openness ratio for the Stream Crossing Standards.
    a. *Benesch Response: The cross sectional area from bottom of bridge to top of substrate is approximately 1700 SF and the bridge width is approximately 43 FT. 1700 SF / 43 FT = 39.5 FT.*

Stormwater

15. Section 2.3 of the narrative states there will be a 1,960 square foot (sf) increase in impervious surface while the Stormwater Management Memo states 2,900 sf. Please clarify the increase in impervious surface and revise the stormwater calculations if needed.
    a. *Benesch Response: 2,900 is the correct SF increase. This is shown in the revised Stormwater Management Memo in Addendum Attachment 5.*
16. Please note that in addition to the Fort River being a coldwater fishery, there are two Zone I Wellhead Protection Areas (WPAs) that intersect the project, and the entire site is in a Zone II WPA, all of which are also Critical Areas per 314 CMR 9.02. Per Stormwater Management Standard 6, the use of salt for the deicing of impervious surfaces must be minimized within WPAs and coldwater fisheries. Section 2.1.4 of the Long-Term Pollution Prevention Plan needs to be revised to reflect this.
    a. *Benesch Response: Agree, Section 2.1.4 has been revised. This is shown in the revised O&M Plan and LTPPP in Addendum Attachment 6.*
17. Relevant calculations for Stormwater Management Standards 2, 3, and 4 are required including pre- and post-construction peak discharge flow rates; required groundwater recharge volume for the net increase in impervious surface; and the total area of impervious surface that will drain to the deep sump catch basin versus the total area of impervious surface proposed to remain as country drainage.
    a. *Benesch Response: Calculations for Standard 2, as well as additional language for Standards 3 and 4, have been provided in the Stormwater Management Memo in Addendum Attachment 5.*
18. The Stormwater Checklist states runoff from all impervious surface is discharging to an infiltration Best Management Practice (BMP). Please clarify as no infiltration BMPs are proposed.
    a. *Benesch Response: There is no proposed infiltration basin.*
19. The Operations and Maintenance Plan will need to be revised to reflect catch basin inspection and cleaning frequencies in accordance with Volume 2, Chapter 2 of the Stormwater Handbook.
    a. *Benesch Response: DEP's handbook represents goals for public works agencies to meet. MassDOT will continue to strive to meet DEP's frequencies listed until a programmatic operation and maintenance plan is established, which will supersede this project-specific O&M plan. It is noted that Volume 2, Chapter 2 suggests that deep sump catch basins be inspected 4 times per year and cleaned 4 times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.*
20. Please add specifications for deep sump catch basins and erosion and sedimentation controls as needed to the Exhibits.
    a. *Benesch Response: Deep sump catch basins are covered in MassDOT Standard Specifications and do not require Special Provisions. The Special Provision for Erosion and Sedimentation Controls was already included in Attachment L of the original filing (under Item 767.121). Similarly, since deep sump catch basins are included in MassDOT's Construction Standard Details, details are not shown on the exhibits.*

Wildlife and Rare Species

21. MassDEP understands coordination with the Massachusetts Natural Heritage and Endangered Species Program (NHESP) is ongoing regarding Priority and Estimated Habitats of Rare Species at the project site. Per 314 9.06(2) and 9.07(1), no project may be permitted which will have any adverse effect on specified habitat sites of Rare Species unless the work is subject to a Conservation and Management Permit or Determination of No Take issued by NHESP. As such, NHESP coordination must be complete prior to issuance of the WQC.
    a. *Benesch Response: NHESP coordination has been completed. Documentation of NHESP coordination has been added to Addendum Attachment 8.*
22. In addition to NHESP consultation, the regulations at 314 CMR 9.07(3)(d) require consultation with the MA Division of Fisheries and Wildlife (DFW) regarding Time of Year restrictions and/or in-water sediment management for the other species listed in the regulation. Please provide the consultation letter or email from the DFW.
    a. *Benesch Response: Documentation has been included in Addendum Attachment 9 which states no requirement of consultation.*

ADDENDUM ATTACHMENT 1

Summary of Revised Impact Areas

Since the original filing, the below revisions have been made to the project impact areas. The revised impacts are also reflected in the exhibits in Addendum Attachment 2.

Land-Under-Water/Waters of the US Temporary Impacts (Fort River) = 8,745 SF
Land-Under-Water/Waters of the US Temporary Impacts (Intermittent Stream) = 45 SF
Land-Under-Water/Waters of the US Temporary Impacts (TOTAL) = 8,790 SF

Land-Under-Water/Waters of the US Permanent Impacts (Fort River) = 1,525 SF
Land-Under-Water/Waters of the US Permanent Impacts (Intermittent Stream) = 21 SF
Land-Under-Water/Waters of the US Permanent Impacts (TOTAL) = 1,546 SF

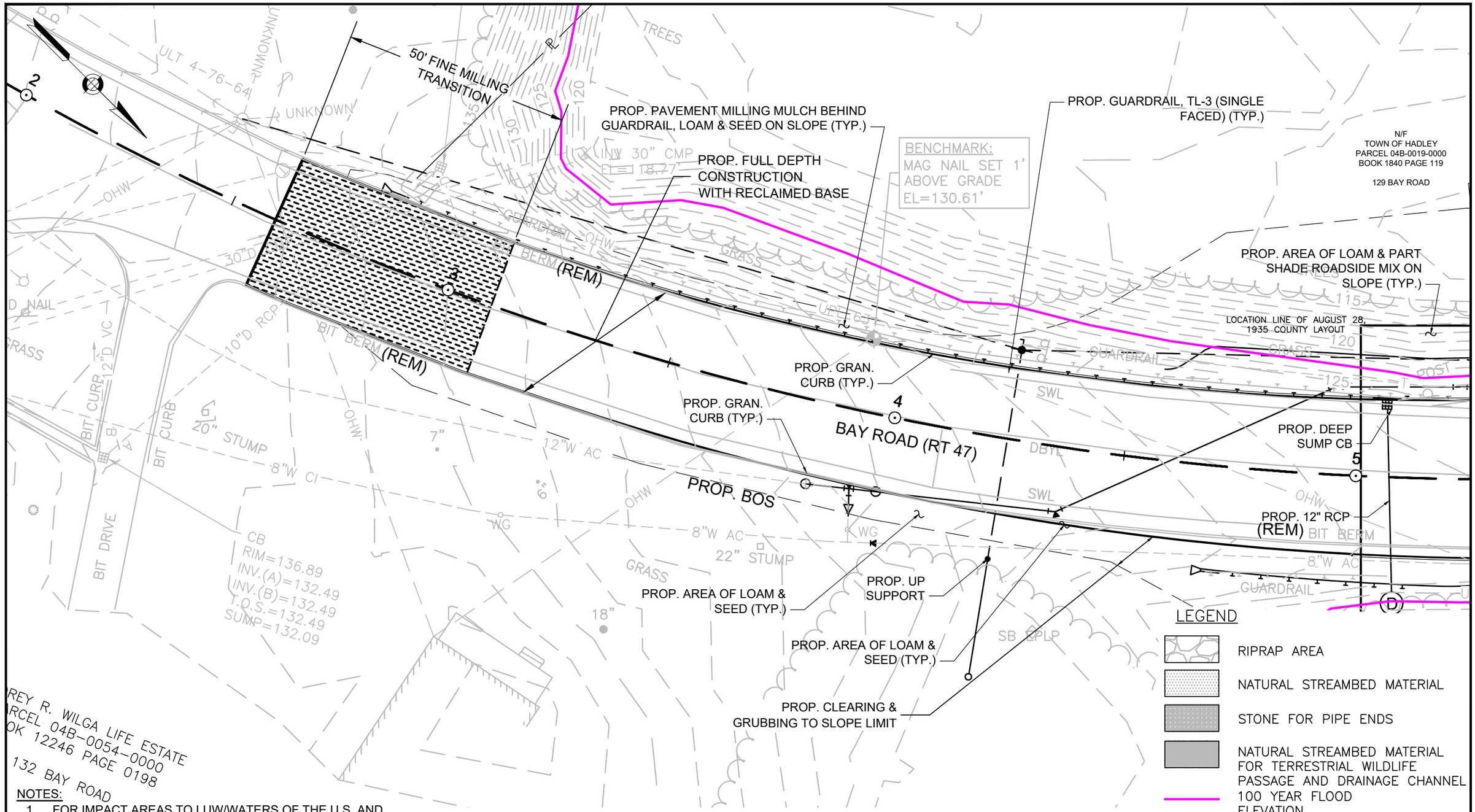
Bordering Vegetated Wetlands/Vegetated Wetland Temporary Impacts = 895 SF
Bordering Vegetated Wetlands/Vegetated Wetland Permanent Impacts = 0 SF
Bordering Vegetated Wetlands/Vegetated Wetlands Wetland Restoration = 895 SF

Volume of Dredging due to Streambed Restoration = 152 CY
Volume of Dredging due to Proposed Riprap = 226 CY
Volume of Dredging (TOTAL) = 378 CY

Permanent Bank Impacts to Fort River (with no loss to stream function) = 239 LF
Permanent Bank Impacts to Intermittent Stream (with loss of stream function) = 18 LF
Temporary Bank Impacts to Fort River = 23 LF
Temporary Bank Impacts to Intermittent Stream = 36 LF

ADDENDUM ATTACHMENT 2

Revised Proposed & Existing Design Exhibits



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

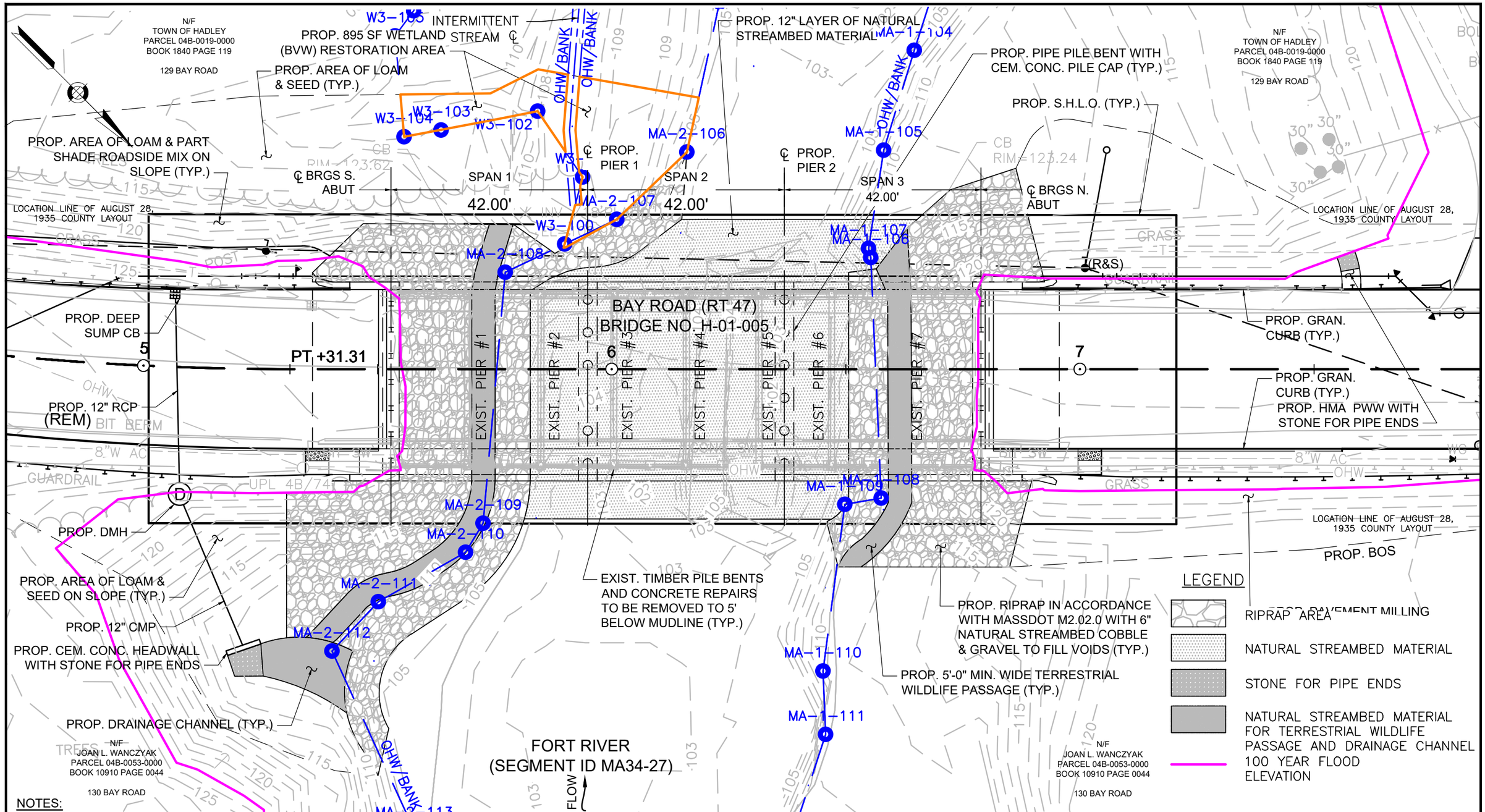
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 1 OF 20



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

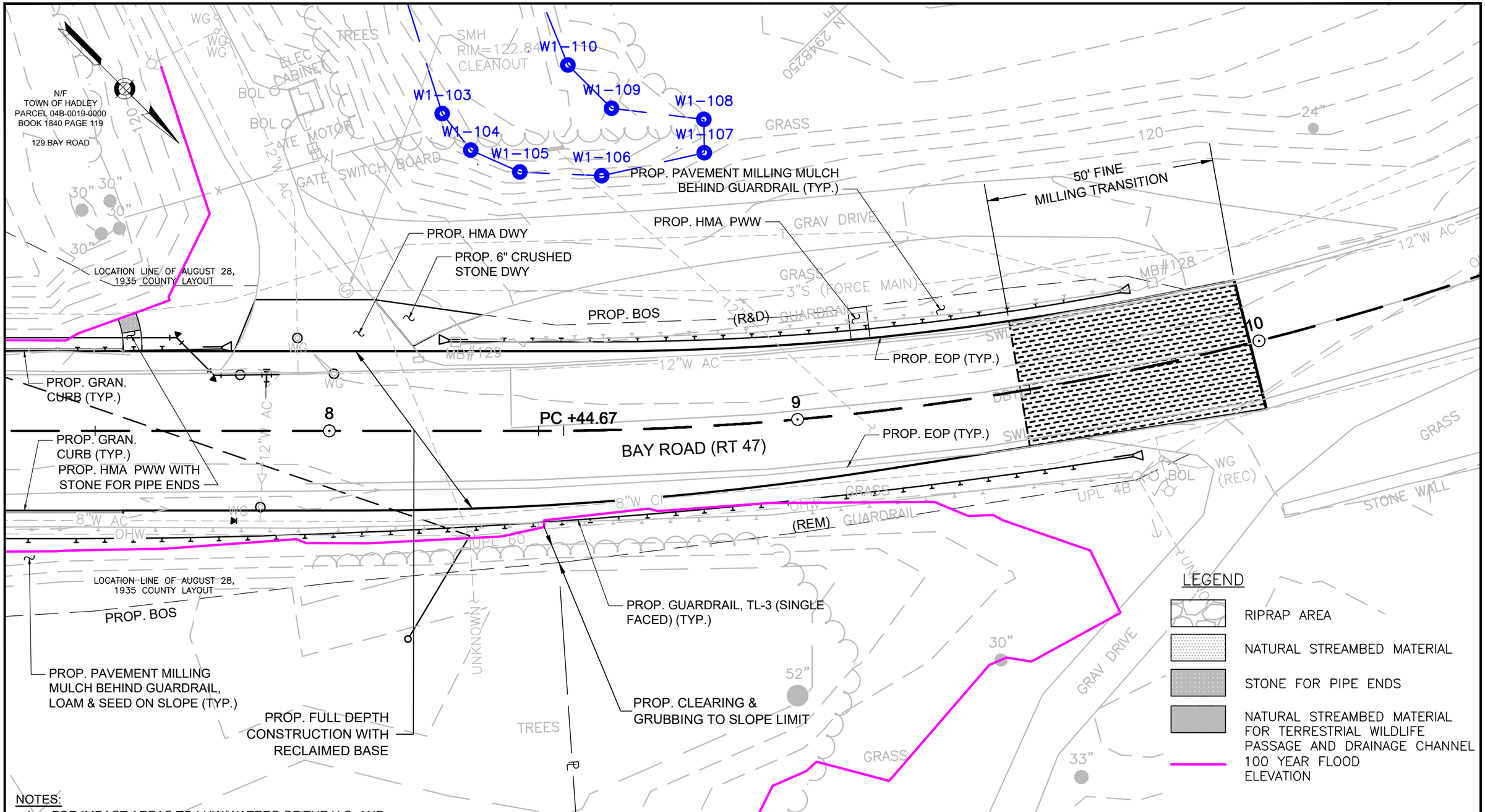
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 2 OF 20



NOTES:
1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

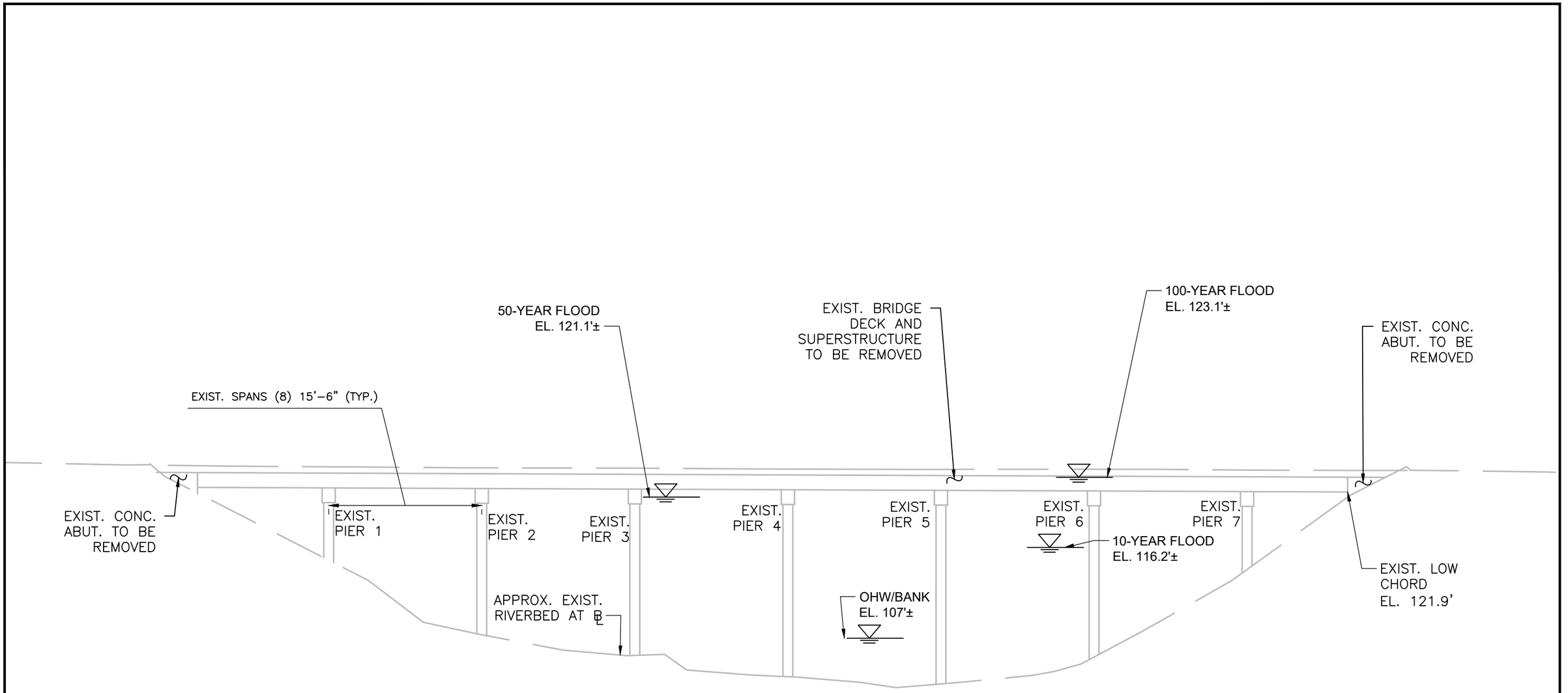
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 3 OF 20



EXISTING EAST ELEVATION

0 10 20 40

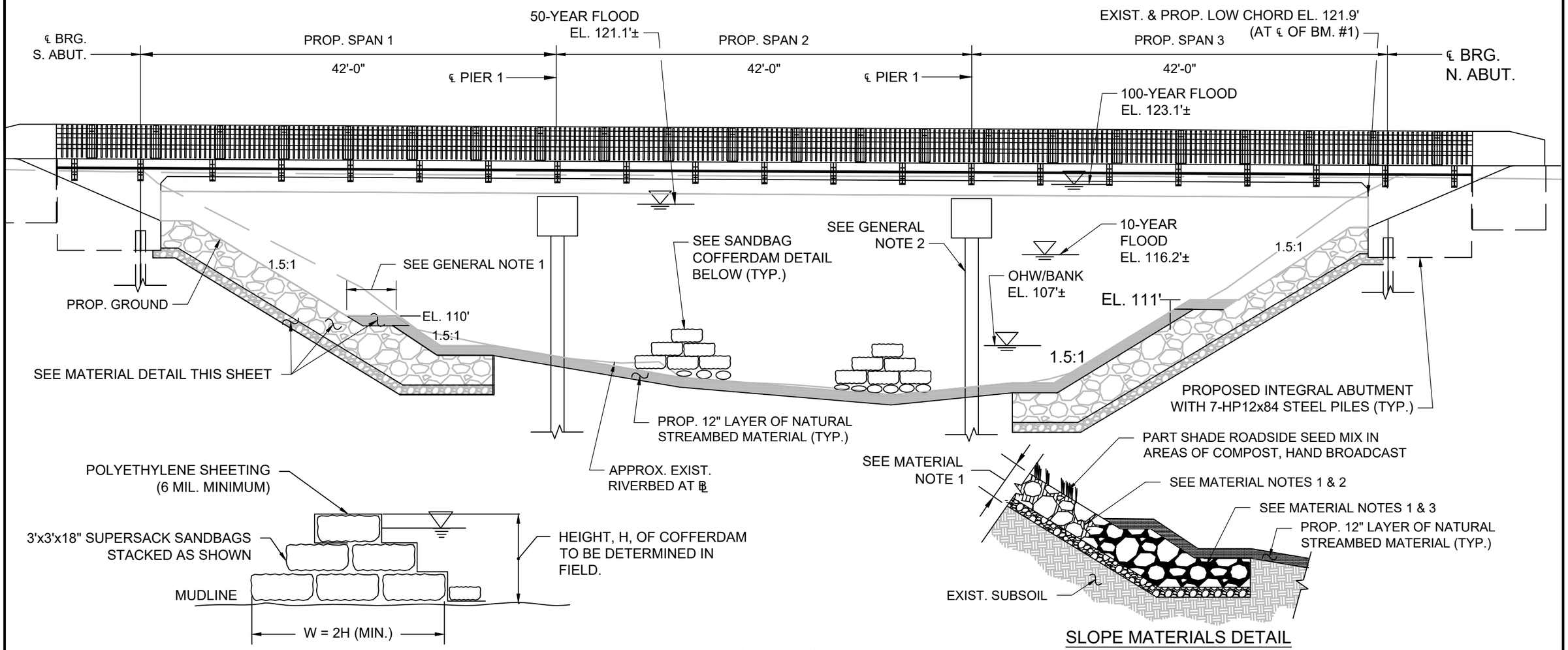
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 4 OF 20



SANDBAG COFFERDAM DETAIL
NOT TO SCALE

SLOPE MATERIALS DETAIL
NOT TO SCALE

GENERAL NOTES:

1. 5'-0" MIN. WIDE NATURAL STREAMBED MATERIAL FOR TERRESTRIAL WILDLIFE PASSAGE (TYP.)
2. PROP. PILE BENT WITH 16" Ø PIPE PILES WITH CONCRETE PILE CAP (TYP.)

SANDBAG NOTES:

1. SANDBAG COFFERDAM IS TO BE CONSTRUCTED IN A PYRAMID SHAPE BASED ON THE REQUIRED HEIGHT AND NUMBER OF BAGS REQUIRED.
2. THE SANDBAGS ARE TO BE PLACED OVERLAPPING ALONG THE LENGTH OF THE COFFERDAM.

MATERIAL NOTES:

1. PROP. 3'-0" LAYER OF RIPRAP (M2.02.0) OVER 12" LAYER OF CRUSHED STONE OVER GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL
2. AT ELEVATIONS HIGHER THAN THE OHW/BANK LINE, OR TERRESTRIAL WILDLIFE PASSAGE (WHERE PRESENT), MODIFIED ROCKFILL SHALL BE APPLIED OVER RIPRAP SUCH THAT MODIFIED ROCKFILL FILLS THE VOIDS AND IS 4" BELOW THE SURFACE OF THE STONES. COMPOST SHALL THEN BE PLACED OVER MODIFIED ROCKFILL TO AN ELEVATION AT OR SLIGHTLY BELOW THE TOP OF RIPRAP STONES. NOT ALL RIPRAP STONES WILL BE COMPLETELY COVERED. COMPOST IS NOT TO BE USED BELOW THE OHW/BANK LINE. PART SHADE ROADSIDE MIX SHALL BE HAND BROADCAST IN AREAS OF COMPOST.
3. AT ELEVATIONS LOWER THAN THE OHW/BANK LINE, OR AT TERRESTRIAL WILDLIFE PASSAGE (WHERE PRESENT), NATURAL STREAMBED MATERIAL SHALL BE PLACED TO FILL IN VOIDS IN THE RIPRAP TO CREATE A SMOOTH SURFACE PRIOR TO PLACEMENT OF 12" LAYER OF NATURAL STREAMBED MATERIAL OVER RIPRAP.

PROPOSED EAST ELEVATION

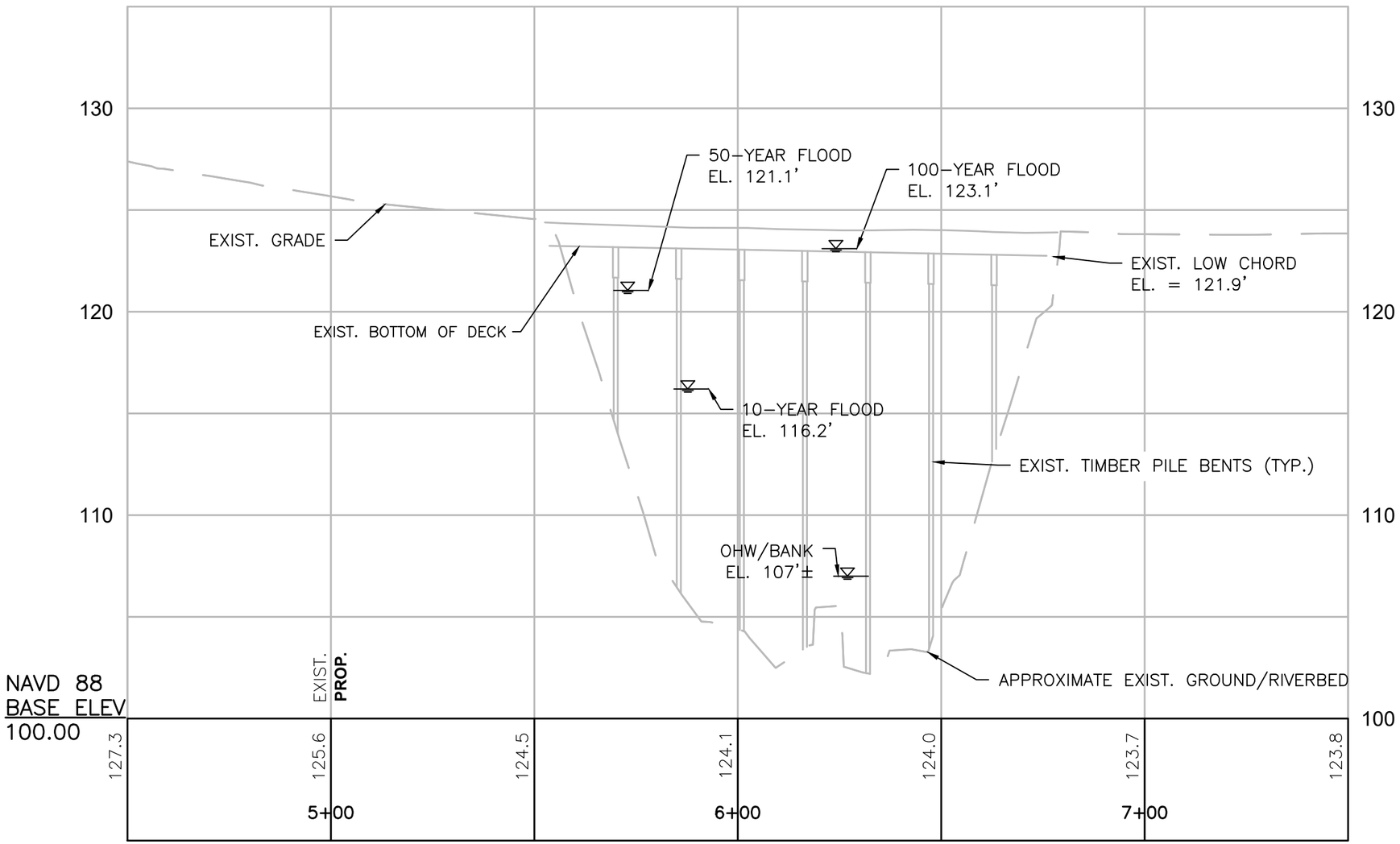
0 10 20 40
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 5 OF 20



HOR. SCALE IN FEET
30 0 30 60
6 0 6 12
VER. SCALE IN FEET

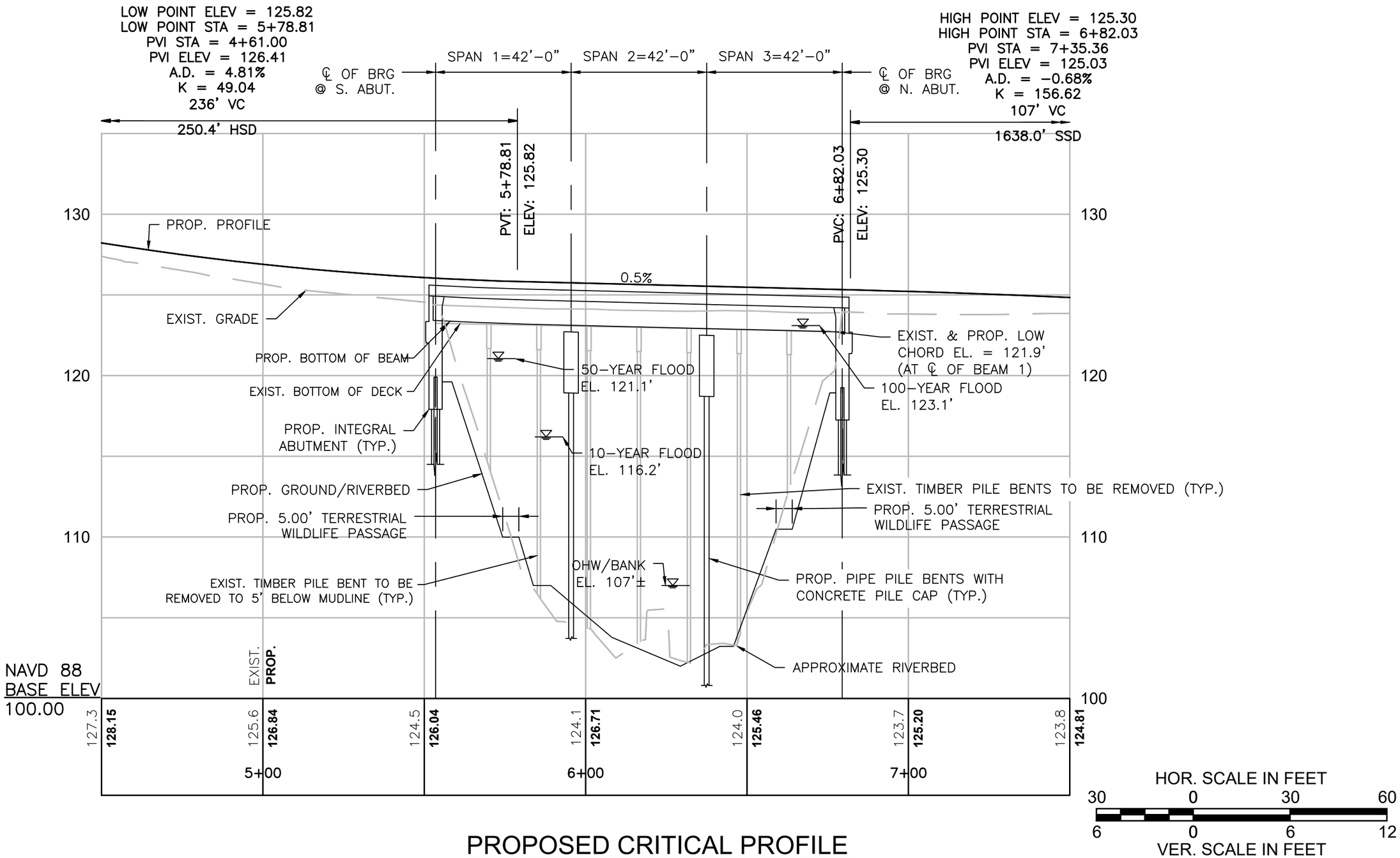
EXISTING CRITICAL PROFILE

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 30'

EXHIBIT NO. 6 OF 20



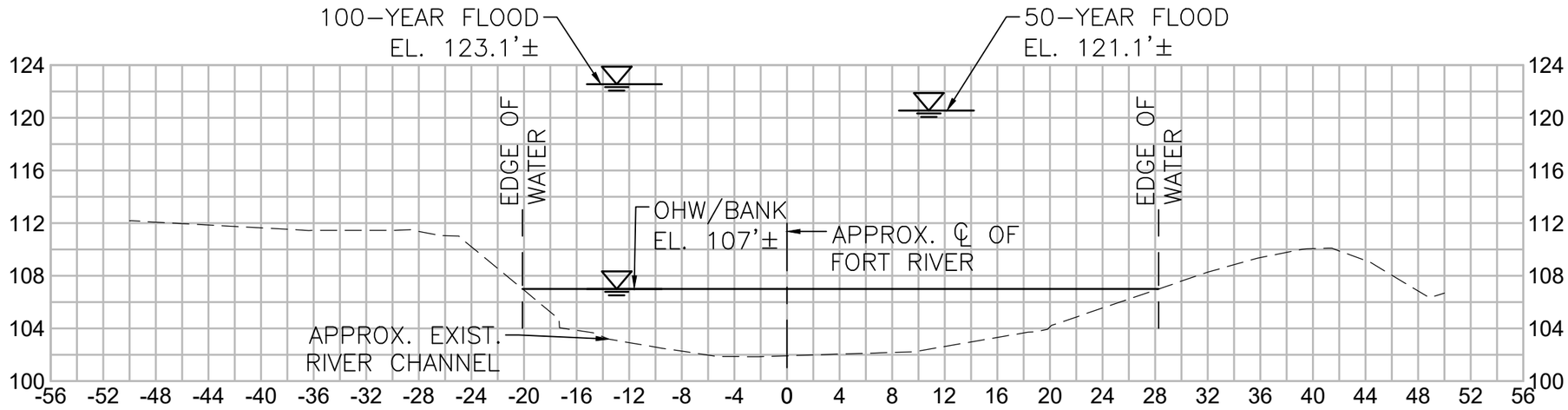
PROPOSED CRITICAL PROFILE

benesch

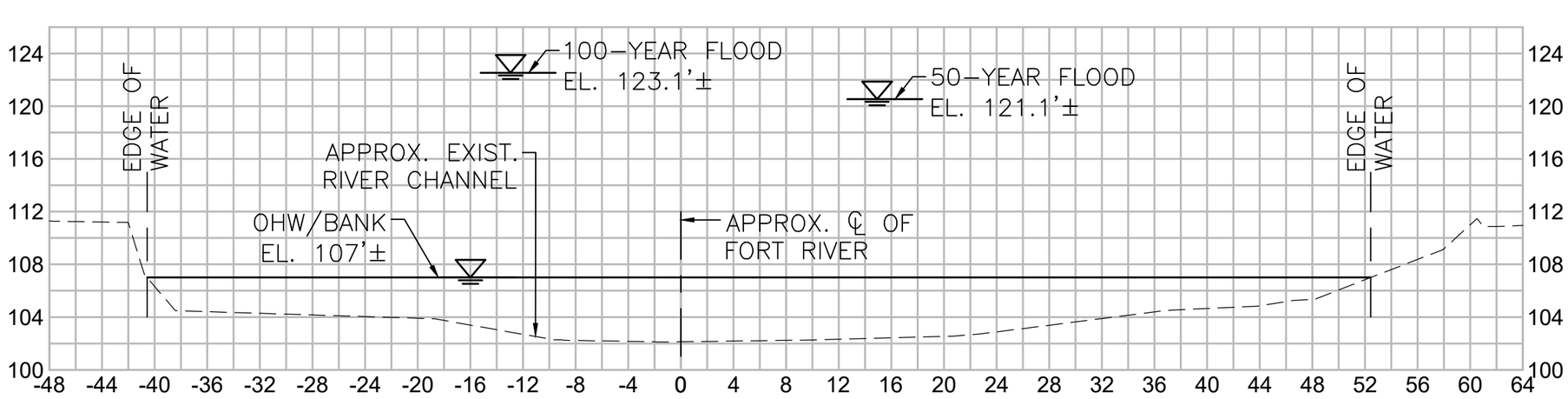
BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 30'

EXHIBIT NO. 7 OF 20



50 FT DOWNSTREAM OF WEST FASCIA
(LOOKING UPSTREAM)



50 FT UPSTREAM OF EAST FASCIA
(LOOKING UPSTREAM)

HOR. SCALE IN FEET
10 0 10 20
10 0 10 20
VER. SCALE IN FEET

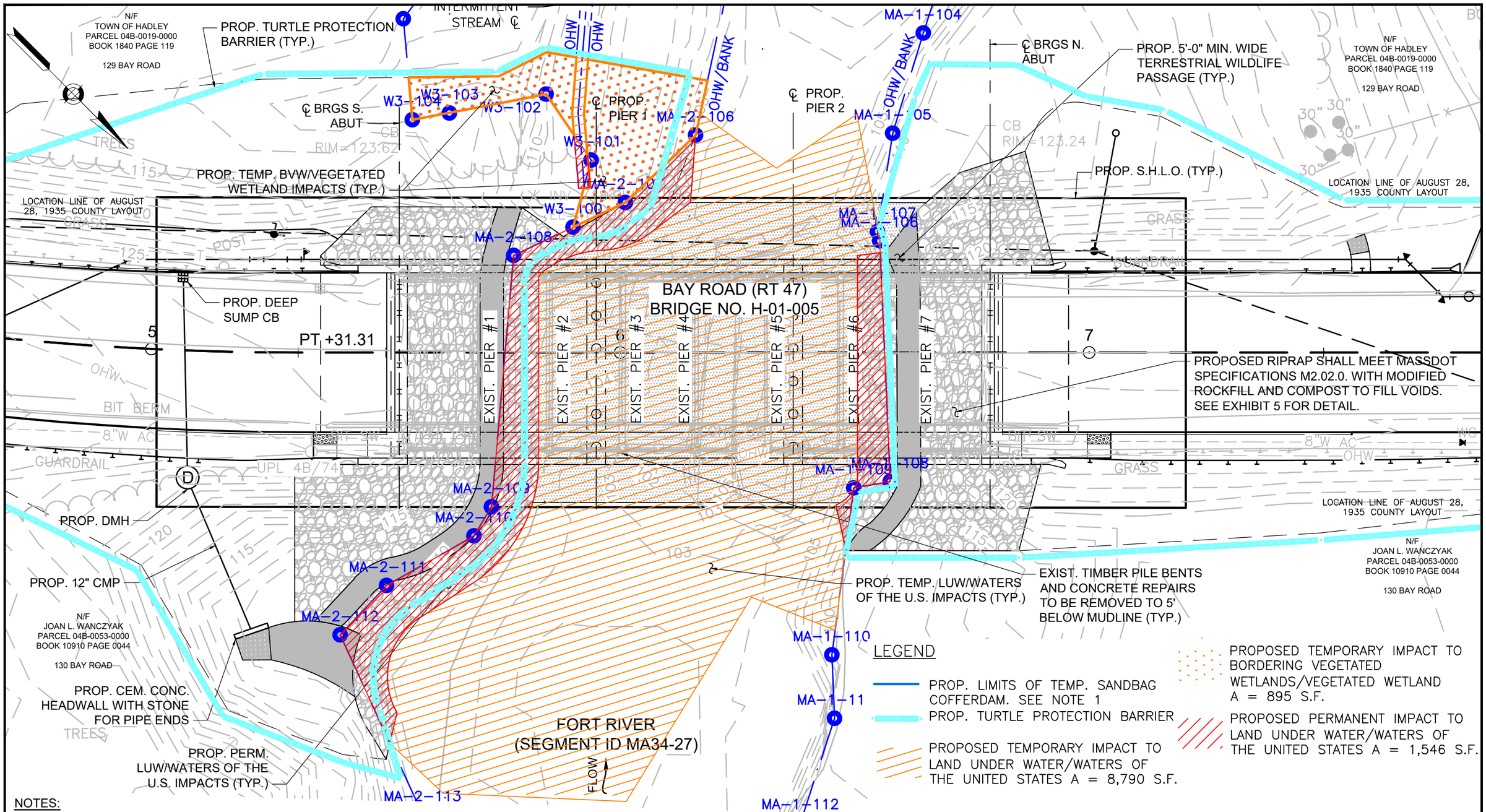
CHANNEL SECTIONS

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 8 OF 20



NOTES:

1. FOR WORK-IN-WATER SEQUENCING DURING STAGED CONSTRUCTION, SEE EXHIBITS 11 AND 12.
2. THE BANK IS COINCIDENT WITH THE OHW LINE. FOR BANK IMPACTS, SEE EXHIBIT 10.

TEMPORARY & PERMANENT IMPACTS

0 20 40 80

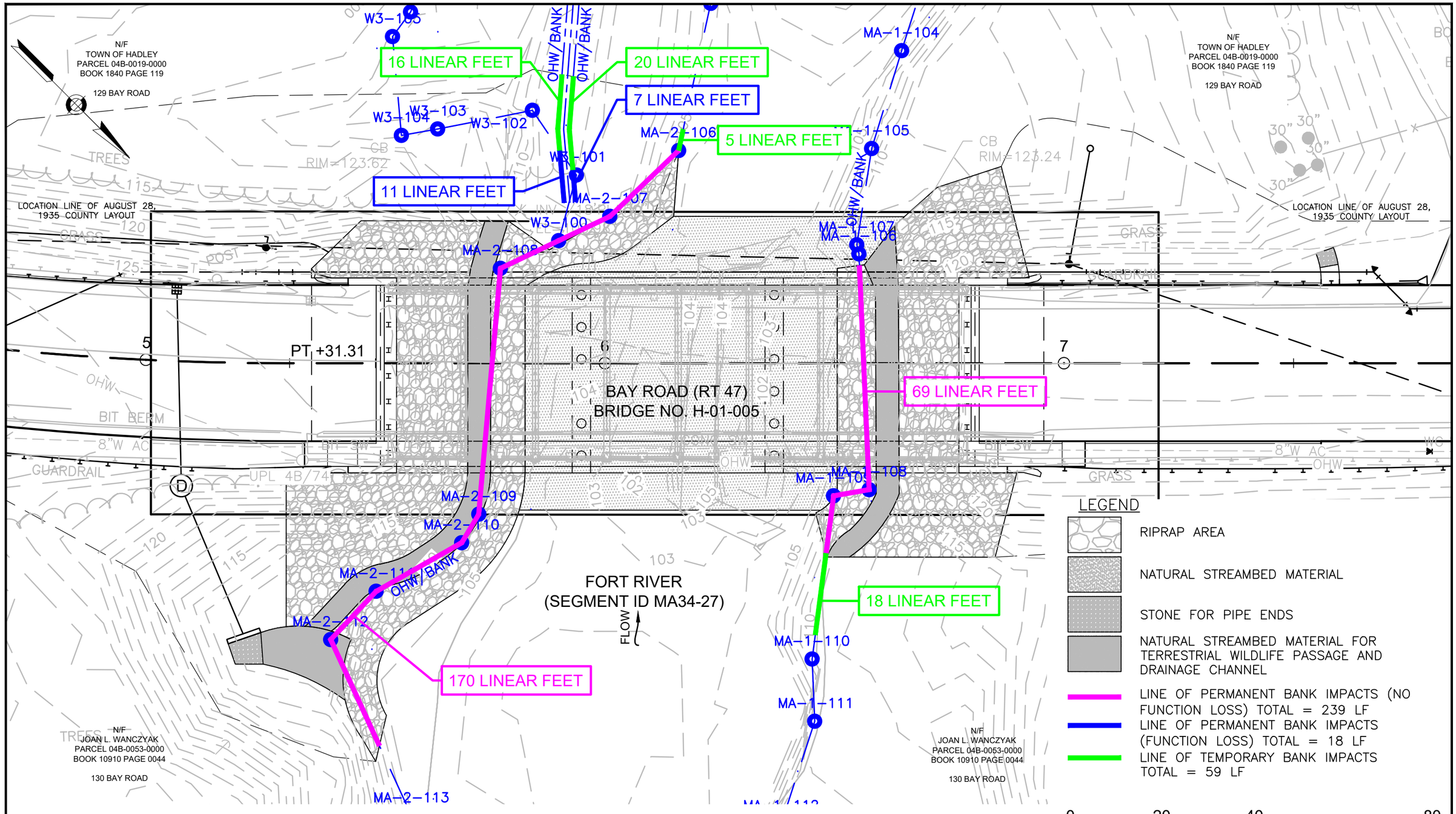
SCALE: 1" = 20'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 9 OF 20



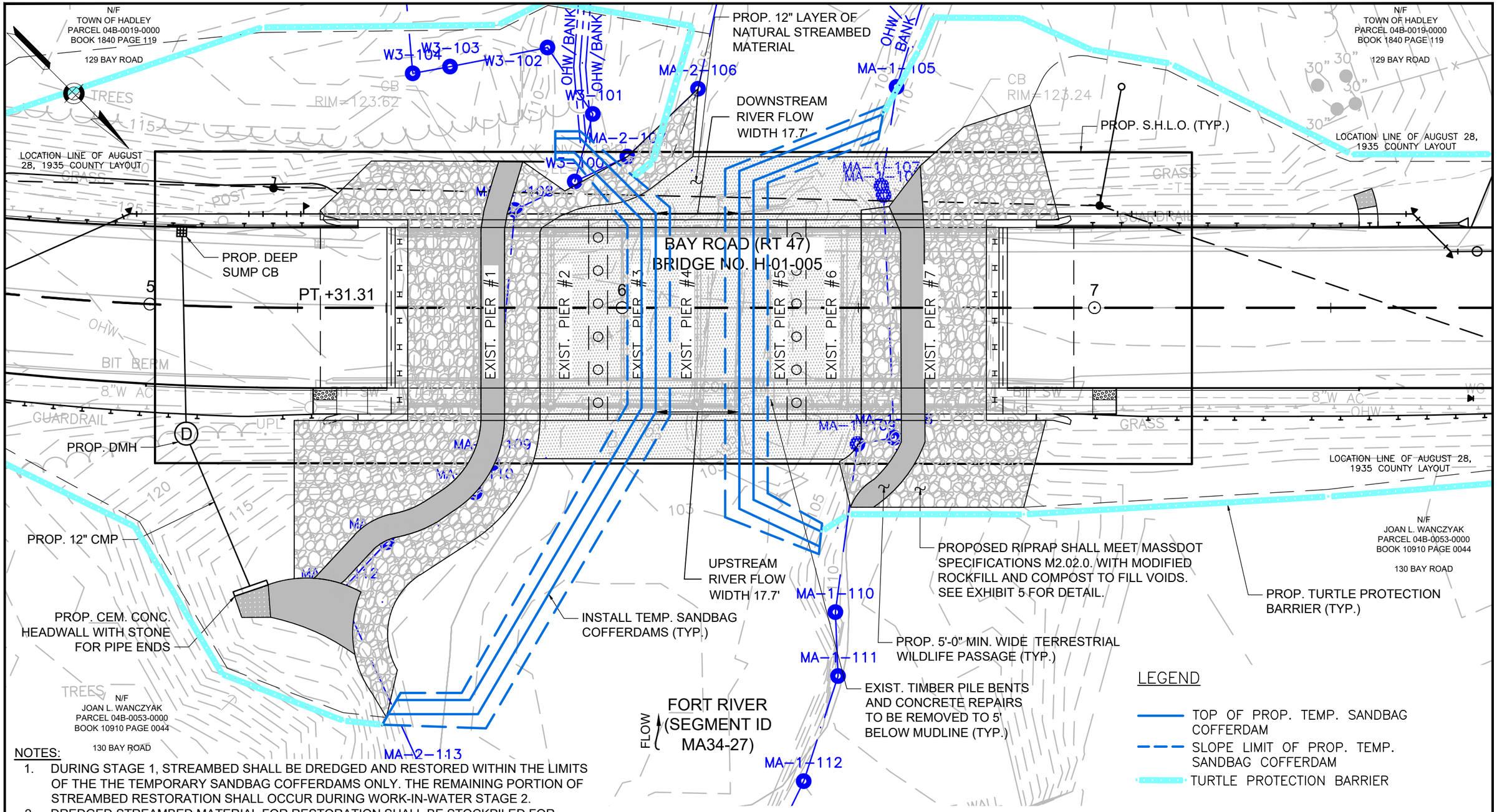
BANK IMPACTS

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 10 OF 20



NOTES:

1. DURING STAGE 1, STREAMBED SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY. THE REMAINING PORTION OF STREAMBED RESTORATION SHALL OCCUR DURING WORK-IN-WATER STAGE 2.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

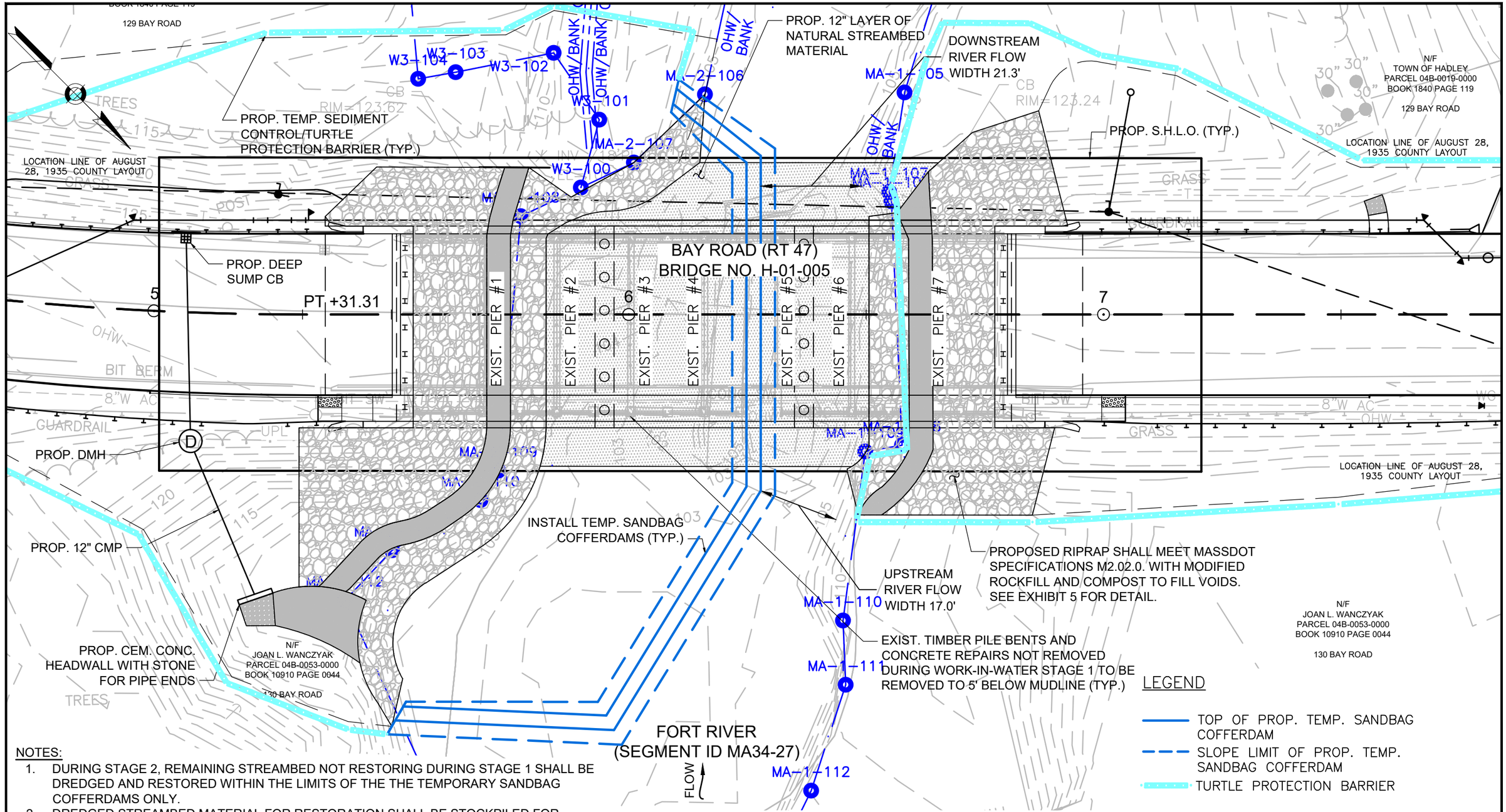
WORK-IN-WATER STAGE 1

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 11 OF 20



NOTES:

1. DURING STAGE 2, REMAINING STREAMBED NOT RESTORING DURING STAGE 1 SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

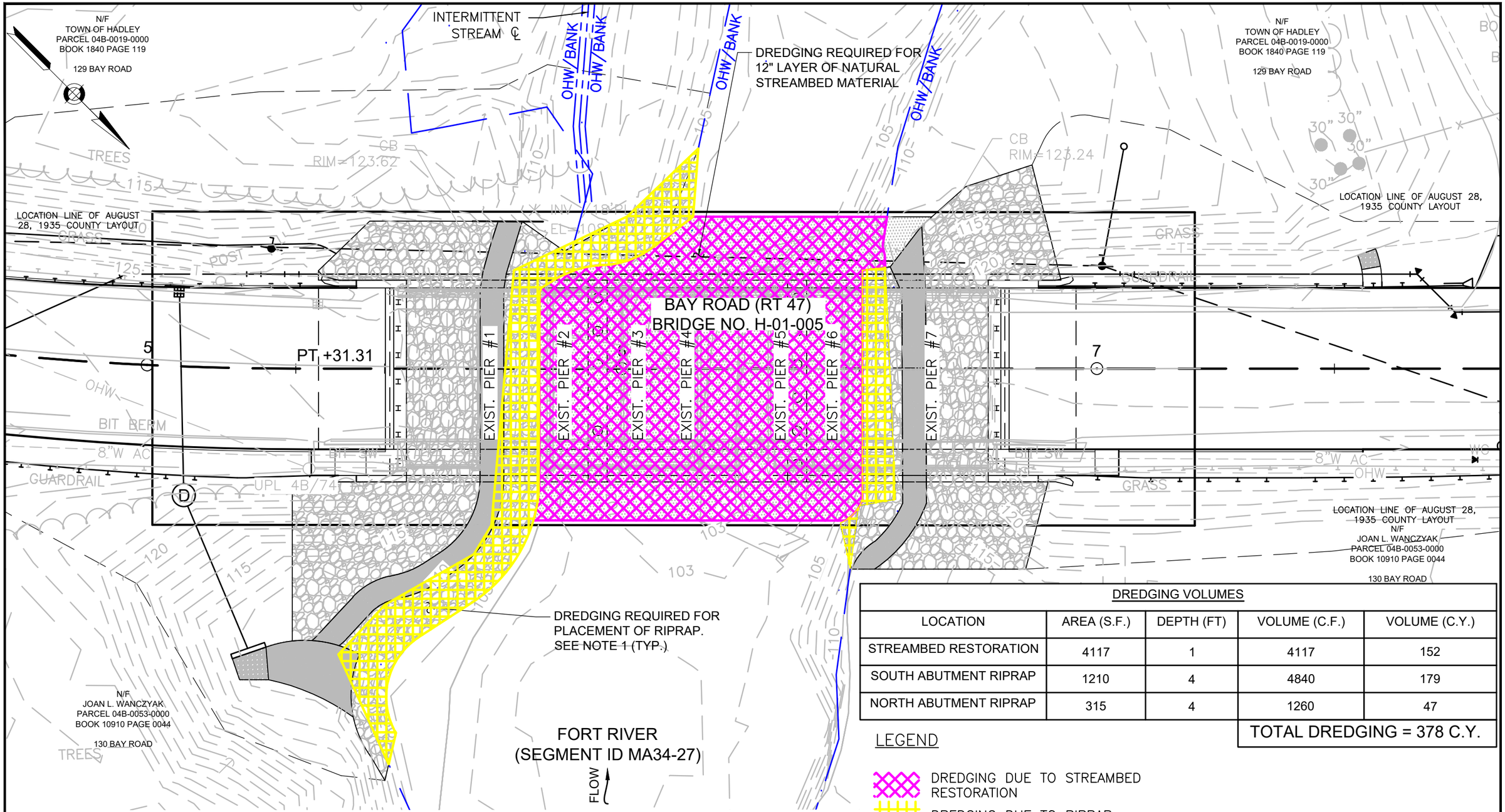
WORK-IN-WATER STAGE 2

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 12 OF 20



DREDGING VOLUMES				
LOCATION	AREA (S.F.)	DEPTH (FT)	VOLUME (C.F.)	VOLUME (C.Y.)
STREAMBED RESTORATION	4117	1	4117	152
SOUTH ABUTMENT RIPRAP	1210	4	4840	179
NORTH ABUTMENT RIPRAP	315	4	1260	47
			TOTAL DREDGING = 378 C.Y.	

LEGEND

DREDGING DUE TO STREAMBED RESTORATION

DREDGING DUE TO RIPRAP

0 20 40 80

SCALE: 1" = 20'

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH MODIFIED ROCKFILL AND COMPOST TO FILL VOIDS. SEE EXHIBIT 5 FOR DETAIL.

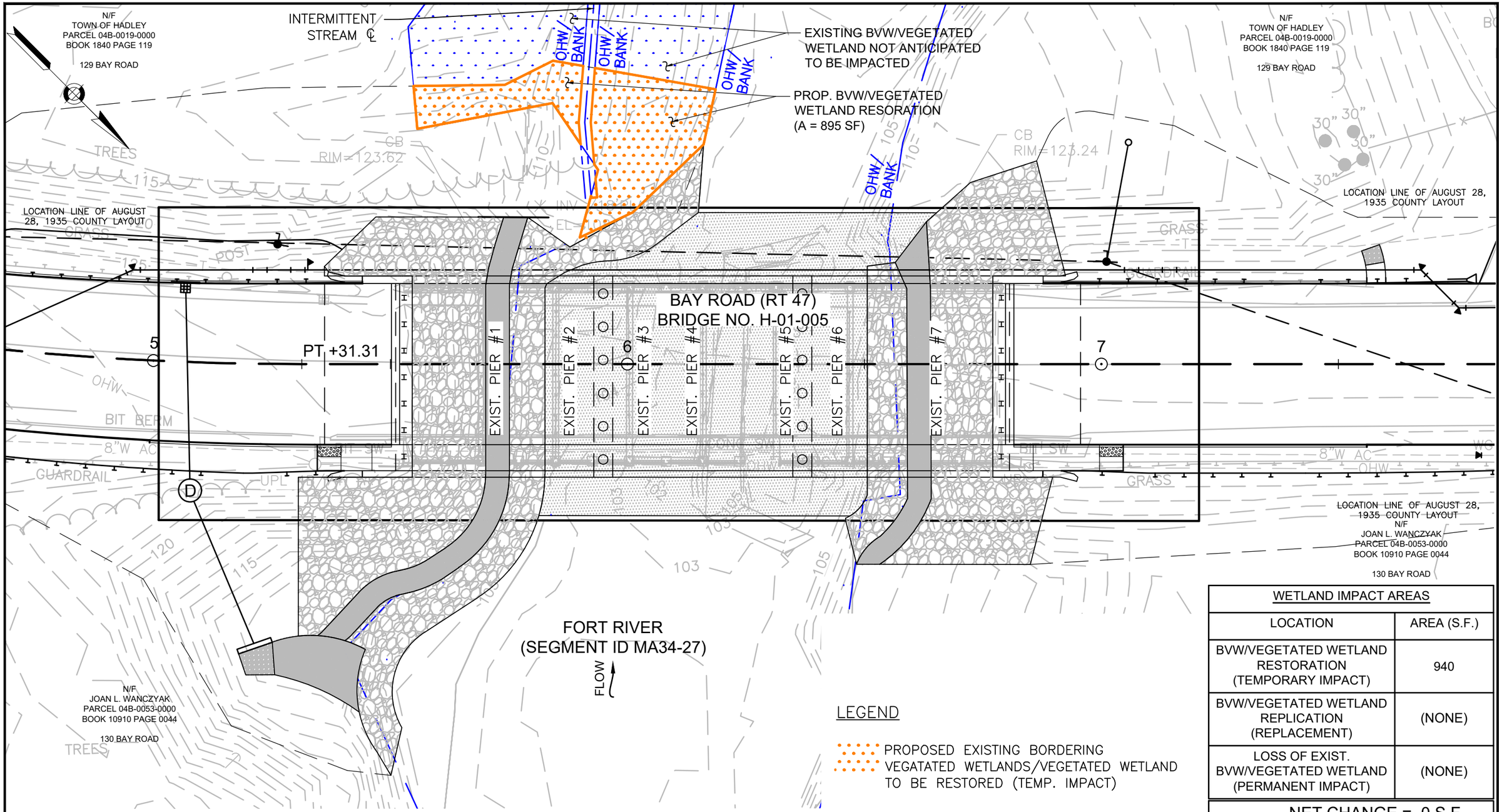
DREDGING LOCATION PLAN

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 13 OF 20



WETLAND IMPACT AREAS	
LOCATION	AREA (S.F.)
BVW/VEGETATED WETLAND RESTORATION (TEMPORARY IMPACT)	940
BVW/VEGETATED WETLAND REPLICATION (REPLACEMENT)	(NONE)
LOSS OF EXIST. BVW/VEGETATED WETLAND (PERMANENT IMPACT)	(NONE)
NET CHANGE = 0 S.F.	

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH MODIFIED ROCKFILL AND COMPOST TO FILL VOIDS. SEE EXHIBIT 5 FOR DETAIL.

0 20 40 80

SCALE: 1" = 20'

WETLAND MITIGATION PLAN

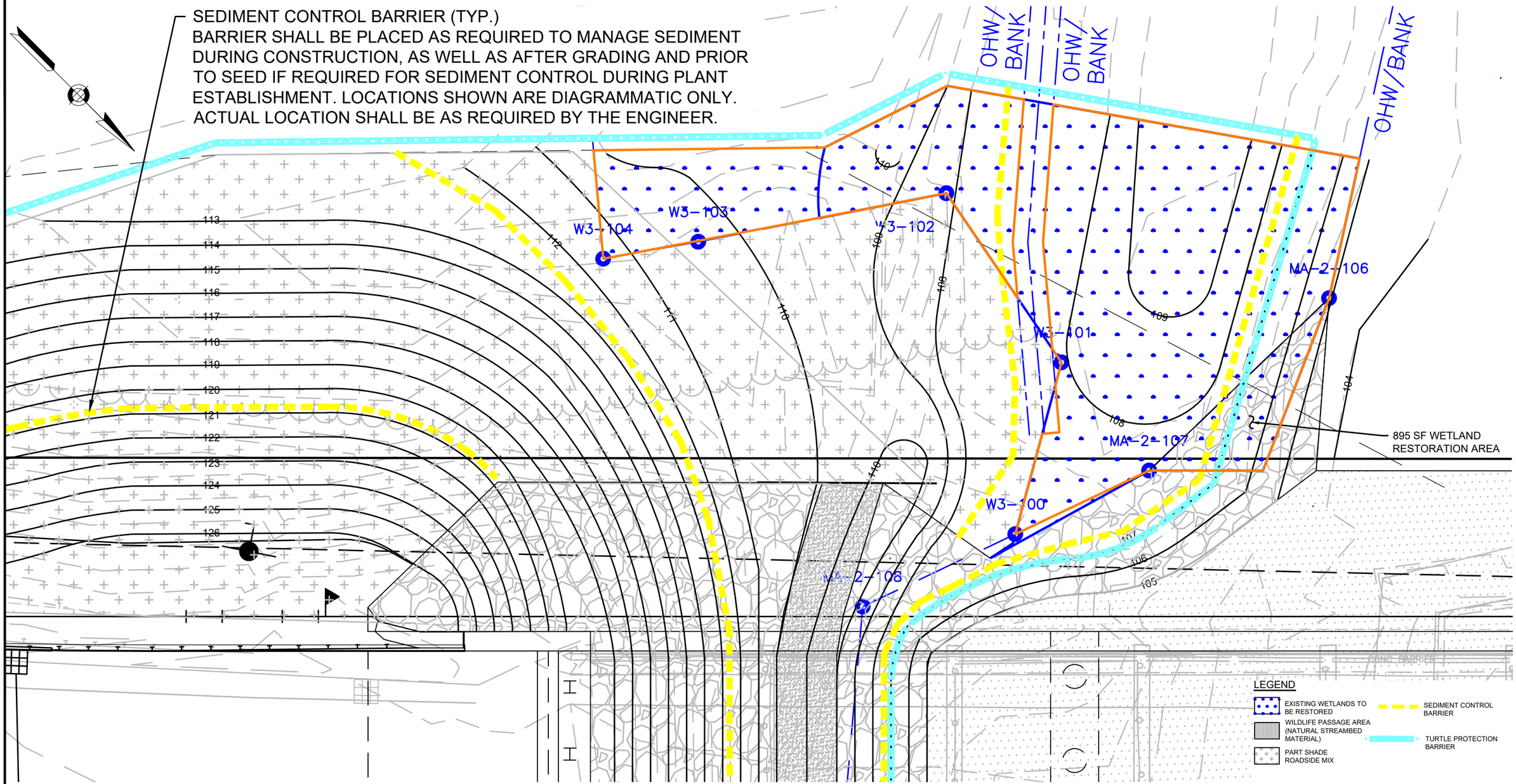
benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 14 OF 20

SEDIMENT CONTROL BARRIER (TYP.)
BARRIER SHALL BE PLACED AS REQUIRED TO MANAGE SEDIMENT DURING CONSTRUCTION, AS WELL AS AFTER GRADING AND PRIOR TO SEED IF REQUIRED FOR SEDIMENT CONTROL DURING PLANT ESTABLISHMENT. LOCATIONS SHOWN ARE DIAGRAMMATIC ONLY. ACTUAL LOCATION SHALL BE AS REQUIRED BY THE ENGINEER.



WETLAND RESTORATION AREA
PLAN VIEW

0 8 16 24 32

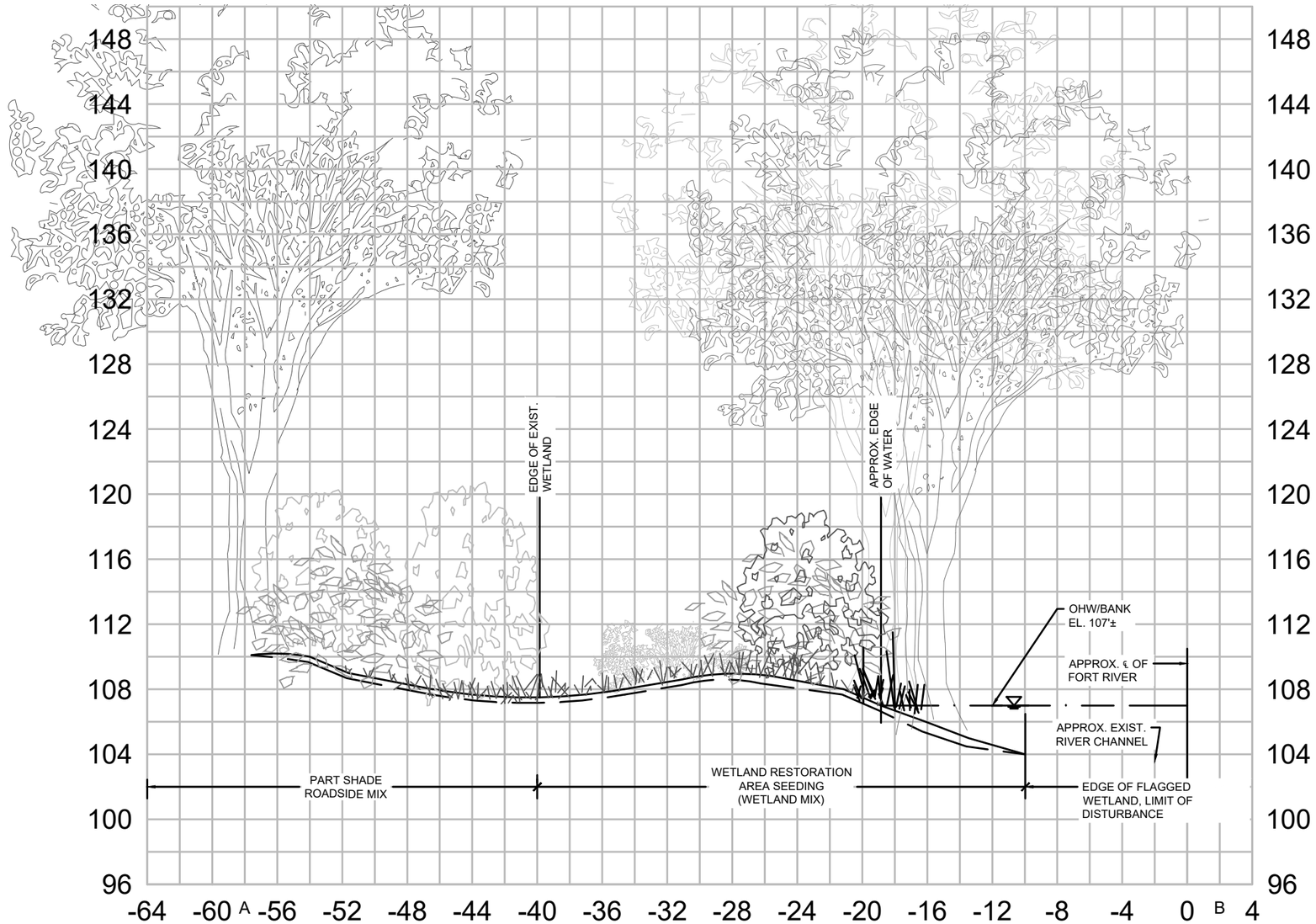
SCALE: 1" = 8'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 8'

EXHIBIT NO. 15 OF 20



WETLAND RESTORATION SECTION A-B
(LOOKING WEST)

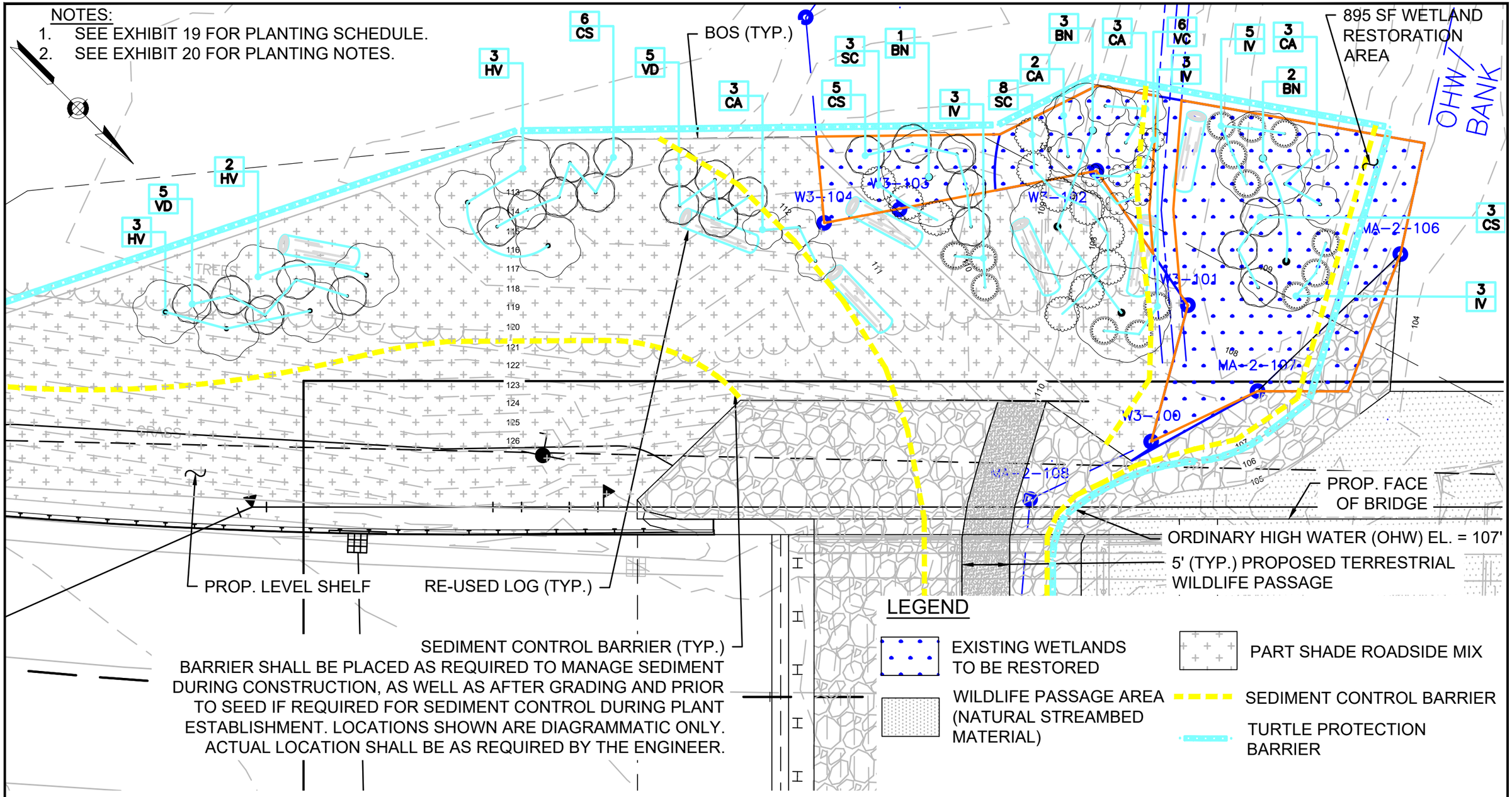
benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: NTS

EXHIBIT NO. 16 OF 20

NOTES:
1. SEE EXHIBIT 19 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 20 FOR PLANTING NOTES.



WETLAND RESTORATION AND PROPOSED WETLAND AND UPLAND PLANTINGS (WEST OF BRIDGE)

benesch

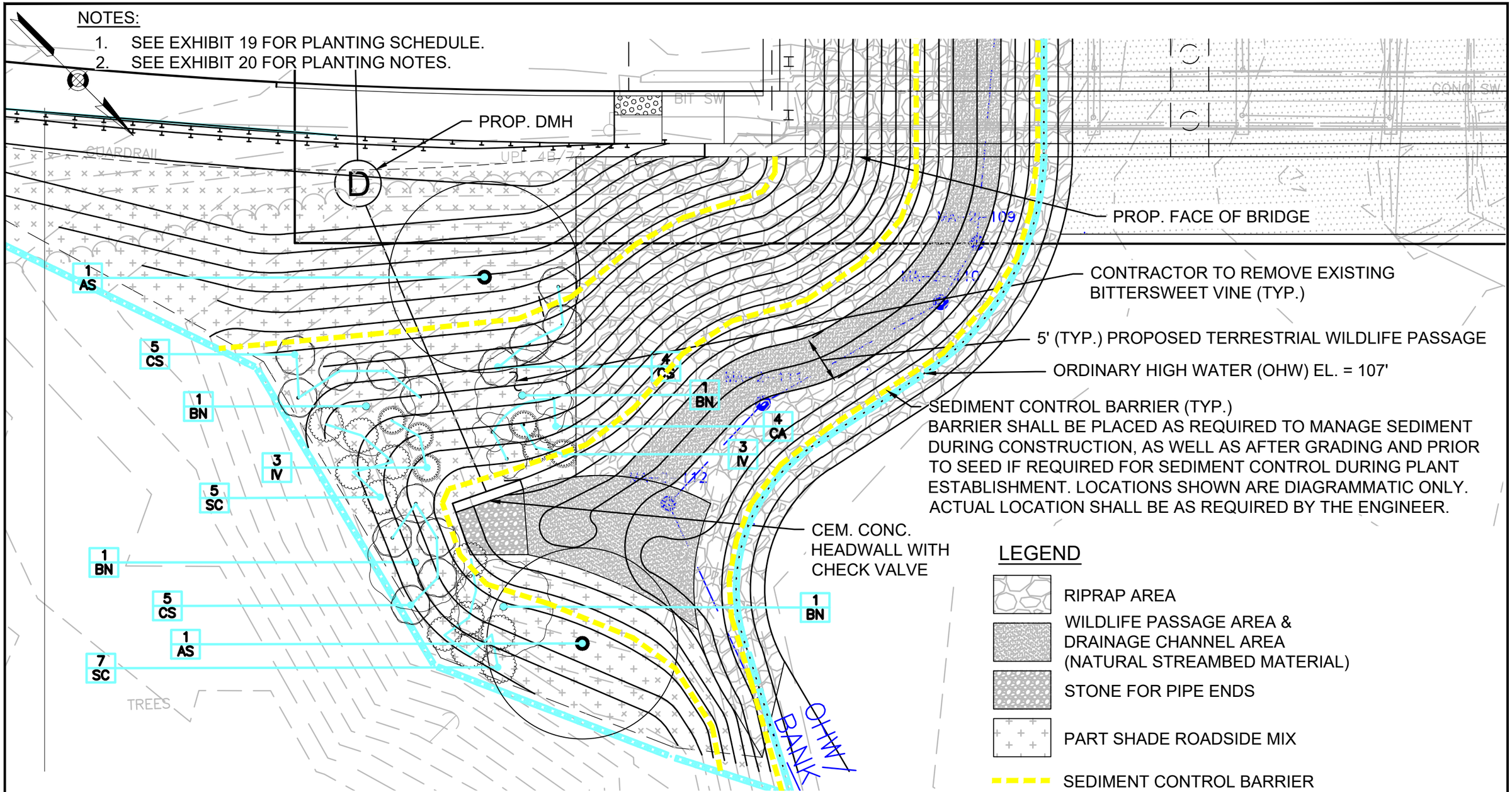
BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 17 OF 20

NOTES:

1. SEE EXHIBIT 19 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 20 FOR PLANTING NOTES.



LEGEND

- RIPRAP AREA
- WILDLIFE PASSAGE AREA & DRAINAGE CHANNEL AREA (NATURAL STREAMBED MATERIAL)
- STONE FOR PIPE ENDS
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER
- TURTLE PROTECTION BARRIER

0 10 20 30 40

SCALE: 1" = 10'

PROPOSED WETLAND AND UPLAND PLANTINGS (EAST OF BRIDGE)

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 18 OF 20

PLANT LIST (WEST OF BRIDGE)

PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	3 + 8*	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	7 + 7*	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	6 + 8*	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	7 + 4*	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
	HV	8	HAMAMELIS VIRGINIANA	WITCH HAZEL	2'-2.5'	5' TYP.
	VD	10	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-2.5'	5' TYP.
	VC	6*	VACCINIUM CORYMBOSOM	HIGHBUSH BLUEBERRY	2'-3'	
TREES						
	BN	2 + 4*	BETULA NIGRA	RIVER BIRCH	5'-6'	

PLANT LIST (EAST OF BRIDGE)

PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	4	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	14	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	6	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	12	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
TREES						
	AS	2	ACER SACCHARINUM	SILVER MAPLE	5'-6'	
	BN	4	BETULA NIGRA	RIVER BIRCH	5'-6'	

* THE QUANTITIES MARKED WITH AN ASTERISK ARE LOCATED WITHIN THE AREAS OF WETLAND RESTORATION. ALL OTHER QUANTITIES ARE LOCATED WITHIN UPLAND AREAS.

PROPOSED WETLAND AND UPLAND PLANTING SCHEDULE

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: N/A

EXHIBIT NO. 19 OF 20

GENERAL NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER. REFER TO THE APPLICABLE SPECIAL PROVISION.
2. ORDINARY HIGH WATER IS AT EL. 107'.

PLANTING NOTES:

1. FOR WETLAND RESTORATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.45.
2. RESTORATION WORK SHALL NOT COMMENCE UNTIL ALL WORK IN WATER AND SLOPE RECONSTRUCTION HAS BEEN COMPLETED TO AVOID DAMAGE TO MITIGATION AREA.
3. REFER TO CONSTRUCTION PLANS FOR LIMIT OF CLEARING AND GRUBBING. AS SHOWN ON THE PLANS AND PER SPECIAL PROVISION ITEM 767.122, TREES SHALL BE SELECTED TO BE REUSED ON SITE. PLACEMENT OF LOGS AT TIME OF WETLAND CONSTRUCTION SHALL BE PER THE WETLAND SPECIALIST (PLAN LOCATIONS ARE SYMBOLIC ONLY.)
4. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
5. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
6. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
7. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
8. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
9. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

PROPOSED WETLAND AND UPLAND PLANTING NOTES

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: N/A

EXHIBIT NO. 20 OF 20

ADDENDUM ATTACHMENT 3

Wetland Delineation Summary Report, Dated 10/22/2024

WETLAND DELINEATION SUMMARY REPORT

Date: October 22, 2024

To: Massachusetts Department of Transportation, Highway Division

From: Robert Brewer, Staff Scientist, Epsilon Associates, Inc.

Subject: Wetland Delineation Summary Memo – Bay Road (Route 47) Bridge over the Fort River, Hadley, Massachusetts

INTRODUCTION

Epsilon Associates, Inc. ("Epsilon") was retained by Massachusetts Department of Transportation ("MassDOT") to delineate wetland resource areas in the vicinity of Bay Road (Route 47) over the Fort River in Hadley, Massachusetts (the "Study Area"). This report describes general environmental conditions and delineated wetland resource areas within the Study Area, including a discussion of potential jurisdiction under local, state, and federal wetlands regulatory programs. The wetland resource areas described in further detail below were field delineated by Epsilon on June 10, 2024. Included with this Freshwater Wetland Delineation Summary Report are the following attachments:

- Attachment A – Figures (USGS Locus Map, MassGIS Wetlands & Hydrologic Connections, NHESP Priority/Estimated Habitat & potential and certified vernal pools, NRCS Soils Map, and FEMA-FIRM).
- Attachment B – Representative photographs of Study Area and delineated wetland resource areas.
- Attachment C – MassDEP Bordering Vegetated Wetland Determination Forms.
- Attachment D – Wetland Delineation Map.

STUDY AREA DESCRIPTION

The Study Area includes approximately 400 linear feet of the Fort River on the north and south of the Bay Road Bridge (Route 47), and the immediate surrounding area out to a distance of approximately 200 feet. (see Attachment D). The Fort River flows in a southeasterly direction beneath the bridge, before joining the Connecticut River, approximately 3,000 feet southwest of the bridge. Two drainage culverts were observed within the Study Area, one which outlets into a large drainage swale in the northwest portion of the Study Area (wetland flag series W1-100), and a second which outlets from the bridge deck, south of

the river crossing into a drainage channel that is parallel to the Fort River between wetland flag series W3 and Mean Annual High Water ("MAHW") series MA2-100, (see Attachment D).

The Study Area is bordered to the north, south, and east by residential properties, and to the west by land owned by the Town of Hadley (water treatment plant).

The upland portions of the Study Area generally consist of undeveloped forested areas. Plant species observed include: red oak (*Quercus rubra*), catalpa (*Catalpa speciosa*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), white ash (*Fraxinus americana*) trees and/or saplings; poison ivy (*Toxicodendron radicans*), asiatic bittersweet (*Celastrus orbiculatus*), virginia creeper (*Parthenocissus quinquefolia*), climbing woody vines; highbush blueberry (*Vaccinium corymbosum*), honeysuckle (*Lonicera spp.*), multiflora rose (*Rosa multiflora*), and mapleleaf viburnum (*Viburnum acerifolium*) shrubs; and poison ivy, new york fern (*Thelypteris noveboracensis*), bracken fern (*Pteridium aquilinum*), hayscented fern (*Dennstaedtia punctilobula*), teaberry (*Gaultheria procumbens*), partridge-berry (*Mitchella repens*), and wild-lily-of-the-valley (*Maianthemum canadense*), ground cover. The wetland resources observed on the site are described further in this memo.

According to U.S. Department of Agriculture ("USDA") Natural Resources Conservation Service ("NRCS") mapping information, soils in the Study Area include Pootatuck, Rippowam, and Limerick.

Soil Name	Proportion of Hydric Soils	Drainage Classification
Pootatuck fine sandy loam, (2A)	15%	Moderately well drained
Rippowam fine sandy loam, (4A)	95%	Poorly drained
Limerick silt loam, (8A)	95%	Poorly drained

See Attachment A, Figure 4 for additional detail.

The Study Area is mapped as Priority Habitat (PH 2084) of Rare Species and Estimated Habitat of Rare Wildlife by the Natural Heritage and Endangered Species Program (NHESP). There are no mapped Certified Vernal Pools; however, there is a mapped Potential Vernal Pool in the northwest corner of the Study Area, within the W2 Series BVW. (see Attachment A, Figure 3)[1].

The Study Area does not contain any mapped Certified Vernal Pools ("CVP's") or Potential Vernal Pools ("PVP's).

WETLAND DELINEATION METHODOLOGY & REGULATORY FRAMEWORK

Wetlands within the Study Area were delineated in accordance with the following guidance manuals and regulatory processes:

- U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987);

[1] Priority Habitat is based on the known geographical extent of habitat for all state-listed rare species, both plants and animals, and is codified under the Massachusetts Endangered Species Act ("MESA"). Estimated Habitats are a sub-set of the Priority Habitats and are based on the geographical extent of habitat of state-listed rare wetlands wildlife and is codified under the Wetlands Protection Act, which does not protect plants. State-listed wetland wildlife species are protected under MESA as well as the Wetlands Protection Act.

- Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Environmental Laboratory, Version 2.0, January 2012);

- Massachusetts Wetlands Protection Act ("WPA") and implementing regulations (310 CMR 10.00);

- Massachusetts Department of Environmental Protection ("MassDEP"), Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (MassDEP, 2nd Edition, September 2022); and

The wetland delineation methodologies referenced above generally prescribe a multi-parameter approach, where hydrophytic vegetation and hydrology (including hydric soils) are reviewed in conjunction with one another when delineating a wetland boundary.

The boundaries of the wetland resource areas were delineated in the field by tying brightly colored survey flagging to woody vegetation or other relatively permanent vegetation/structures. The flags were placed sufficiently close together to clearly identify wetland/resource area edges and to allow survey crews to see adjacent flags from one another. Flags were labeled successively using unique numeric identifiers for each wetland series.

RESULTS

The wetland resource areas delineated or otherwise identified by Epsilon are described below.

Bordering Vegetated Wetlands

According to the WPA Regulations, BVW's are "freshwater wetlands that border on creeks, rivers, streams, ponds and lakes and include wet meadows, marshes, swamps and bogs. Generally, the soils are saturated and/or inundated conditions exist such that these areas support a predominance of wetland indicator plants." Under the Act, BVW has a 100-foot Buffer Zone extending from its edge.

BVW Flag Series W1 (flags 100 through 112)

BVW Series W1 is located in the western portion of the Study Area on the wastewater treatment plant land and borders on the Fort River. This wetland system is a relatively wide drainage swale, ultimately ending in the Fort River. Vegetation species observed include: American elm (*Ulmus Americana*), red maple, catalpa, jump-seed (*Persicaria virginiana*), New York fern, sensitive fern (*Onoclea sensibilis*), poison ivy, Virginia creeper, Asiatic bittersweet, creeping charlie (*Glechoma hederacea*), jewelweed (*Impatiens capensis*), and jack-in-the-pulpit (*Arisaema triphyllum*).

BVW Flag Series W2 (flags 100 through 105)

BVW Series W2 is located adjacent to MAHW series MA1 in the northwest portion of the Study Area. The W2 series borders on the Fort River Vegetation species observed include; red maple, American elm, silver maple , white ash, silky dogwood (*Cornus amomum*), spicebush (*Lindera benzoin*), hop sedge (*Carex lupulina*), stinging nettle (*Urtica dioica*), New York fern, jewelweed, poison ivy, catalpa, and sensitive fern.

BVW Flag Series W3 (flags 100 through 108)

Wetland series W3 is located in the southeast portion of the Study Area and borders on the Fort River. An intermittent stream channel was observed that runs parallel to the Fort River that carries flood water from the Fort River and accepts stormwater from a culvert. The culvert conveys stormwater from a catch basin in Bay Road, and is not a jurisdictional stream under the WPA, as it does not flow out of an area subject to protection under the WPA, and because it is upgradient of all bogs, swamps, wet meadows and marshes. Vegetation species observed include: red maple, silver maple, American elm, ash, spice bush, silky dogwood, poison ivy, Virginia creeper, jump-seed, reed canary grass (*Phalaris arundinacea*), beggarticks (*Bidens aristosa*) New York fern, sensitive fern, and jewelweed.

Bordering Land Subject to Flooding

According to the WPA regulations, Bordering Land Subject to Flooding ("BLSF") is "an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland. The boundary of BLSF is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm. Said boundary shall be that determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed under the National Flood Insurance Program (NFIP, currently administered by the Federal Emergency Management Agency, successor to the U.S. Department of Housing and Urban Development). Said boundary, so determined, shall be presumed accurate."[2]

BLSF does not have a 100-foot Buffer Zone extending from its boundary.

According to the current Federal Emergency Management Agency Flood Insurance Rate Map ("FEMA-FIRM") Community Panel Number 2501630002Bfor the Town of Hadley, Hampshire County, dated June 1, 1978, the Study Area is located within the mapped 100-year floodplain (see Attachment A, Figure 5).

Inland Bank and Land Under Water Bodies and Waterways

According to the WPA regulations, an Inland Bank is "the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a bordering vegetated wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and upland. The upper boundary of Bank is the first observable break in slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level."

According to the WPA regulations, Land Under Water Bodies and Waterways ("LUW") is "the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock; the boundary of LUW is the mean annual low water level."

[2] As explained in the WPA regulations, this presumption is rebuttable and may be overcome only by credible evidence from a registered professional engineer or other professional competent in such matters. Where NFIP Profile data is unavailable, the boundary of BLSF shall be the maximum lateral extent of flood water which has been observed or recorded. In the event of a conflict, the issuing authority may require the applicant to determine the boundary of BLSF by engineering calculations. Please see 310 CMR 10.57 for additional information.

Bank and LUW are associated with the Fort River identified with the Study Area. LUW was not specifically field delineated as it is contained within the MA1 & MA2 MAHW/Bank flag series described below.

Riverfront Area

According to the WPA regulations, a river is any natural flowing body of water that empties to any ocean, lake, pond, or other river and which flows throughout the year. Rivers include streams (see 310 CMR 10.04: Stream) that are perennial because surface water flows within them throughout the year. Intermittent streams are not rivers as defined herein because surface water does not flow within them throughout the year.

A Riverfront Area ("RFA") is the area of land between a river's mean annual high-water ("MAHW") line and a parallel line measured horizontally. The RFA may include or overlap with other resource areas or their Buffer Zones. The RFA is the area of land between a river's MAHW line measured horizontally outward from the river and a parallel line located 200-feet away[3]. The RFA does not have a Buffer Zone under the WPA.

According to the WPA regulations, a perennial stream (aka "river") is defined (in part), as follows:

- A river or stream shown as perennial on the current USGS map or more recent map provided by MassDEP is perennial.

- A river or stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size greater than or equal to one square mile, is perennial.

- A stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size less than one square mile, is intermittent unless the stream has a watershed size of at least ½ (0.50) square mile and has a predicted flow rate greater than or equal to 0.01 cubic feet per second at the 99% flow duration using the USGS Stream Stats method; or it meets certain criteria specified in the WPA regulations.[4]

The Study Area contains one perennial stream reach, the Fort River, having an associated 200-foot RFA. The reach of the Fort River flowing through the Study Area is shown as perennial on the current USGS Map. This resource area is described in further detail below.

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[3] Except that the parallel line is located: a. 25 feet away in Boston, Brockton, Cambridge, Chelsea, Everett, Fall River, Lawrence, Lowell, Malden, New Bedford, Somerville, Springfield, Winthrop, and Worcester; b. 25 feet away in densely developed areas, as designated by the Secretary of the Executive Office of Energy and Environmental Affairs pursuant to 301 CMR 10.00: Densely Developed Areas; and c. 100 feet away for new agricultural and aquacultural activities. Measured horizontally means that the riverfront area extends at a right angle to the MAHW line rather than along the surface of the land.

[4] See 310 CMR 10.58.2(a) for additional detail.

MAHW Flag Series MA1 (flags 100 through 117)

The MA1 series delineates the MAHW associated with the northern Bank of the Fort River. In this reach the MAHW is coincident with the Bank. Bankfull field indicators such as vertical banks, changes in vegetation, stain lines, changes in bank materials, and in some locations, bank undercuts, were used to establish the MAHW. Vegetation observed on the Bank include silky dogwood, catalpa, spicebush, silver maple, poison ivy, beggarticks, American elm, and jewelweed.

MAHW Flag Series MA2 (flags 100 through 117)

The MA2 series delineates the MAHW associated with the southern Bank of the Fort River. South of the bridge, the Bank gradually sloped down toward the river, while north of the bridge the Bank was vertical in many locations, much like the bank associated with the MA1 series described above. Vegetation observed on the Bank include American elm, silver maple, catalpa, poison ivy, silky dogwood, spicebush, jewelweed, and beggarticks.

DISCUSSION

Depending on the location and extent of potential future work, Epsilon recommends filing an Abbreviated Notice of Resource Area Delineation ("ANRAD") at the appropriate time with the Conservation Commission seeking formal approval of the proposed wetland resource area boundaries described herein. The ANRAD provides a procedure for an applicant to obtain official confirmation from the Conservation Commission regarding the extent and types of local and state jurisdictional wetland resource areas on the site. The Commission's approval of the wetland resource area boundaries is valid for 3 years, notwithstanding any extension permits issued thereto. Having an approved wetland boundary will allow Project Engineers to advance the design work in accordance with applicable regulatory performance standards and with confidence knowing that the wetland boundaries are "locked in" and not subject to change leading up to the eventual filing of a Notice of Intent ("NOI") with the Conservation Commission describing proposed work.

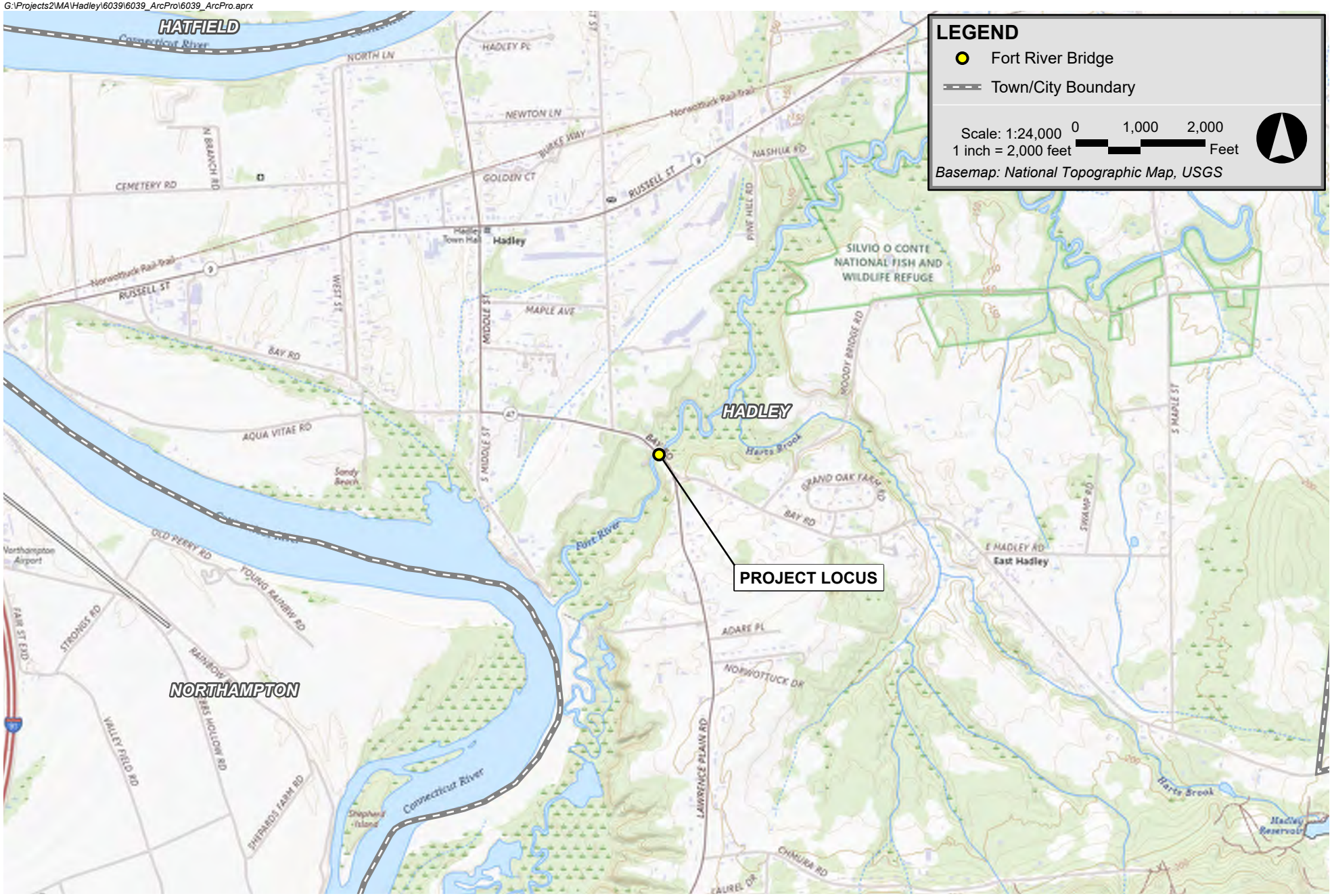
For purposes of this report, it is assumed that all the delineated vegetated wetlands are waters of the U.S. subject to regulation under Section 401 and 404 of the U.S. Clean Water Act.[5]

[5] "Waters of the United States" is broadly defined in the federal regulations that implement the Clean Water Act. It includes tidal waters, rivers, streams, lakes, ponds and wetlands. Wetlands are further defined MassDEP's 401 Water Quality Certification regulations as follows: "Bordering Vegetated Wetlands ("BVW") - Any land or surface area so defined by the Massachusetts Wetlands Protection Act, M.G.L. c. 131, § 40 and 310 CMR 10.55(2). [According to 310 CMR 10.55, BVW means (in part), "… freshwater wetlands which border on creeks, rivers, streams, ponds and lakes …"]; and Isolated Vegetated Wetlands ("IVW") - Areas subject to jurisdiction under 33 U.S.C. 1251, et seq. that are not Bordering Vegetated Wetlands subject to jurisdiction under M.G.L. c. 131, § 40 and 310 CMR 10.55(2).

Attachment A

Figures

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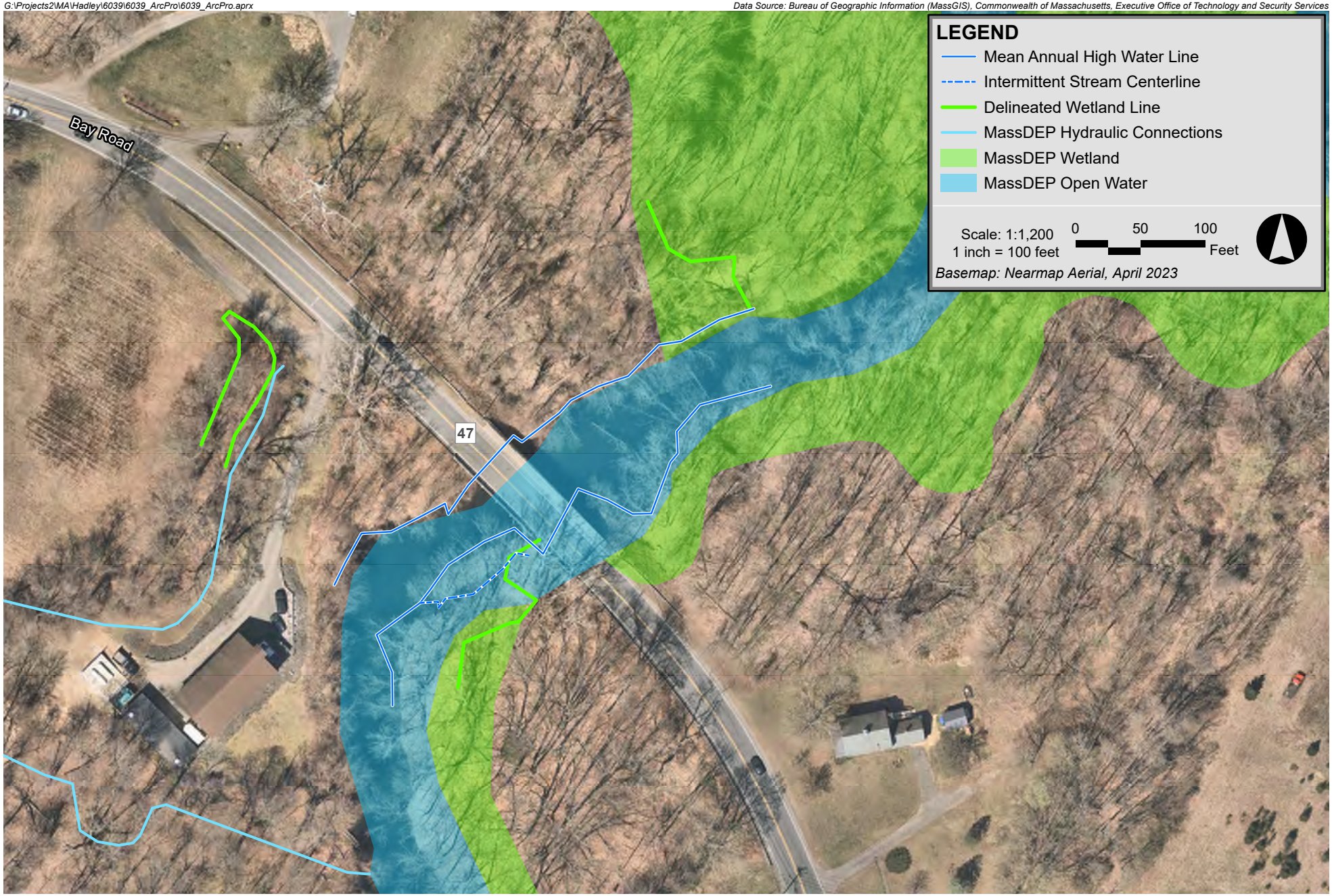
Fort River Bridge Hadley, Massachusetts

Epsilon Associates Inc.

Figure 1
USGS Locus Map

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Fort River Bridge Hadley, Massachusetts

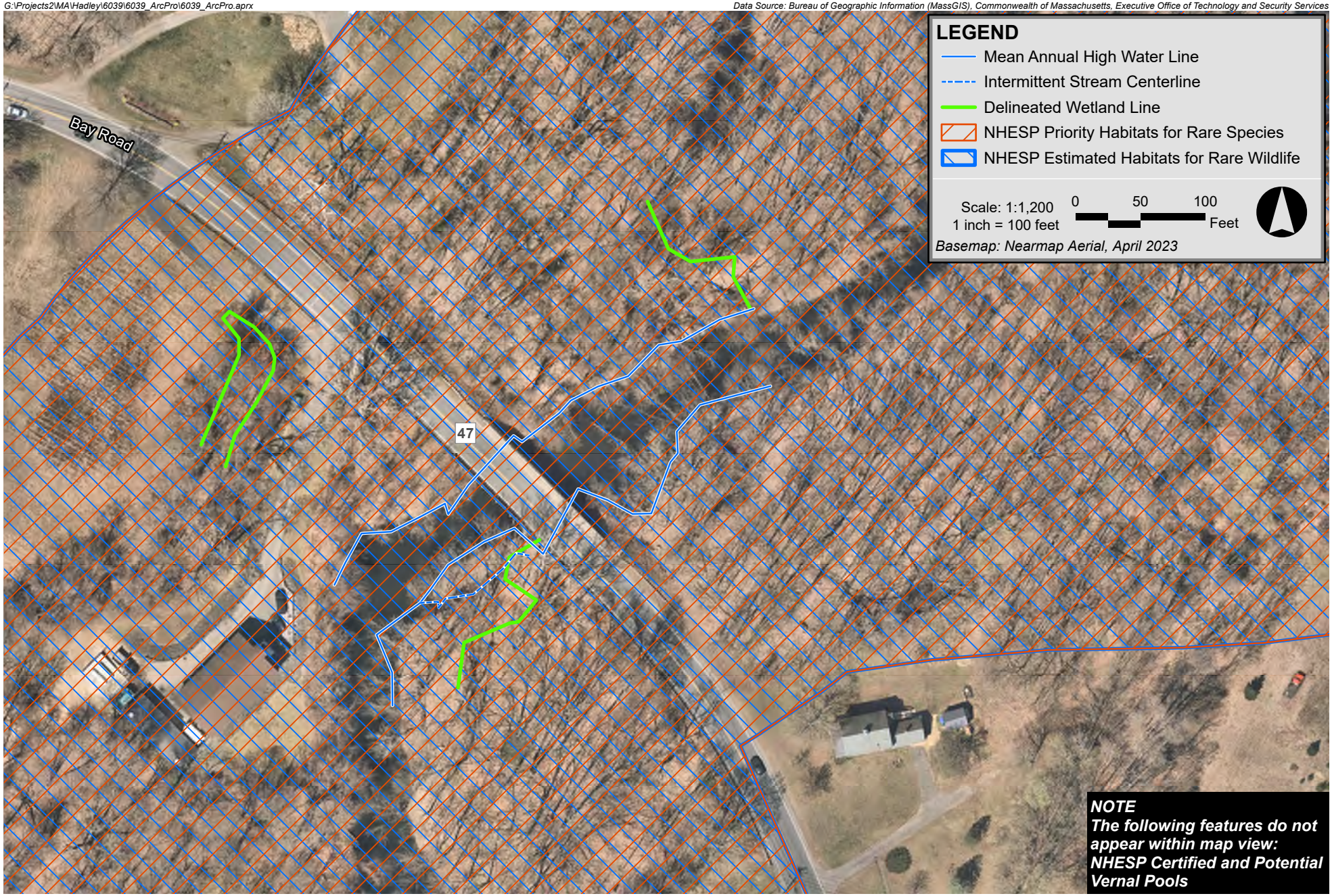
Epsilon Associates Inc.

Figure 2

MassDEP Wetlands and Hydraulic Connections

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Fort River Bridge **Hadley, Massachusetts**

Epsilon Associates Inc.

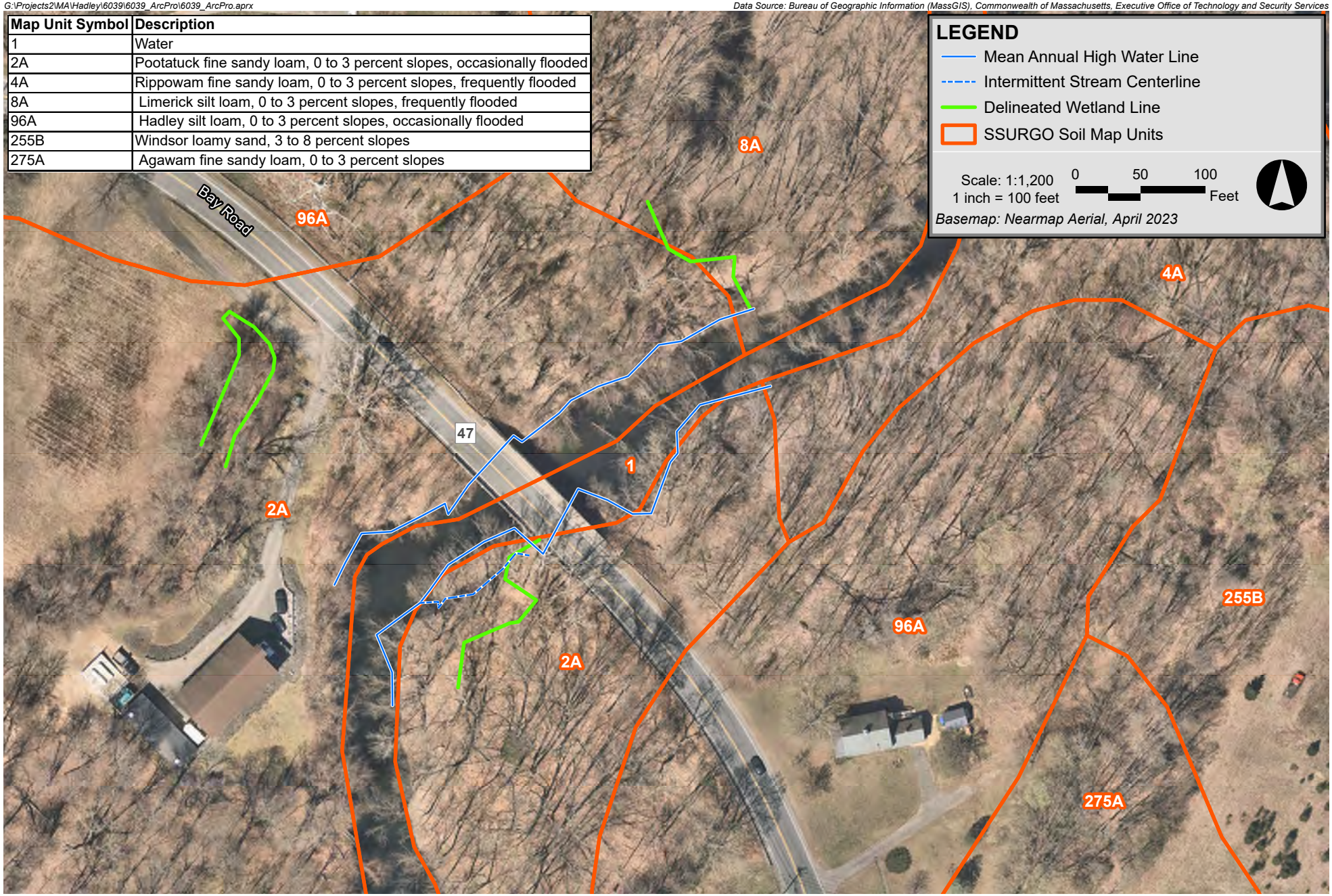
Figure 3

NHESP Habitats and Vernal Pools

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

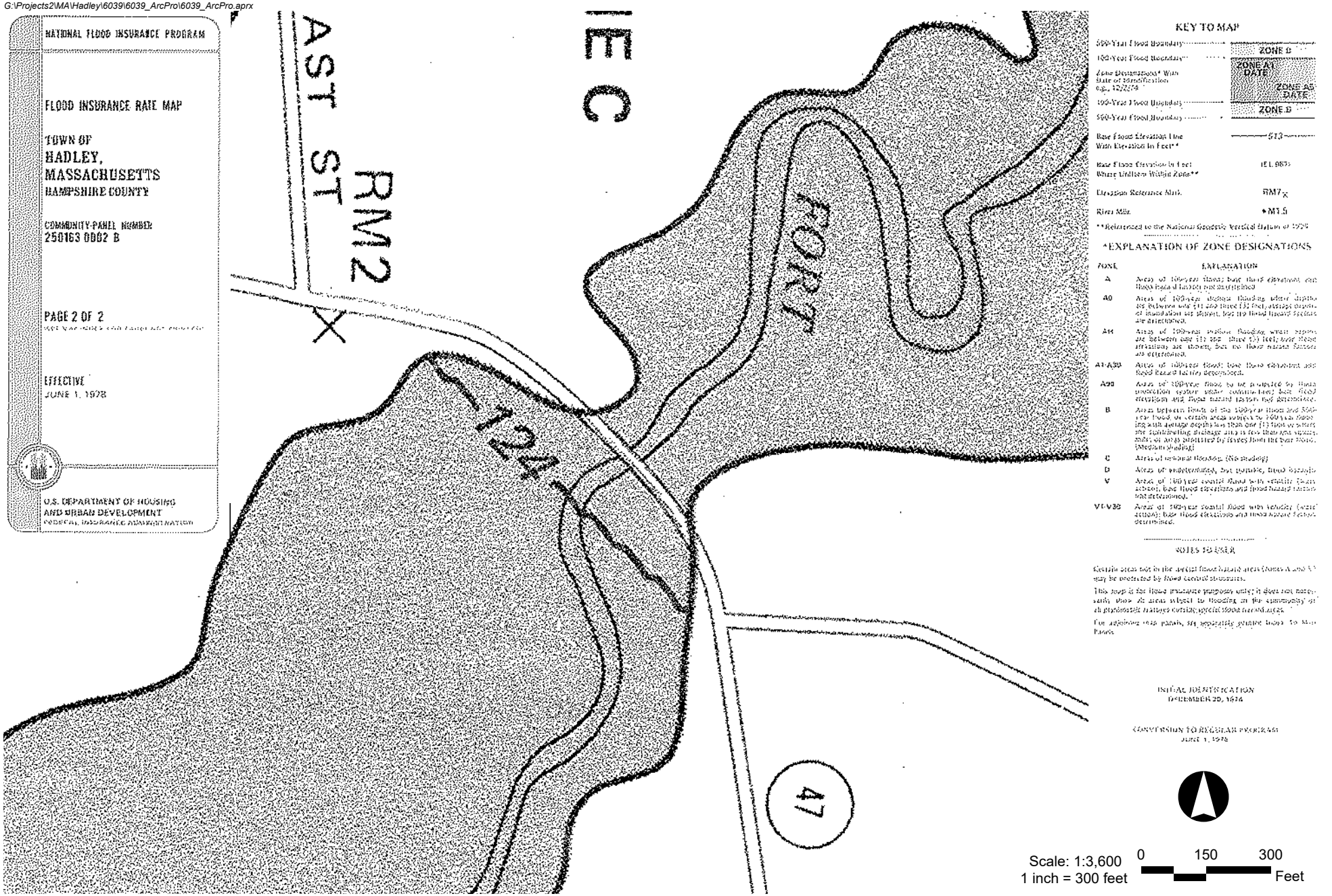
Map Unit Symbol	Description
1	Water
2A	Pootatuck fine sandy loam, 0 to 3 percent slopes, occasionally flooded
4A	Rippowam fine sandy loam, 0 to 3 percent slopes, frequently flooded
8A	Limerick silt loam, 0 to 3 percent slopes, frequently flooded
96A	Hadley silt loam, 0 to 3 percent slopes, occasionally flooded
255B	Windsor loamy sand, 3 to 8 percent slopes
275A	Agawam fine sandy loam, 0 to 3 percent slopes



Fort River Bridge Hadley, Massachusetts

Figure 4
NRCS SSURGO Soils

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Fort River Bridge Hadley, Massachusetts

Epsilon Associates Inc.

Figure 5
FEMA FIRM

Attachment B

Photos



Photo 1: Overview of wetland flag series W1 looking north toward Bay Road



Photo 2: Overview of wetland flag series W1 looking south toward Hadley Water Department facility



Photo 3: View from north side underneath Fort River Bridge



Photo 4: View of the Fort River as seen from the top of the bridge on Bay Road



Photo 5: View of gravel drive near wetland series W1, with the entrance to the Hadley water department to the right, and a view of Bay Road and the Fort River Bridge in the background to the left.



Photo 6: View of the culvert found just south of the bridge on the southern bank.



Photo 7: View of drainage ditch carrying water from the culvert found south of the bridge



Photo 8: View of Fort River from the southern bank, north of the Fort River Bridge

Attachment C

Wetland Determination Forms

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Town of Hadley Sampling Point or Zone: W1 - Upland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.333096, -72.579467

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: NA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ☐	No ✔	**Is the Sampled Area within a Wetland?**	**Yes** ☐ **No** ✔
Hydric Soils criterion met?	Yes ☐	No ✔		
Wetlands hydrology present?	Yes ☐	No ✔		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)_____
Water Table Present?	Yes ☐	No ✔	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes ☐	No ✔	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	☐ Drainage patterns
☐ Iron deposits	☐ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	☐ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W1 - Upland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. catalpa	Catalpa speciosa	FACU	38.0	Yes	No
3. red oak	Quercus rubra	FACU	38.0	Yes	No
4.					
5.					
6.					
7.					
8.					
9.					

114.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. multiflora rose	Rosa multiflora	FACU	38.0	Yes	No
2. green ash	Fraxinus pennsylvanica	FACW	10.5	No	
3. honeysuckle	Lonicera japonica	FACU	20.5	Yes	No
4. Norway maple	Acer platanoides	UPL	20.5	Yes	No
5.					
6.					
7.					
8.					
9.					

89.5 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. jewelweed	Impatiens capensis	FACW	20.5	Yes	Yes
2. christmas fern	Polystichum acrostichoides	FACU	10.5	Yes	Yes
3. poision ivy	Toxicodendron radicans	FAC	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

51.5 = Total Cover

Sampling Point W1 - Upland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	10.0	Yes	No
2. Virginia creeper	Parthenocissus quinquefolia	FACU	30.0	Yes	No
3.					
4.					
			40.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes _ _ No ✔
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	11	3		Yes _ _ No _ ✔
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	31	X 2	= 62.00
	FAC species	59	X 3	= 177.00
	FACU species	107	X 4	= 428.00
	UPL species	31	X 5	= 155.00
	Column Totals	(A) 228		(B) 822
Prevalence Index		B/A = 3.61		Is the Prevalence Index ≤ 3.0? Yes _ _ No _ ✔
Wetland vegetation criterion met?		**Yes** _ _	**No** ✔	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W1 - Upland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-8	10YR 3/2	100.00					FSL	
8-16+	7.5YR 5/6	100.00					FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: no redox

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Town of Hadley Sampling Point or Zone: W1 - Wetland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.333003, -72.579486

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: NA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ✔	No ☐	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ☐
Hydric Soils criterion met?	Yes ✔	No ☐		
Wetlands hydrology present?	Yes ✔	No ☐		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)
Water Table Present?	Yes ✔	No ☐	Depth (inches) 10.00
Saturation Present (including capillary fringe)?	Yes ✔	No ☐	Depth (inches) 10.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	✔ Drainage patterns
☐ Iron deposits	✔ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	✔ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W1 - Wetland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	63.0	Yes	Yes
2. catalpa	Catalpa speciosa	FACU	20.5	Yes	No
3. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

104.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
2. red maple	Acer rubrum	FAC	20.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

41.0 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. sensitive fern	Onoclea sensibilis	FACW	38.0	Yes	Yes
2. jewelweed	Impatiens capensis	FACW	20.5	No	
3. creeping charlie	Glechoma hederacea	FACU	10.5	No	
4. poison ivy	Toxicodendron radicans	FAC	38.0	Yes	Yes
5. New York fern	Thelypteris noveboracensis	FAC	20.5	No	
6.					
7.					
8.					
9.					
10.					
11.					
12.					

127.5 = Total Cover

Sampling Point W1 - Wetland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	20.5	Yes	No
2.					
3.					
4.					
			20.5 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	8	6		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	100	X 2	= 200.00
	FAC species	142	X 3	= 426.00
	FACU species	31	X 4	= 124.00
	UPL species	21	X 5	= 105.00
	Column Totals	(A) 294		(B) 855
Prevalence Index		B/A = 2.91		Is the Prevalence Index ≤ 3.0? Yes ☑ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W1 - Wetland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-6								fill
6-10	10YR 3/2	100.00					fine sandy loam	
10-20	2.5Y 4/2	85.00	5YR 5/8	15.00	C	M	loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Wanczyk Lee Ann Trustee Sampling Point or Zone: W2 - Upland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.332411, -72.578770

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: R2USC

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ☐	No ✔	**Is the Sampled Area within a Wetland?**	**Yes** ☐ **No** ✔
Hydric Soils criterion met?	Yes ☐	No ✔		
Wetlands hydrology present?	Yes ☐	No ✔		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)_____
Water Table Present?	Yes ☐	No ✔	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes ☐	No ✔	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	☐ Drainage patterns
☐ Iron deposits	☐ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	☐ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W2 - Upland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. silver maple	Acer saccharinum	FACW	38.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

76.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. multiflora rose	Rosa multiflora	FACU	38.0	Yes	No
2. honeysuckle	Lonicera japonica	FACU	20.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					

58.5 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. poison ivy	Toxicodendron radicans	FAC	20.5	Yes	Yes
2. creeping charlie	Glechoma hederacea	FACU	10.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

31.0 = Total Cover

Sampling Point W2 - Upland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Asiatic bittersweet	Celastrus orbiculatus	UPL	10.5	Yes	No
2. Virginia creeper	Parthenocissus quinquefolia	FACU	10.5	Yes	No
3.					
4.					
			21.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes _ _ No ✔
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	8	3		Yes _ _ No _ ✔ _
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	38	X 2	= 76.00
	FAC species	59	X 3	= 175.50
	FACU species	80	X 4	= 318.00
	UPL species	11	X 5	= 52.50
	Column Totals	(A) 186.5		(B) 622
Prevalence Index		B/A = 3.34		Is the Prevalence Index ≤ 3.0? Yes _ _ No _ ✔ _
Wetland vegetation criterion met?		**Yes** _ _	**No** ✔	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2 - Upland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)								
Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]	Texture	Remarks
0-10	10YR 3/2	100.00					FSL	
10-16	7.5YR 5/6	100.00					FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: no redox

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Bay Road Bridge over Fort River City/Town: Hadley Sampling Date: June 20, 2024

Applicant/Owner: MassDOT/Wanczyk Lee Ann Trustee Sampling Point or Zone: W2 - Wetland

Investigator(s): Greg Hochmuth PWS, CWS, Rob Brewer Latitude / Longitude: 42.332495, -72.578757

Soil Map Unit Name: 2A, Pootatuck fine sandy loam NWI or DEP Classification: R2USC

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐ , or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ✔	No ☐	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ☐
Hydric Soils criterion met?	Yes ✔	No ☐		
Wetlands hydrology present?	Yes ✔	No ☐		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☐	No ✔	Depth (inches)
Water Table Present?	Yes ✔	No ☐	Depth (inches) 10.00
Saturation Present (including capillary fringe)?	Yes ✔	No ☐	Depth (inches) 10.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☐ Water-stained leaves	☐ Hydrological records	☐ Direct observation of inundation
☐ Evidence of aquatic fauna	☐ Free water in a soil test hole	✔ Drainage patterns
☐ Iron deposits	✔ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☐ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☐ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☐ Trees with shallow root systems	☐ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	✔ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point W2 - Wetland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. American elm	Ulmus Americana	FACW	20.5	Yes	Yes
3. silver maple	Acer saccharinum	FACW	20.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

79.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. silky dogwood	Swida amomum	FACW	20.5	Yes	Yes
2. green ash	Fraxinus pennsylvanica	FACW	3.0	No	
3. spice bush	Lindera benzoin	FACW	10.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

34.0 = Total Cover

Herb Stratum Plot size 1,000 s.f.

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. poison ivy	Toxicodendron radicans	FAC	10.5	Yes	Yes
2. sensitive fern	Onoclea sensibilis	FACW	10.5	Yes	Yes
3. jewelweed	Impatiens capensis	FACW	10.5	Yes	Yes
4. New York fern	Thelypteris noveboracensis	FAC	38.0	Yes	Yes
5. hop sedge	Carex lupulina	OBL	3.0	No	
6. stinging nettle	Urtica dioica	FAC	10.5	Yes	Yes
7.					
8.					
9.					
10.					
11.					
12.					

83.0 = Total Cover

Sampling Point W2 - Wetland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,000 s.f.				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test:	Do all dominant species have an indicator status of OBL or FACW?			Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	10	10		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	3	X 1	= 3.00
	FACW species	96	X 2	= 192.00
	FAC species	97	X 3	= 291.00
	FACU species	0	X 4	= 0.00
	UPL species	0	X 5	= 0.00
	Column Totals	(A) 196		(B) 486
	Prevalence Index	B/A = 2.48		Is the Prevalence Index ≤ 3.0? Yes ☑ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2 - Wetland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-10	10YR 3/2	100.00					SIL	
10-18	5Y 5/2	85.00	10YR 5/8	15.00	C	M	FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

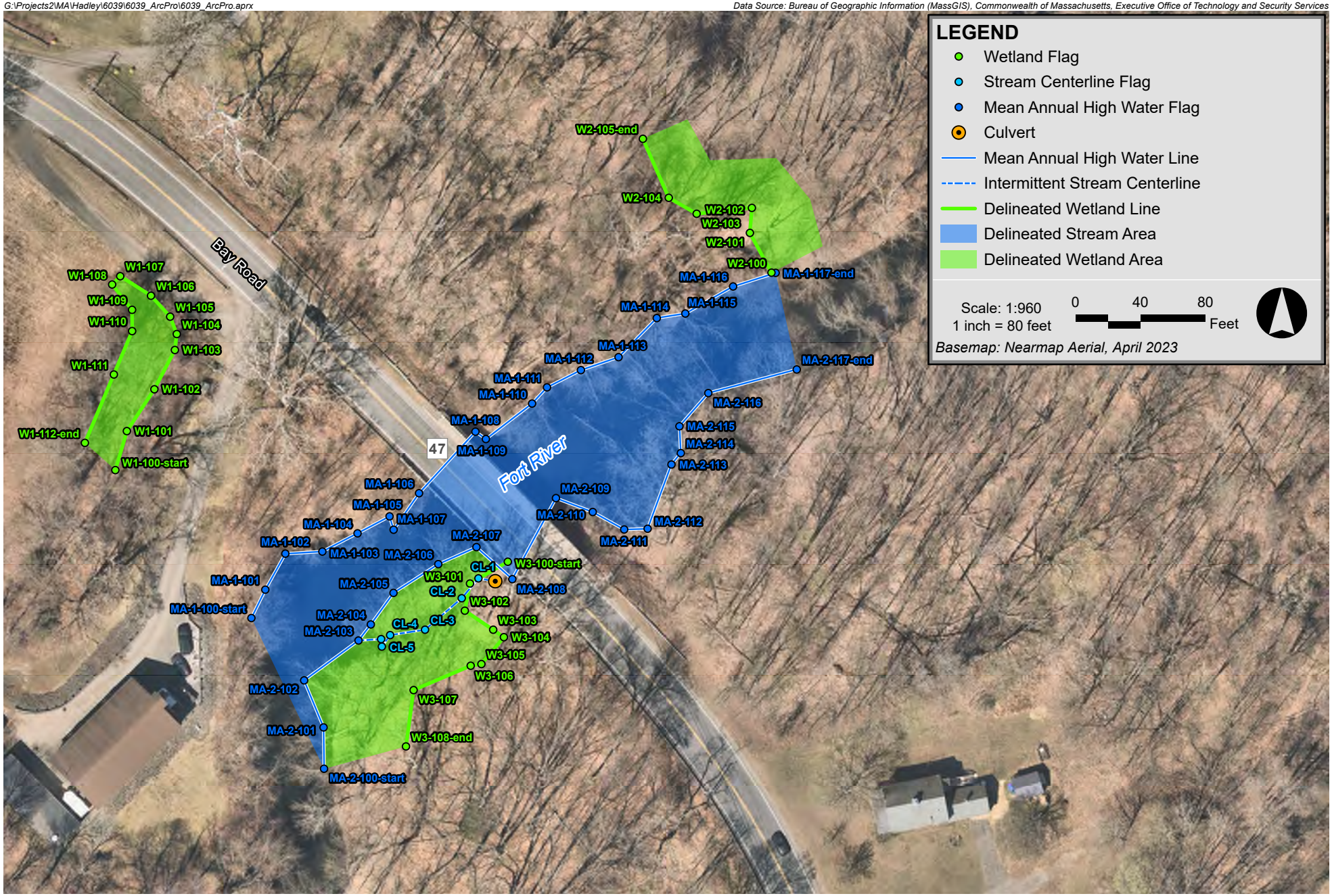
Hydric Soils criterion met? **Yes** ☑ **No** ☐

Attachment D

Wetland Delineation Map

G:\Projects2\MA\Hadley\6039\6039_ArcPro\6039_ArcPro.aprx

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Fort River Bridge Hadley, Massachusetts

Attachment D

Delineated Wetland Resource Areas

ADDENDUM ATTACHMENT 4

Sediment Sampling Summary

January 22, 2025
Project No. 2407720

VIA EMAIL: michael.a.joa@dot.state.ma.us

Michael Joa
Massachusetts Department of Transportation – Highway Division
10 Park Plaza
Boston, MA 02116

Re: Sediment Sampling Summary
Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

Dear Mr. Joa:

This Sediment Sampling Summary letter presents the results of the sediment sampling program for the above referenced project.

Introduction

Bridge No. H-01-005 is an approximately 126-foot long, two-lane bridge with one sidewalk on the north side that carries Bay Road over the Fort River in Hadley, Massachusetts (the Site, Fig. 1). The Massachusetts Department of Transportation (MassDOT) is preparing to dredge sediments as part of a bridge replacement project, including installation of riprap on the upstream side of the bridge and regrading of the riverbed primarily on the downstream side of the bridge. The volume of sediment to be dredged is estimated by MassDOT to be 374 cubic yards. Because this is more than 100 cubic yards, a Sampling and Analysis Plan (SAP) to characterize the sediment to be dredged was prepared by GEI Consultants, Inc. (GEI) and on November 13, 2024 submitted to the Massachusetts Department of Environmental Protection (MassDEP), in accordance with the Water Quality Certificate (WQC) regulations [314 CMR 9.07(2)(b)(5)]. The SAP was approved by MassDEP via email on November 20, 2024.

The purpose of this sampling was to collect and test representative samples to characterize sediment that will be generated during waterway crossing replacements, in compliance with the MassDEP requirements for the Section 401 Water Quality Certification testing criteria. In accordance with the SAP, GEI collected two samples below the sediment surface within the proposed dredge area of the Fort

River. One sample was collected near the upstream abutment, and one sample was collected near the downstream abutment.

Field Program

Sediment sampling was conducted by GEI on November 21, 2024. A total of two sediment samples (SED-2 and SED-1) were collected using hand tools to the anticipated dredge depth of approximately one to four feet, respectively (Fig. 2), and submitted for laboratory analysis. Each sample was collected from the mudline to the bottom of the exploration across the estimated dredge interval.

For both sampling locations, discrete samples for laboratory analysis of volatile organic compounds (VOCs) were selected from the sampling intervals with the highest jar headspace readings using a photoionization detector (PID) and the MassDEP jar headspace method.

GEI did not observe any visual or olfactory evidence of contamination in the sediment samples. Sediment generally consisted of silty sand with gravel at location SED-01 and sand at location SED-02. The sediment logs are in Appendix A**.**

Sediment Analysis

The samples were submitted to ESS Laboratory of Cranston, Rhode Island (ESS), a Massachusetts-certified laboratory, for the following analyses required by the WQC regulations [314 CMR 9.07(2)(b)(6)]: VOCs, extractable petroleum hydrocarbons (EPH) and target polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls by NOAA Summation of Congeners, metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), grain size, total organic carbon (TOC), and percent water.

Sediment Sampling Results

For comparison purposes only, chemical results were compared to Massachusetts Contingency Plan (MCP) Reportable Concentrations for S-1 soils (RCS-1), which only apply to soil and not sediment. Concentrations of PAHs and several metals were detected above laboratory reporting limits in the samples, but they were below their RCS-1 Standards. The analytical results are summarized in Table 1. The associated laboratory data report is in Appendix B. Detected contaminants are listed below.

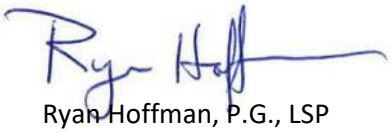
- PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene in one or both samples.
- Metals including arsenic, chromium, copper, lead, nickel, and zinc in both samples.

Please contact us at 781.721.4000 if you have any questions regarding this letter.

Sincerely,

GEI Consultants, Inc.





Christopher Ragnelli
Senior Project Manager

Ryan Hoffman, P.G., LSP
Vice President

CR/RH:vjb
B:\Working\MASSDOT\2407720 MassDOT Bay Rd (Rte 47) Over Fort River Bridge Hadley\07_Reports\Sediment Sampling Summary\20240122_2407720 Sediment Sampling Summary- Hadley FINAL.docx

Attachments:

Table
Figures
Appendix A Sediment Logs
Appendix B Laboratory Data

cc: Timothy Dexter, MassDOT
Courtney Walker, MassDOT

Table

Table 1. Sediment Laboratory Testing Results

Table 1. Sediment Laboratory Testing Results
Sediment Sampling Summary
Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
Volatile Organic Compounds (VOCs)	8260D Low	mg/kg			NT	NT		NT	NT
1,1,1,2-Tetrachloroethane			0.1	<0.0043			<0.0058		
1,1,1-Trichloroethane			30	<0.0043			<0.0058		
1,1,2,2-Tetrachloroethane			0.005	<0.0043			<0.0058		
1,1,2-Trichloroethane			0.1	<0.0043			<0.0058		
1,1-Dichloroethane			0.4	<0.0043			<0.0058		
1,1-Dichloroethene			3	<0.0043			<0.0058		
1,1-Dichloropropene			NS	<0.0043			<0.0058		
1,2,3-Trichlorobenzene			NS	<0.0043			<0.0058		
1,2,3-Trichloropropane			100	<0.0043			<0.0058		
1,2,4-Trichlorobenzene			2	<0.0043			<0.0058		
1,2,4-Trimethylbenzene			1,000	<0.0043			<0.0058		
1,2-Dibromo-3-chloropropane			10	<0.0043			<0.0058		
1,2-Dibromoethane			0.1	<0.0043			<0.0058		
1,2-Dichlorobenzene			9	<0.0043			<0.0058		
1,2-Dichloroethane			0.1	<0.0043			<0.0058		
1,2-Dichloropropane			0.1	<0.0043			<0.0058		
1,3,5-Trimethylbenzene			10	<0.0043			<0.0058		
1,3-Dichlorobenzene			3	<0.0043			<0.0058		
1,3-Dichloropropane			500	<0.0043			<0.0058		
1,4-Dichlorobenzene			0.7	<0.0043			<0.0058		
1,4-Dioxane			0.2	<0.0861			<0.116		
2,2-Dichloropropane			NS	<0.0043			<0.0058		
2-Chlorotoluene			100	<0.0043			<0.0058		
2-Hexanone			100	<0.0430			<0.0581		
4-Chlorotoluene			NS	<0.0043			<0.0058		
4-Isopropyltoluene			100	<0.0043			<0.0058		
4-Methyl-2-pentanone			0.4	<0.0430			<0.0581		
Acetone			6	<0.0430			<0.0581		
Benzene			2	<0.0043			<0.0058		
Bromobenzene			100	<0.0043			<0.0058		
Bromochloromethane			NS	<0.0043			<0.0058		
Bromodichloromethane			0.1	<0.0043			<0.0058		
Bromoform			0.1	<0.0043			<0.0058		
Bromomethane			0.5	<0.0086			<0.0116		
Carbon disulfide			100	<0.0043			<0.0058		
Carbon tetrachloride			5	<0.0043			<0.0058		
Chlorobenzene			1	<0.0043			<0.0058		

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Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
Chloroethane			100	<0.0086			<0.0116		
Chloroform			0.2	<0.0043			<0.0058		
Chloromethane			100	<0.0086			<0.0116		
cis-1,2-Dichloroethene			0.1	<0.0043			<0.0058		
cis-1,3-Dichloropropene			0.01	<0.0043			<0.0058		
Dibromochloromethane			0.005	<0.0043			<0.0058		
Dibromomethane			500	<0.0043			<0.0058		
Dichlorodifluoromethane			1000	<0.0086			<0.0116		
Diethyl Ether			100	<0.0043			<0.0058		
Di-isopropyl ether			100	<0.0043			<0.0058		
Ethyl tertiary-butyl ether			NS	<0.0043			<0.0058		
Ethylbenzene			40	<0.0043			<0.0058		
Hexachlorobutadiene			30	<0.0043			<0.0058		
Isopropylbenzene			1,000	<0.0043			<0.0058		
Xylene P,M			100	<0.0086			<0.0116		
Methyl Ethyl Ketone (2-Butanone)			4	<0.0430			<0.0581		
Methyl tert-Butyl Ether			0.1	<0.0043			<0.0058		
Methylene chloride			0.1	<0.0215			<0.0290		
Naphthalene			4	<0.0043			<0.0058		
n-Butylbenzene			NS	<0.0043			<0.0058		
n-Propylbenzene			100	<0.0043			<0.0058		
Xylene O			100	<0.0043			<0.0058		
sec-Butylbenzene			NS	<0.0043			<0.0058		
Styrene			3	<0.0043			<0.0058		
tert-Butylbenzene			100	<0.0043			<0.0058		
tertiary-amyl methyl ether			NS	<0.0043			<0.0058		
Tetrachloroethene			1	<0.0043			<0.0058		
Tetrahydrofuran			500	<0.0172			<0.0232		
Toluene			30	<0.0043			<0.0058		
Xylenes, Total			100	<0.0086			<0.0116		
trans-1,2-Dichloroethene			1	<0.0043			<0.0058		
trans-1,3-Dichloropropene			0.01	<0.0043			<0.0058		
Trichloroethene			0.3	<0.0043			<0.0058		
Trichlorofluoromethane			1000	<0.0043			<0.0058		
Vinyl chloride			0.3	<0.0086			<0.0116		
Total VOCs			NS	ND			ND		
Extractable Petroleum Hydrocarbons (EPH)		mg/kg		NT		NT	NT		NT

Table 1. Sediment Laboratory Testing Results
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Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
C9 to C18 Aliphatic Hydrocarbons	MADEP-EPH		1000		<12.8			<11.6	
C19 to C36 Aliphatic Hydrocarbons	MADEP-EPH		3000		<12.8			<11.6	
C11 to C22 Aromatic Hydrocarbons	EPH8270SIM		1000		<13.0			<11.8	
Benzo(a)anthracene	EPH8270SIM		20		0.025			0.010	
Benzo(a)pyrene	EPH8270SIM		2		0.028			<0.009	
Benzo(b)fluoranthene	EPH8270SIM		20		0.022			<0.009	
Benzo(g,h,i)perylene	EPH8270SIM		1000		0.019			<0.009	
Benzo(k)fluoranthene	EPH8270SIM		200		0.026			<0.009	
Chrysene	EPH8270SIM		200		0.027			0.011	
Dibenzo(a,h)anthracene	EPH8270SIM		2		<0.010			<0.009	
Fluoranthene	EPH8270SIM		1000		0.05			0.014	
Fluorene	EPH8270SIM		1000		<0.010			<0.009	
Indeno(1,2,3-cd)pyrene	EPH8270SIM		20		0.015			<0.009	
2-Methylnaphthalene	EPH8270SIM		0.7		<0.010			<0.009	
Naphthalene	EPH8270SIM		4		<0.010			<0.009	
Phenanthrene	EPH8270SIM		10		0.017			0.037	
Pyrene	EPH8270SIM		1000		0.043			0.029	
Polychlorinated Biphenyls (PCBs)	8082A Cong	mg/kg		NT		NT	NT		NT
BZ#8			NS		<0.00033			<0.00032	
BZ#18			NS		<0.00033			<0.00032	
BZ#28			NS		<0.00033			<0.00032	
BZ#44			NS		<0.00033			<0.00032	
BZ#52			NS		<0.00033			<0.00032	
BZ#66			NS		<0.00033			<0.00032	
BZ#101			NS		<0.00033			<0.00032	
BZ#105			NS		<0.00033			<0.00032	
BZ#118			NS		<0.00033			<0.00032	
BZ#128			NS		<0.00033			<0.00032	
BZ#138			NS		<0.00033			<0.00032	
BZ#153			NS		<0.00033			<0.00032	
BZ#170			NS		<0.00033			<0.00032	
BZ#180			NS		<0.00033			<0.00032	
BZ#187			NS		<0.00033			<0.00032	
BZ#195			NS		<0.00033			<0.00032	
BZ#206			NS		<0.00033			<0.00032	
BZ#209			NS		<0.00033			<0.00032	
Total PCBs			1		ND			ND	
Total Metals		mg/kg		NT	NT		NT	NT	

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Bridge Replacement Project (Bridge No. H-01-005)
Bay Road (Route 47) Over Fort River
Hadley, Massachusetts
MassDOT Project No. 608460

				SED 1			SED 2		
			Sample ID:	SED-1-GRAB	SED-1-COMP	SED-1-COMP-OVEN DRIED	SED-2-GRAB	SED-2-COMP	SED-2-COMP-OVEN DRIED
			Lab Package ID:	24K1020-04	24K1020-03	24K1020-06	24K1020-02	24K1020-01	24K1020-05
			Sample Date:	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024	11/21/2024
			Sample Depth (ft):	0-4			0-1		
			PID (ppm):	0.8-1.0			3.3-4.7		
Analyte	**Method**	**Units**	**MCP RCS-1**						
Arsenic	6010D		20			3.96			5.69
Cadmium	6010D		80			<0.10			<0.10
Chromium (Total)	6010D		100			6.32			7.46
Copper	6010D		NS			7.65			5.95
Lead	6010D		200			6.55			3.94
Mercury	7471B		20			<0.010			<0.010
Nickel	6010D		700			4.58			5.04
Zinc	6010D		1000			19.2			20.4
Grain Size Analysis	ASTM D2216/D6913			NT			NT		
% Total Gravel	-	%	NS		21.7	NT		44.4	NT
% Coarse Sand	-	%	NS		13.9			19	
% Medium Sand	-	%	NS		34.3			28.7	
% Fine Sand	-	%	NS		21.1			6.7	
% Total Fines	-	%	NS		9.0			1.2	
General Chemistry									
Total Organic Carbon	LK	mg/kg	NS	NT	4,560	NT	NT	1,600	NT
Moisture, Percent	2540G	%	NS	NT	20	NT	NT	15	NT
Solids, Percent	2540G	%	NS	83	80	100	92	85	100

General Notes:

1. In general, analytes detected in at least one sample are reported here. For a complete list of analytes see the laboratory data sheets.
2. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.
3. MCP = 310 CMR 40.0000 Massachusetts Contingency Plan with revisions effective March 1, 2024
4. Reportable Concentrations (e.g., RCS-1) where identified, are cited from the MCP.
5. NS = No MCP standard or disposal facility criteria
6. ND = Not detected above laboratory reporting limit
7. NT = Not tested
8. mg/kg = milligrams per kilogram.
9. SED-1-COMP and SED-2-COMP for were oven dried at 60 degrees Celsius prior to digesting and relogged as samples SED-1-COMP-OVEN DRIED and SED-2-COMP-OVEN DRIED, respectively.

Figures

Figure 1. Site Location Map

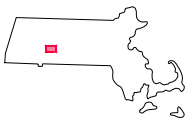
Figure 2. Sediment Sampling Locations



0 1000 2000 4000 6000

SCALE, FEET

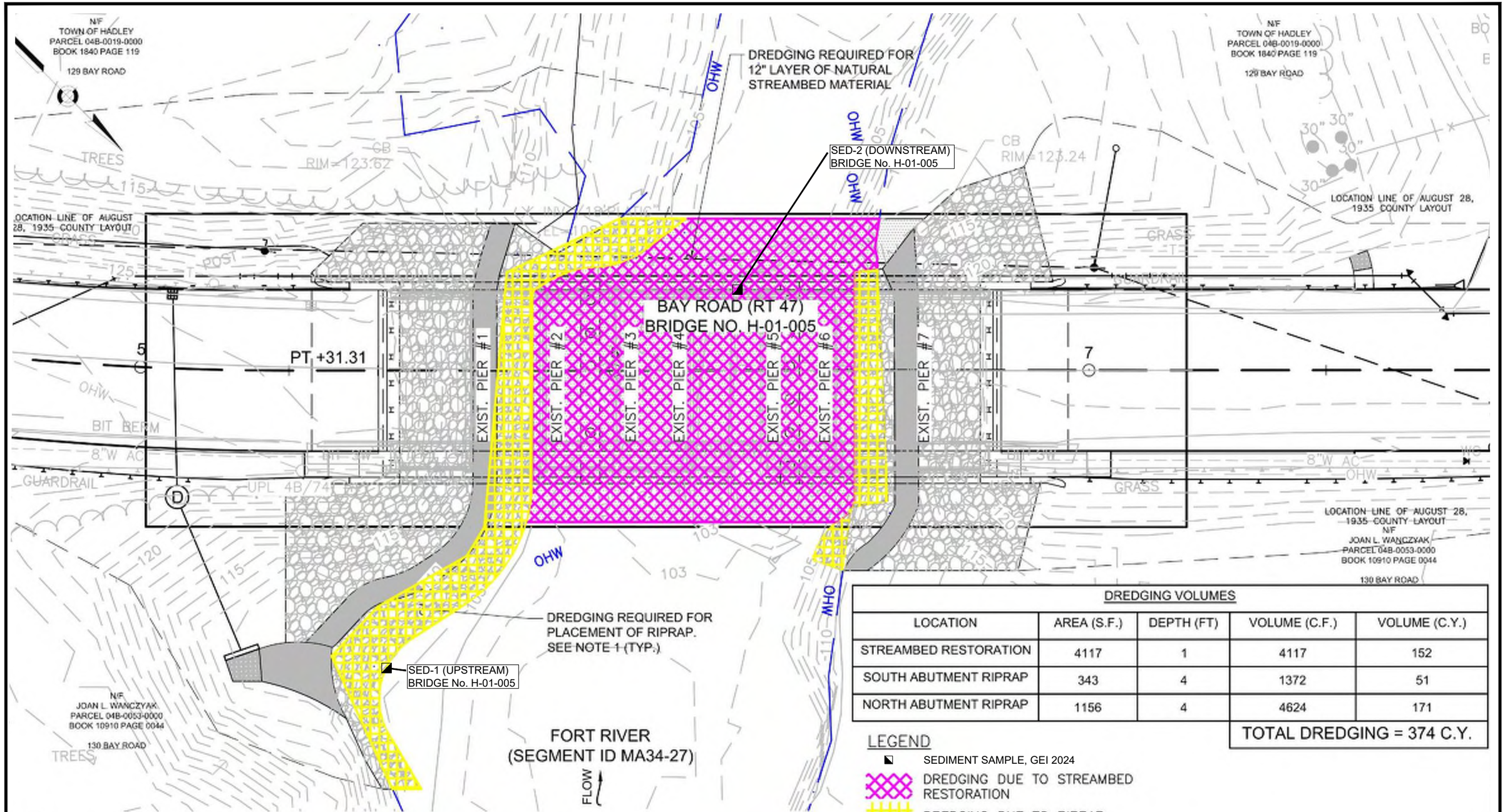
This Image is from U.S.G.S. Topographic 7.5 Minute Series
Mount Holyoke, MA, CT Quadrangle, 2024.
Datum is North American Vertical Datum of 1988 (NAVD88).
Contour Interval is 10 Feet.



MASSACHUSETTS
QUADRANGLE LOCATION

Sediment Sampling Summary Letter Hadley Bridge No. H-01-005 Improvements Bay (Rte. 47) Road Over Fort River Hadley, Massachusetts	GEI Consultants	SITE LOCATION MAP
Massachusetts Department of Transportation Boston, Massachusetts	Project 2407720	January 2025 Fig. 1

B:\Working\MASSDOT\2407720 MassDOT Bay Rd (Rte 47) Over Fort River Bridge Hadley\00_CAD\Figures\Gt\2407720-01



DREDGING VOLUMES				
LOCATION	AREA (S.F.)	DEPTH (FT)	VOLUME (C.F.)	VOLUME (C.Y.)
STREAMBED RESTORATION	4117	1	4117	152
SOUTH ABUTMENT RIPRAP	343	4	1372	51
NORTH ABUTMENT RIPRAP	1156	4	4624	171
			TOTAL DREDGING = 374 C.Y.	

LEGEND

- SEDIMENT SAMPLE, GEI 2024
- DREDGING DUE TO STREAMBED RESTORATION
- DREDGING DUE TO RIPRAP

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH 6" NATURAL STREAMBED COBBLE & GRAVEL TO FILL VOIDS (TYP.)

SOURCE:

1. BASE PLAN FROM *"DREDGING LOCATION PLAN, BAY ROAD (ROUTE 47) OVER FORT RIVER (segment ID MA 34-27) HADLEY, MA,"* EXHIBIT NO. 10 OF 17 PREPARED BY BENESCH.

0 20 40

SCALE, FEET

Sediment Sampling Summary Letter
Hadley Bridge No. H-01-005 Improvements
Bay (Rte. 47) Road Over Fort River
Hadley, Massachusetts

Massachusetts Department of Transportation
Boston, Massachusetts

GEI Consultants

SEDIMENT SAMPLING LOCATIONS

Project 2407720 | January 2025 | Fig. 2

CLINGEN, PAUL B:\Working\MASSDOT\2407720 MassDOT Bay Rd (Rte 47) Over Fort River Bridge Hadley\00_CAD\Figures\Gt\2407720-02.dwg - 12/20/2024

Appendix A Sediment Logs

SEDIMENT SAMPLE INFORMATION

LOCATION:

GROUND SURFACE EL. (ft): NM | **DATE START/END:** 11/21/2024 - 11/21/2024

VERTICAL DATUM: NA | **DRILLING COMPANY:** NA

TOTAL DEPTH (ft): 4.0 | **SAMPLER NAME:** Ben Johnson and Asa Burrows-Crane

LOGGED BY: B. Johnson | **RIG TYPE:** Hand Auger

BORING SED-1

DRILLING INFORMATION

HAMMER TYPE: NA | **CASING I.D./O.D.:** NA / NA | **CORE BARREL TYPE:**

AUGER I.D./O.D.: NA / NA | **DRILL ROD O.D.:** NM | **CORE BARREL I.D./O.D.** NA / NA

DRILLING METHOD: Hand Auger

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 1	12/12		PID: S1 (0-12") = 0.80 ppmv	SILTY SAND WITH GRAVEL	S1 (0-12") SILTY SAND WITH GRAVEL (SM): ~65% fine to coarse sand, ~20% subrounded gravel up to 0.25", ~15% nonplastic fines, brown with orange stains.
	1	S2	1 to 2	12/12		PID: S2 (12-24") = 0.99 ppmv		S2 (12-24") SILTY SAND WITH GRAVEL (SM): ~60% fine to coarse sand, ~20% subrounded gravel up to 0.5", ~20% nonplastic fines, tan to orange.
	2	S3	2 to 3	12/12		PID: S3 (24-36") = 0.96 ppmv		S3 (24-36") Similar to S2 (12-24").
	3	S4	3 to 4	12/12		PID: S4 (36-48") = 0.96 ppmv		S4 (36-48") SILTY SAND WITH GRAVEL (SM): ~55% fine to coarse sand, ~20% subrounded gravel up to 0.5", ~25% nonplastic fines.
	4							END OF BORING 4'.

NOTES: Sediment Sample. Environmental grab and composite samples collected. Soil samples screened in the field for VOCs using a PID with 10.6 eV lamp, calibrated to an isobutylene standard.

PROJECT NAME: MassDOT Bay Road (Rte 47) Over Fort River Bridge Hadley

CITY/STATE: Hadley, MA

GEI PROJECT NUMBER: 2407720

GEI Consultants

GEI WOBURN STD 1-LOCATION-LAYER NAME HADLEY BORING LOGS.GPJ 12/20/24

SEDIMENT SAMPLE INFORMATION

LOCATION:

GROUND SURFACE EL. (ft): NM | **DATE START/END:** 11/21/2024 - 11/21/2024

VERTICAL DATUM: NA | **DRILLING COMPANY:** NA

TOTAL DEPTH (ft): 1.0 | **SAMPLER NAME:** Ben Johnson and Asa Burrows-Crane

LOGGED BY: B. Johnson | **RIG TYPE:** Hand Auger

BORING SED-2

DRILLING INFORMATION

HAMMER TYPE: NA | **CASING I.D./O.D.:** NA / NA | **CORE BARREL TYPE:**

AUGER I.D./O.D.: NA / NA | **DRILL ROD O.D.:** NM | **CORE BARREL I.D./O.D.** NA / NA

DRILLING METHOD: Hand Auger

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	0	S1	0 to 1	12/12		PID: S1 (0-12") = 3.30-4.68 ppmv	Sand	S1 (0-12") WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM): ~60% fine to coarse sand, ~30% subrounded gravel up to 1.5", ~10% nonplastic fines, brown. Contains brick.
	1							END OF BORING 1'.
	2							
	3							
	4							

NOTES: Sediment Sample. Environmental grab and composite samples collected. Soil samples screened in the field for VOCs using a PID with 10.6 eV lamp, calibrated to an isobutylene standard.

PROJECT NAME: MassDOT Bay Road (Rte 47) Over Fort River Bridge Hadley

CITY/STATE: Hadley, MA

GEI PROJECT NUMBER: 2407720

GEI Consultants

GEI WOBURN STD 1-LOCATION-LAYER NAME HADLEY BORING LOGS.GPJ 12/20/24

Appendix B Laboratory Data

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Chris Ragnelli
GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801

RE: Hadley Bridge Rehabilitation - 401WQ (2407720)
ESS Laboratory Work Order Number: 24K1020

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 8:12 pm, Dec 05, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

CTS - Cranston, RI	Grain Size Analysis, Water Content

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

SAMPLE RECEIPT

The following samples were received on November 22, 2024 for the analyses specified on the enclosed Chain of Custody Record.

Samples 24K1020-01 and 24K1020-03 for Metals were oven dried at 60 degrees Celsius prior to digestion and relogged in as samples 24K1020-05 and 24K1020-06. This was done to increase the dry weight of the sample digested which decreases variability of results and lowers the detection limits for samples with high water content.

Low Level VOA vials were frozen by ESS Laboratory on November 22, 2024 at 19:18.

Lab Number	Sample Name	Matrix	Analysis
24K1020-01	2407720-SED-2-COMP	Sediment	2540G, 8082A Cong, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
24K1020-02	2407720-SED-2-GRAB	Sediment	8260D Low
24K1020-03	2407720-SED-1-COMP	Sediment	2540G, 8082A Cong, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
24K1020-04	2407720-SED-1-GRAB	Sediment	8260D Low
24K1020-05	2407720-SED-2-COMP - OVEN DRIED	Sediment	6010D, 7471B
24K1020-06	2407720-SED-1-COMP - OVEN DRIED	Sediment	6010D, 7471B

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

PROJECT NARRATIVE

Volatile Organics Low Level

D4K0471-CCV1 **Calibration required quadratic regression (Q).**
1,4-Dioxane (119% @ 80-120%), Bromoform (111% @ 40-160%), Tertiary-amyl methyl ether (111% @ 80-120%)

D4K0471-CCV1 **Continuing Calibration %Diff/Drift is above control limit (CD+).**
2,2-Dichloropropane (22% @ 20%)

DK42542-BS1 **Blank Spike recovery is above upper control limit (B+).**
2,2-Dichloropropane (136% @ 70-130%)

DK42542-BSD1 **Blank Spike recovery is above upper control limit (B+).**
2,2-Dichloropropane (134% @ 70-130%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010D - ICP
6020B - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260D - VOA
8270E - SVOA
8270E SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 19-2.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40
Percent Solids: 85
Initial Volume: 25.2g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/25/24 11:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (11.6)	---	MADEP-EPH	---	1	JDN	11/26/24 22:42	D4K0476	DK42507
C19-C36 Aliphatics1	ND (11.6)	---	MADEP-EPH	---	1	JDN	11/26/24 22:42	D4K0476	DK42507
C11-C22 Unadjusted Aromatics1	ND (11.6)	---	EPH8270	---	1	IBM	11/26/24 20:45	D4K0487	DK42507
C11-C22 Aromatics1,2	ND (11.8)	---	EPH8270	---		TJ	12/03/24 11:42	---	[CALC]
2-Methylnaphthalene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Acenaphthene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Naphthalene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Phenanthrene	**0.037** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Acenaphthylene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Anthracene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(a)anthracene	**0.010** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(a)pyrene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(b)fluoranthene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(g,h,i)perylene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Benzo(k)fluoranthene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Chrysene	**0.011** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Dibenzo(a,h)Anthracene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Fluoranthene	**0.014** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Fluorene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Indeno(1,2,3-cd)Pyrene	ND (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507
Pyrene	**0.029** (0.009)	---	EPH8270SIM	---	1	TJ	12/03/24 11:42	D4L0035	DK42507

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*86 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*100 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*98 %*		*40-140*
Surrogate: O-Terphenyl	*111 %*		*40-140*

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40
Percent Solids: 85

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**15** (1)	---	2540G	---	1	CCP	11/22/24 22:30	%	DK42233
Total Organic Carbon (Average)	**1600** (500)	---	LK	---	1	CCP	12/04/24 14:24	mg/kg	[CALC]

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Grain Size	**See Attached** (N/A)	---		---				%	
Water Content	**See Attached** (N/A)	---		---				%	

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP
Date Sampled: 11/21/24 14:40
Percent Solids: 85
Initial Volume: 30g
Final Volume: 2ml
Extraction Method: 3540C

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 12/2/24 11:35

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#18	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#28	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#44	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#52	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#66	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#101	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#105	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#118	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#128	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#138	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#153	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#170	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#180	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#187	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#195	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#206	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209
BZ#209	ND (0.00032)	---	8082A Cong	---	1	12/03/24 14:54	D4L0043	DL40209

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*78 %*		*30-150*

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-GRAB
Date Sampled: 11/21/24 14:41
Percent Solids: 92
Initial Volume: 4.7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1,1-Trichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1,2,2-Tetrachloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1,2-Trichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1-Dichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1-Dichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,1-Dichloropropene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,3-Trichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,3-Trichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,4-Trichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2,4-Trimethylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dibromo-3-Chloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dibromoethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dichloroethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,2-Dichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,3,5-Trimethylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,3-Dichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,3-Dichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,4-Dichlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
1,4-Dioxane	ND (0.116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2,2-Dichloropropane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2-Butanone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2-Chlorotoluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
2-Hexanone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
4-Chlorotoluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
4-Isopropyltoluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-GRAB
Date Sampled: 11/21/24 14:41
Percent Solids: 92
Initial Volume: 4.7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
4-Methyl-2-Pentanone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Acetone	ND (0.0581)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Benzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromochloromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromodichloromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromoform	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Bromomethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Carbon Disulfide	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Carbon Tetrachloride	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chlorobenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chloroethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chloroform	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Chloromethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
cis-1,2-Dichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
cis-1,3-Dichloropropene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Dibromochloromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Dibromomethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Dichlorodifluoromethane	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Diethyl Ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Di-isopropyl ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Ethyl tertiary-butyl ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Ethylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Hexachlorobutadiene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Isopropylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Methyl tert-Butyl Ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Methylene Chloride	ND (0.0290)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-GRAB
Date Sampled: 11/21/24 14:41
Percent Solids: 92
Initial Volume: 4.7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Naphthalene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
n-Butylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
n-Propylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
sec-Butylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Styrene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
tert-Butylbenzene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Tertiary-amyl methyl ether	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Tetrachloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Tetrahydrofuran	ND (0.0232)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Toluene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
trans-1,2-Dichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
trans-1,3-Dichloropropene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Trichloroethene	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Trichlorofluoromethane	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Vinyl Chloride	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Xylene O	ND (0.0058)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Xylene P,M	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542
Xylenes (Total)	ND (0.0116)	---	8260D Low	---	1	MEK	11/25/24 16:14	D4K0471	DK42542

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*116 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*87 %*		*70-130*
Surrogate: Dibromofluoromethane	*109 %*		*70-130*
Surrogate: Toluene-d8	*97 %*		*70-130*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50
Percent Solids: 80
Initial Volume: 24.4g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/25/24 11:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (12.8)	---	MADEP-EPH	---	1	JDN	11/26/24 23:16	D4K0476	DK42507
C19-C36 Aliphatics1	ND (12.8)	---	MADEP-EPH	---	1	JDN	11/26/24 23:16	D4K0476	DK42507
C11-C22 Unadjusted Aromatics1	ND (12.8)	---	EPH8270	---	1	IBM	11/26/24 21:25	D4K0487	DK42507
C11-C22 Aromatics1,2	ND (13.0)	---	EPH8270	---		TJ	12/03/24 12:10	---	[CALC]
2-Methylnaphthalene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Acenaphthene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Naphthalene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Phenanthrene	**0.017** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Acenaphthylene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Anthracene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(a)anthracene	**0.025** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(a)pyrene	**0.028** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(b)fluoranthene	**0.022** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(g,h,i)perylene	**0.019** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Benzo(k)fluoranthene	**0.026** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Chrysene	**0.027** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Dibenzo(a,h)Anthracene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Fluoranthene	**0.050** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Fluorene	ND (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Indeno(1,2,3-cd)Pyrene	**0.015** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507
Pyrene	**0.043** (0.010)	---	EPH8270SIM	---	1	TJ	12/03/24 12:10	D4L0035	DK42507

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*83 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*99 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*96 %*		*40-140*
Surrogate: O-Terphenyl	*103 %*		*40-140*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50
Percent Solids: 80

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**20** (1)	---	2540G	---	1	CCP	11/22/24 22:30	%	DK42233
Total Organic Carbon (Average)	**4560** (500)	---	LK	---	1	CCP	12/04/24 13:01	mg/kg	[CALC]

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Grain Size	**See Attached** (N/A)	---		---				%	
Water Content	**See Attached** (N/A)	---		---				%	

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP
Date Sampled: 11/21/24 15:50
Percent Solids: 80
Initial Volume: 30.6g
Final Volume: 2ml
Extraction Method: 3540C

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-03
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 12/2/24 11:35

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#18	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#28	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#44	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#52	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#66	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#101	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#105	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#118	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#128	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#138	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#153	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#170	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#180	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#187	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#195	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#206	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209
BZ#209	ND (0.00033)	---	8082A Cong	---	1	12/03/24 15:24	D4L0043	DL40209

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*78 %*		*30-150*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-GRAB
Date Sampled: 11/21/24 15:51
Percent Solids: 83
Initial Volume: 7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1,1-Trichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1,2,2-Tetrachloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1,2-Trichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1-Dichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1-Dichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,1-Dichloropropene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,3-Trichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,3-Trichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,4-Trichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2,4-Trimethylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dibromo-3-Chloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dibromoethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dichloroethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,2-Dichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,3,5-Trimethylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,3-Dichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,3-Dichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,4-Dichlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
1,4-Dioxane	ND (0.0861)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2,2-Dichloropropane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2-Butanone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2-Chlorotoluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
2-Hexanone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
4-Chlorotoluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
4-Isopropyltoluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-GRAB
Date Sampled: 11/21/24 15:51
Percent Solids: 83
Initial Volume: 7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
4-Methyl-2-Pentanone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Acetone	ND (0.0430)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Benzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromochloromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromodichloromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromoform	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Bromomethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Carbon Disulfide	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Carbon Tetrachloride	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chlorobenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chloroethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chloroform	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Chloromethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
cis-1,2-Dichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
cis-1,3-Dichloropropene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Dibromochloromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Dibromomethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Dichlorodifluoromethane	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Diethyl Ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Di-isopropyl ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Ethyl tertiary-butyl ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Ethylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Hexachlorobutadiene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Isopropylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Methyl tert-Butyl Ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Methylene Chloride	ND (0.0215)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-GRAB
Date Sampled: 11/21/24 15:51
Percent Solids: 83
Initial Volume: 7g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK
Prepared: 11/25/24 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Naphthalene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
n-Butylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
n-Propylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
sec-Butylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Styrene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
tert-Butylbenzene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Tertiary-amyl methyl ether	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Tetrachloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Tetrahydrofuran	ND (0.0172)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Toluene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
trans-1,2-Dichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
trans-1,3-Dichloropropene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Trichloroethene	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Trichlorofluoromethane	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Vinyl Chloride	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Xylene O	ND (0.0043)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Xylene P,M	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542
Xylenes (Total)	ND (0.0086)	---	8260D Low	---	1	MEK	11/25/24 16:39	D4K0471	DK42542

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*111 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*83 %*		*70-130*
Surrogate: Dibromofluoromethane	*108 %*		*70-130*
Surrogate: Toluene-d8	*99 %*		*70-130*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-2-COMP - OVEN DRIED
Date Sampled: 11/21/24 14:40
Percent Solids: 100

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-05
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	IV / FV	Batch
Arsenic	**5.69** (0.39)	---	6010D	---	1	KJB	12/02/24 12:06	5.14 100	DK42713
Cadmium	ND (0.10)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Chromium	**7.46** (0.39)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Copper	**5.95** (0.97)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Lead	**3.94** (1.95)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Mercury	ND (0.010)	---	7471B	---	1	AFV	11/26/24 21:02	2.04 40	DK42622
Nickel	**5.04** (0.97)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713
Zinc	**20.4** (0.97)	---	6010D	---	1	KJB	11/27/24 16:16	5.14 100	DK42713

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ
Client Sample ID: 2407720-SED-1-COMP - OVEN DRIED
Date Sampled: 11/21/24 15:50
Percent Solids: 100

ESS Laboratory Work Order: 24K1020
ESS Laboratory Sample ID: 24K1020-06
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	IV / FV	Batch
Arsenic	**3.96** (0.38)	---	6010D	---	1	KJB	12/02/24 12:08	5.21 100	DK42713
Cadmium	ND (0.10)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Chromium	**6.32** (0.38)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Copper	**7.65** (0.96)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Lead	**6.55** (1.92)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Mercury	ND (0.010)	---	7471B	---	1	AFV	11/26/24 21:04	2.05 40	DK42622
Nickel	**4.58** (0.96)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713
Zinc	**19.2** (0.96)	---	6010D	---	1	KJB	11/27/24 16:18	5.21 100	DK42713

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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch DK42622 - 7471B										
Blank										
Mercury	ND	0.032	mg/kg wet							
LCS										
Mercury	23.9	3.09	mg/kg wet	24.90		96	80-120			
LCS Dup										
Mercury	23.5	2.96	mg/kg wet	24.90		94	80-120	2	30	
Batch DK42713 - 3050B										
Blank										
Arsenic	ND	0.97	mg/kg wet							
Cadmium	ND	0.24	mg/kg wet							
Chromium	ND	0.97	mg/kg wet							
Copper	ND	2.42	mg/kg wet							
Lead	ND	4.83	mg/kg wet							
Nickel	ND	2.42	mg/kg wet							
Zinc	ND	2.42	mg/kg wet							
LCS										
Arsenic	125	3.28	mg/kg wet	280.0		45	32-110			
Cadmium	87.0	0.82	mg/kg wet	210.0		41	33-110			
Chromium	126	3.28	mg/kg wet	225.0		56	50-110			
Copper	128	8.20	mg/kg wet	290.0		44	33-110			
Lead	149	16.4	mg/kg wet	350.0		43	31-110			
Nickel	52.9	8.20	mg/kg wet	95.00		56	48-111			
Zinc	212	8.20	mg/kg wet	500.0		42	30-110			
LCS Dup										
Arsenic	106	2.99	mg/kg wet	280.0		38	32-110	17	30	
Cadmium	76.4	0.75	mg/kg wet	210.0		36	33-110	13	30	
Chromium	120	2.99	mg/kg wet	225.0		53	50-110	5	30	
Copper	112	7.46	mg/kg wet	290.0		39	33-110	13	30	
Lead	130	14.9	mg/kg wet	350.0		37	31-110	14	30	
Nickel	51.0	7.46	mg/kg wet	95.00		54	48-111	4	30	
Zinc	188	7.46	mg/kg wet	500.0		38	30-110	12	30	
Volatile Organics Low Level										
Batch DK42542 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							

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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0500	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0500	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0500	mg/kg wet							
Acetone	ND	0.0500	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0050	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0250	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0200	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0516*		mg/kg wet	*0.05000*		*103*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0432*		mg/kg wet	*0.05000*		*86*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0514*		mg/kg wet	*0.05000*		*103*	*70-130*			
Surrogate: Toluene-d8	*0.0489*		mg/kg wet	*0.05000*		*98*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	0.0605	0.0050	mg/kg wet	0.05000		121	70-130			
1,1,1-Trichloroethane	0.0561	0.0050	mg/kg wet	0.05000		112	70-130			
1,1,2,2-Tetrachloroethane	0.0528	0.0050	mg/kg wet	0.05000		106	40-160			
1,1,2-Trichloroethane	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
1,1-Dichloroethane	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
1,1-Dichloroethene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			
1,1-Dichloropropene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
1,2,3-Trichlorobenzene	0.0586	0.0050	mg/kg wet	0.05000		117	70-130			
1,2,3-Trichloropropane	0.0508	0.0050	mg/kg wet	0.05000		102	70-130			
1,2,4-Trichlorobenzene	0.0607	0.0050	mg/kg wet	0.05000		121	70-130			
1,2,4-Trimethylbenzene	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
1,2-Dibromo-3-Chloropropane	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
1,2-Dibromoethane	0.0561	0.0050	mg/kg wet	0.05000		112	70-130			
1,2-Dichlorobenzene	0.0552	0.0050	mg/kg wet	0.05000		110	70-130			
1,2-Dichloroethane	0.0489	0.0050	mg/kg wet	0.05000		98	70-130			
1,2-Dichloropropane	0.0515	0.0050	mg/kg wet	0.05000		103	70-130			
1,3,5-Trimethylbenzene	0.0567	0.0050	mg/kg wet	0.05000		113	70-130			
1,3-Dichlorobenzene	0.0555	0.0050	mg/kg wet	0.05000		111	70-130			

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
1,3-Dichloropropane	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
1,4-Dichlorobenzene	0.0543	0.0050	mg/kg wet	0.05000		109	70-130			
1,4-Dioxane	1.16	0.100	mg/kg wet	1.000		116	70-130			
2,2-Dichloropropane	0.0678	0.0050	mg/kg wet	0.05000		136	70-130			B+
2-Butanone	0.268	0.0500	mg/kg wet	0.2500		107	40-160			
2-Chlorotoluene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130			
2-Hexanone	0.286	0.0500	mg/kg wet	0.2500		114	40-160			
4-Chlorotoluene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
4-Isopropyltoluene	0.0548	0.0050	mg/kg wet	0.05000		110	70-130			
4-Methyl-2-Pentanone	0.257	0.0500	mg/kg wet	0.2500		103	40-160			
Acetone	0.286	0.0500	mg/kg wet	0.2500		114	40-160			
Benzene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
Bromobenzene	0.0558	0.0050	mg/kg wet	0.05000		112	70-130			
Bromochloromethane	0.0523	0.0050	mg/kg wet	0.05000		105	70-130			
Bromodichloromethane	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
Bromoform	0.0597	0.0050	mg/kg wet	0.05000		119	40-160			
Bromomethane	0.0540	0.0100	mg/kg wet	0.05000		108	40-160			
Carbon Disulfide	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
Carbon Tetrachloride	0.0593	0.0050	mg/kg wet	0.05000		119	70-130			
Chlorobenzene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130			
Chloroethane	0.0573	0.0100	mg/kg wet	0.05000		115	40-160			
Chloroform	0.0499	0.0050	mg/kg wet	0.05000		100	70-130			
Chloromethane	0.0415	0.0100	mg/kg wet	0.05000		83	40-160			
cis-1,2-Dichloroethene	0.0515	0.0050	mg/kg wet	0.05000		103	70-130			
cis-1,3-Dichloropropene	0.0571	0.0050	mg/kg wet	0.05000		114	40-160			
Dibromochloromethane	0.0601	0.0050	mg/kg wet	0.05000		120	40-160			
Dibromomethane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130			
Dichlorodifluoromethane	0.0336	0.0100	mg/kg wet	0.05000		67	40-160			
Diethyl Ether	0.0524	0.0050	mg/kg wet	0.05000		105	70-130			
Di-isopropyl ether	0.0525	0.0050	mg/kg wet	0.05000		105	70-130			
Ethyl tertiary-butyl ether	0.0637	0.0050	mg/kg wet	0.05000		127	70-130			
Ethylbenzene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130			
Hexachlorobutadiene	0.0578	0.0050	mg/kg wet	0.05000		116	40-160			
Isopropylbenzene	0.0623	0.0050	mg/kg wet	0.05000		125	70-130			
Methyl tert-Butyl Ether	0.0558	0.0050	mg/kg wet	0.05000		112	70-130			
Methylene Chloride	0.0501	0.0250	mg/kg wet	0.05000		100	70-130			
Naphthalene	0.0581	0.0050	mg/kg wet	0.05000		116	40-160			
n-Butylbenzene	0.0556	0.0050	mg/kg wet	0.05000		111	70-130			
n-Propylbenzene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130			
sec-Butylbenzene	0.0531	0.0050	mg/kg wet	0.05000		106	70-130			
Styrene	0.0546	0.0050	mg/kg wet	0.05000		109	40-160			
tert-Butylbenzene	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
Tertiary-amyl methyl ether	0.0615	0.0050	mg/kg wet	0.05000		123	70-130			
Tetrachloroethene	0.0541	0.0050	mg/kg wet	0.05000		108	70-130			

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Tetrahydrofuran	0.0518	0.0200	mg/kg wet	0.05000		104	70-130			
Toluene	0.0518	0.0050	mg/kg wet	0.05000		104	70-130			
trans-1,2-Dichloroethene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
trans-1,3-Dichloropropene	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
Trichloroethene	0.0510	0.0050	mg/kg wet	0.05000		102	70-130			
Trichlorofluoromethane	0.0489	0.0050	mg/kg wet	0.05000		98	40-160			
Vinyl Chloride	0.0525	0.0100	mg/kg wet	0.05000		105	70-130			
Xylene O	0.0551	0.0050	mg/kg wet	0.05000		110	70-130			
Xylene P,M	0.111	0.0100	mg/kg wet	0.1000		111	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0493*		mg/kg wet	*0.05000*		*99*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0468*		mg/kg wet	*0.05000*		*94*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0503*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: Toluene-d8	*0.0500*		mg/kg wet	*0.05000*		*100*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0596	0.0050	mg/kg wet	0.05000		119	70-130	1	20	
1,1,1-Trichloroethane	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	0.8	20	
1,1,2,2-Tetrachloroethane	0.0528	0.0050	mg/kg wet	0.05000		106	40-160	0.1	20	
1,1,2-Trichloroethane	0.0501	0.0050	mg/kg wet	0.05000		100	70-130	0.9	20	
1,1-Dichloroethane	0.0508	0.0050	mg/kg wet	0.05000		102	70-130	2	20	
1,1-Dichloroethene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130	0.6	20	
1,1-Dichloropropene	0.0500	0.0050	mg/kg wet	0.05000		100	70-130	0.9	20	
1,2,3-Trichlorobenzene	0.0571	0.0050	mg/kg wet	0.05000		114	70-130	2	20	
1,2,3-Trichloropropane	0.0510	0.0050	mg/kg wet	0.05000		102	70-130	0.3	20	
1,2,4-Trichlorobenzene	0.0587	0.0050	mg/kg wet	0.05000		117	70-130	3	20	
1,2,4-Trimethylbenzene	0.0548	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,2-Dibromo-3-Chloropropane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	3	20	
1,2-Dibromoethane	0.0555	0.0050	mg/kg wet	0.05000		111	70-130	1	20	
1,2-Dichlorobenzene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	4	20	
1,2-Dichloroethane	0.0483	0.0050	mg/kg wet	0.05000		97	70-130	1	20	
1,2-Dichloropropane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	2	20	
1,3,5-Trimethylbenzene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,3-Dichlorobenzene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130	3	20	
1,3-Dichloropropane	0.0515	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
1,4-Dichlorobenzene	0.0528	0.0050	mg/kg wet	0.05000		106	70-130	3	20	
1,4-Dioxane	1.24	0.100	mg/kg wet	1.000		124	70-130	6	20	
2,2-Dichloropropane	0.0670	0.0050	mg/kg wet	0.05000		134	70-130	1	20	B+
2-Butanone	0.268	0.0500	mg/kg wet	0.2500		107	40-160	0.06	20	
2-Chlorotoluene	0.0522	0.0050	mg/kg wet	0.05000		104	70-130	4	20	
2-Hexanone	0.289	0.0500	mg/kg wet	0.2500		116	40-160	1	20	
4-Chlorotoluene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	3	20	
4-Isopropyltoluene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	3	20	
4-Methyl-2-Pentanone	0.266	0.0500	mg/kg wet	0.2500		107	40-160	4	20	
Acetone	0.278	0.0500	mg/kg wet	0.2500		111	40-160	3	20	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Benzene	0.0498	0.0050	mg/kg wet	0.05000		100	70-130	1	20	
Bromobenzene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130	2	20	
Bromochloromethane	0.0517	0.0050	mg/kg wet	0.05000		103	70-130	1	20	
Bromodichloromethane	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Bromoform	0.0595	0.0050	mg/kg wet	0.05000		119	40-160	0.3	20	
Bromomethane	0.0523	0.0100	mg/kg wet	0.05000		105	40-160	3	20	
Carbon Disulfide	0.0521	0.0050	mg/kg wet	0.05000		104	70-130	1	20	
Carbon Tetrachloride	0.0586	0.0050	mg/kg wet	0.05000		117	70-130	1	20	
Chlorobenzene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Chloroethane	0.0547	0.0100	mg/kg wet	0.05000		109	40-160	5	20	
Chloroform	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
Chloromethane	0.0396	0.0100	mg/kg wet	0.05000		79	40-160	5	20	
cis-1,2-Dichloroethene	0.0501	0.0050	mg/kg wet	0.05000		100	70-130	3	20	
cis-1,3-Dichloropropene	0.0554	0.0050	mg/kg wet	0.05000		111	40-160	3	20	
Dibromochloromethane	0.0587	0.0050	mg/kg wet	0.05000		117	40-160	2	20	
Dibromomethane	0.0497	0.0050	mg/kg wet	0.05000		99	70-130	1	20	
Dichlorodifluoromethane	0.0317	0.0100	mg/kg wet	0.05000		63	40-160	6	20	
Diethyl Ether	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
Di-isopropyl ether	0.0507	0.0050	mg/kg wet	0.05000		101	70-130	3	20	
Ethyl tertiary-butyl ether	0.0627	0.0050	mg/kg wet	0.05000		125	70-130	1	20	
Ethylbenzene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Hexachlorobutadiene	0.0565	0.0050	mg/kg wet	0.05000		113	40-160	2	20	
Isopropylbenzene	0.0612	0.0050	mg/kg wet	0.05000		122	70-130	2	20	
Methyl tert-Butyl Ether	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	2	20	
Methylene Chloride	0.0491	0.0250	mg/kg wet	0.05000		98	70-130	2	20	
Naphthalene	0.0587	0.0050	mg/kg wet	0.05000		117	40-160	1	20	
n-Butylbenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	3	20	
n-Propylbenzene	0.0534	0.0050	mg/kg wet	0.05000		107	70-130	2	20	
sec-Butylbenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	3	20	
Styrene	0.0534	0.0050	mg/kg wet	0.05000		107	40-160	2	20	
tert-Butylbenzene	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
Tertiary-amyl methyl ether	0.0606	0.0050	mg/kg wet	0.05000		121	70-130	2	20	
Tetrachloroethene	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	5	20	
Tetrahydrofuran	0.0544	0.0200	mg/kg wet	0.05000		109	70-130	5	20	
Toluene	0.0508	0.0050	mg/kg wet	0.05000		102	70-130	2	20	
trans-1,2-Dichloroethene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	0.9	20	
trans-1,3-Dichloropropene	0.0483	0.0050	mg/kg wet	0.05000		97	70-130	2	20	
Trichloroethene	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	1	20	
Trichlorofluoromethane	0.0480	0.0050	mg/kg wet	0.05000		96	40-160	2	20	
Vinyl Chloride	0.0511	0.0100	mg/kg wet	0.05000		102	70-130	3	20	
Xylene O	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	2	20	
Xylene P,M	0.110	0.0100	mg/kg wet	0.1000		110	70-130	1	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0493*		mg/kg wet	*0.05000*		*99*	*70-130*			

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Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DK42542 - 5035										
Surrogate: 4-Bromofluorobenzene	*0.0474*		mg/kg wet	*0.05000*		*95*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0506*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: Toluene-d8	*0.0496*		mg/kg wet	*0.05000*		*99*	*70-130*			
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK42507 - 3546										
Blank										
C19-C36 Aliphatics1	ND	10.0	mg/kg wet							
C9-C18 Aliphatics1	ND	10.0	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.79*		mg/kg wet	*2.000*		*90*	*40-140*			
Blank										
C11-C22 Unadjusted Aromatics1	ND	10.0	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*1.99*		mg/kg wet	*2.000*		*99*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.85*		mg/kg wet	*2.000*		*92*	*40-140*			
Surrogate: O-Terphenyl	*1.95*		mg/kg wet	*2.000*		*97*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.008	mg/kg wet							
Acenaphthene	ND	0.008	mg/kg wet							
Acenaphthylene	ND	0.008	mg/kg wet							
Anthracene	ND	0.008	mg/kg wet							
Benzo(a)anthracene	ND	0.008	mg/kg wet							
Benzo(a)pyrene	ND	0.008	mg/kg wet							
Benzo(b)fluoranthene	ND	0.008	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.008	mg/kg wet							
Benzo(k)fluoranthene	ND	0.008	mg/kg wet							
Chrysene	ND	0.008	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.008	mg/kg wet							
Fluoranthene	ND	0.008	mg/kg wet							
Fluorene	ND	0.008	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.008	mg/kg wet							
Naphthalene	0.008	0.008	mg/kg wet							
Phenanthrene	ND	0.008	mg/kg wet							
Pyrene	ND	0.008	mg/kg wet							
LCS										
C19-C36 Aliphatics1	15.6	10.0	mg/kg wet	16.00		98	40-140			
C9-C18 Aliphatics1	10.5	10.0	mg/kg wet	12.00		87	40-140			
Surrogate: 1-Chlorooctadecane	*1.84*		mg/kg wet	*2.000*		*92*	*40-140*			
LCS										
C11-C22 Unadjusted Aromatics1	30.3	10.0	mg/kg wet	34.00		89	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK42507 - 3546										
Surrogate: 2-Bromonaphthalene	*2.03*		mg/kg wet	*2.000*		*101*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.88*		mg/kg wet	*2.000*		*94*	*40-140*			
Surrogate: O-Terphenyl	*2.27*		mg/kg wet	*2.000*		*113*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	1.64	0.040	mg/kg wet	2.000		82	40-140			
Acenaphthene	1.71	0.040	mg/kg wet	2.000		86	40-140			
Acenaphthylene	1.98	0.040	mg/kg wet	2.000		99	40-140			
Anthracene	1.79	0.040	mg/kg wet	2.000		90	40-140			
Benzo(a)anthracene	1.88	0.040	mg/kg wet	2.000		94	40-140			
Benzo(a)pyrene	1.95	0.040	mg/kg wet	2.000		98	40-140			
Benzo(b)fluoranthene	2.16	0.040	mg/kg wet	2.000		108	40-140			
Benzo(g,h,i)perylene	1.85	0.040	mg/kg wet	2.000		92	40-140			
Benzo(k)fluoranthene	1.98	0.040	mg/kg wet	2.000		99	40-140			
Chrysene	1.92	0.040	mg/kg wet	2.000		96	40-140			
Dibenzo(a,h)Anthracene	1.87	0.040	mg/kg wet	2.000		94	40-140			
Fluoranthene	1.80	0.040	mg/kg wet	2.000		90	40-140			
Fluorene	1.86	0.040	mg/kg wet	2.000		93	40-140			
Indeno(1,2,3-cd)Pyrene	1.83	0.040	mg/kg wet	2.000		92	40-140			
Naphthalene	1.44	0.040	mg/kg wet	2.000		72	40-140			
Phenanthrene	1.82	0.040	mg/kg wet	2.000		91	40-140			
Pyrene	1.85	0.040	mg/kg wet	2.000		93	40-140			
LCS Dup										
C19-C36 Aliphatics1	15.2	10.0	mg/kg wet	16.00		95	40-140	3	25	
C9-C18 Aliphatics1	10.3	10.0	mg/kg wet	12.00		86	40-140	2	25	
Surrogate: 1-Chlorooctadecane	*1.80*		mg/kg wet	*2.000*		*90*	*40-140*			
LCS Dup										
C11-C22 Unadjusted Aromatics1	28.8	10.0	mg/kg wet	34.00		85	40-140	5	25	
Surrogate: 2-Bromonaphthalene	*2.01*		mg/kg wet	*2.000*		*100*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.90*		mg/kg wet	*2.000*		*95*	*40-140*			
Surrogate: O-Terphenyl	*2.14*		mg/kg wet	*2.000*		*107*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	1.62	0.040	mg/kg wet	2.000		81	40-140	1	30	
Acenaphthene	1.68	0.040	mg/kg wet	2.000		84	40-140	2	30	
Acenaphthylene	1.93	0.040	mg/kg wet	2.000		96	40-140	3	30	
Anthracene	1.75	0.040	mg/kg wet	2.000		88	40-140	2	30	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK42507 - 3546										
Benzo(a)anthracene	1.82	0.040	mg/kg wet	2.000		91	40-140	4	30	
Benzo(a)pyrene	1.86	0.040	mg/kg wet	2.000		93	40-140	5	30	
Benzo(b)fluoranthene	2.05	0.040	mg/kg wet	2.000		102	40-140	5	30	
Benzo(g,h,i)perylene	1.71	0.040	mg/kg wet	2.000		85	40-140	8	30	
Benzo(k)fluoranthene	1.97	0.040	mg/kg wet	2.000		98	40-140	1	30	
Chrysene	1.86	0.040	mg/kg wet	2.000		93	40-140	4	30	
Dibenzo(a,h)Anthracene	1.77	0.040	mg/kg wet	2.000		89	40-140	5	30	
Fluoranthene	1.74	0.040	mg/kg wet	2.000		87	40-140	3	30	
Fluorene	1.80	0.040	mg/kg wet	2.000		90	40-140	4	30	
Indeno(1,2,3-cd)Pyrene	1.73	0.040	mg/kg wet	2.000		87	40-140	6	30	
Naphthalene	1.42	0.040	mg/kg wet	2.000		71	40-140	1	30	
Phenanthrene	1.77	0.040	mg/kg wet	2.000		88	40-140	3	30	
Pyrene	1.84	0.040	mg/kg wet	2.000		92	40-140	0.5	30	
Classical Chemistry										
Batch DL40242 - General Preparation										
Blank										
Total Organic Carbon (1)	ND	500	mg/kg							
Total Organic Carbon (2)	ND	500	mg/kg							
LCS										
Total Organic Carbon (1)	8970	500	mg/kg	10010		90	80-120			
Total Organic Carbon (2)	9130	500	mg/kg	10010		91	80-120			
LCS Dup										
Total Organic Carbon (1)	9200	500	mg/kg	10010		92	80-120	3	25	
Total Organic Carbon (2)	8750	500	mg/kg	10010		87	80-120	4	25	
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
Blank										
BZ#101	ND	0.00027	mg/kg wet							
BZ#101 [2C]	ND	0.00027	mg/kg wet							
BZ#105	ND	0.00027	mg/kg wet							
BZ#105 [2C]	ND	0.00027	mg/kg wet							
BZ#118	ND	0.00027	mg/kg wet							
BZ#118 [2C]	ND	0.00027	mg/kg wet							
BZ#128	ND	0.00027	mg/kg wet							
BZ#128 [2C]	ND	0.00027	mg/kg wet							
BZ#138	ND	0.00027	mg/kg wet							
BZ#138 [2C]	ND	0.00027	mg/kg wet							
BZ#153	ND	0.00027	mg/kg wet							
BZ#153 [2C]	ND	0.00027	mg/kg wet							
BZ#170	ND	0.00027	mg/kg wet							

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
BZ#170 [2C]	ND	0.00027	mg/kg wet							
BZ#18	ND	0.00027	mg/kg wet							
BZ#18 [2C]	ND	0.00027	mg/kg wet							
BZ#180	ND	0.00027	mg/kg wet							
BZ#180 [2C]	ND	0.00027	mg/kg wet							
BZ#187	ND	0.00027	mg/kg wet							
BZ#187 [2C]	ND	0.00027	mg/kg wet							
BZ#195	ND	0.00027	mg/kg wet							
BZ#195 [2C]	ND	0.00027	mg/kg wet							
BZ#206	ND	0.00027	mg/kg wet							
BZ#206 [2C]	ND	0.00027	mg/kg wet							
BZ#209	ND	0.00027	mg/kg wet							
BZ#209 [2C]	ND	0.00027	mg/kg wet							
BZ#28	ND	0.00027	mg/kg wet							
BZ#28 [2C]	ND	0.00027	mg/kg wet							
BZ#44	ND	0.00027	mg/kg wet							
BZ#44 [2C]	ND	0.00027	mg/kg wet							
BZ#52	ND	0.00027	mg/kg wet							
BZ#52 [2C]	ND	0.00027	mg/kg wet							
BZ#66	ND	0.00027	mg/kg wet							
BZ#66 [2C]	ND	0.00027	mg/kg wet							
BZ#8	ND	0.00027	mg/kg wet							
BZ#8 [2C]	ND	0.00027	mg/kg wet							
Surrogate: Tetrachloro-m-xylene	*0.00239*		mg/kg wet	*0.003333*		*72*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00242*		mg/kg wet	*0.003333*		*73*	*30-150*			
LCS										
BZ#101	0.00233	0.00027	mg/kg wet	0.003333		70	40-140			
BZ#101 [2C]	0.00241	0.00027	mg/kg wet	0.003333		72	40-140			
BZ#105	0.00296	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#105 [2C]	0.00270	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#118	0.00270	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#118 [2C]	0.00245	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#128	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#128 [2C]	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#138	0.00269	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#138 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#153	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#153 [2C]	0.00247	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#170	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#170 [2C]	0.00260	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#18	0.00291	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#18 [2C]	0.00288	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#180	0.00260	0.00027	mg/kg wet	0.003333		78	40-140			

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
BZ#180 [2C]	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#187	0.00244	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#187 [2C]	0.00244	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#195	0.00254	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#195 [2C]	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#206	0.00248	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#206 [2C]	0.00252	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#209	0.00239	0.00027	mg/kg wet	0.003333		72	40-140			
BZ#209 [2C]	0.00243	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#28	0.00254	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#28 [2C]	0.00279	0.00027	mg/kg wet	0.003333		84	40-140			
BZ#44	0.00246	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#44 [2C]	0.00244	0.00027	mg/kg wet	0.003333		73	40-140			
BZ#52	0.00289	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#52 [2C]	0.00292	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#66	0.00257	0.00027	mg/kg wet	0.003333		77	40-140			
BZ#66 [2C]	0.00246	0.00027	mg/kg wet	0.003333		74	40-140			
BZ#8	0.00250	0.00027	mg/kg wet	0.003333		75	40-140			
BZ#8 [2C]	0.00280	0.00027	mg/kg wet	0.003333		84	40-140			
Surrogate: Tetrachloro-m-xylene	*0.00247*		mg/kg wet	*0.003333*		*74*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00247*		mg/kg wet	*0.003333*		*74*	*30-150*			
LCS Dup										
BZ#101	0.00228	0.00027	mg/kg wet	0.003333		69	40-140	2	30	
BZ#101 [2C]	0.00236	0.00027	mg/kg wet	0.003333		71	40-140	2	30	
BZ#105	0.00273	0.00027	mg/kg wet	0.003333		82	40-140	8	30	
BZ#105 [2C]	0.00256	0.00027	mg/kg wet	0.003333		77	40-140	5	30	
BZ#118	0.00245	0.00027	mg/kg wet	0.003333		74	40-140	9	30	
BZ#118 [2C]	0.00239	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#128	0.00259	0.00027	mg/kg wet	0.003333		78	40-140	0.01	30	
BZ#128 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#138	0.00258	0.00027	mg/kg wet	0.003333		77	40-140	4	30	
BZ#138 [2C]	0.00249	0.00027	mg/kg wet	0.003333		75	40-140	2	30	
BZ#153	0.00242	0.00027	mg/kg wet	0.003333		73	40-140	8	30	
BZ#153 [2C]	0.00243	0.00027	mg/kg wet	0.003333		73	40-140	2	30	
BZ#170	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#170 [2C]	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#18	0.00283	0.00027	mg/kg wet	0.003333		85	40-140	3	30	
BZ#18 [2C]	0.00280	0.00027	mg/kg wet	0.003333		84	40-140	3	30	
BZ#180	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#180 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	3	30	
BZ#187	0.00237	0.00027	mg/kg wet	0.003333		71	40-140	3	30	
BZ#187 [2C]	0.00239	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#195	0.00246	0.00027	mg/kg wet	0.003333		74	40-140	3	30	

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DL40209 - 3540C										
BZ#195 [2C]	0.00249	0.00027	mg/kg wet	0.003333		75	40-140	4	30	
BZ#206	0.00239	0.00027	mg/kg wet	0.003333		72	40-140	3	30	
BZ#206 [2C]	0.00242	0.00027	mg/kg wet	0.003333		73	40-140	4	30	
BZ#209	0.00233	0.00027	mg/kg wet	0.003333		70	40-140	2	30	
BZ#209 [2C]	0.00238	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#28	0.00250	0.00027	mg/kg wet	0.003333		75	40-140	2	30	
BZ#28 [2C]	0.00277	0.00027	mg/kg wet	0.003333		83	40-140	0.6	30	
BZ#44	0.00240	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#44 [2C]	0.00240	0.00027	mg/kg wet	0.003333		72	40-140	2	30	
BZ#52	0.00282	0.00027	mg/kg wet	0.003333		85	40-140	2	30	
BZ#52 [2C]	0.00288	0.00027	mg/kg wet	0.003333		86	40-140	1	30	
BZ#66	0.00256	0.00027	mg/kg wet	0.003333		77	40-140	0.2	30	
BZ#66 [2C]	0.00244	0.00027	mg/kg wet	0.003333		73	40-140	0.8	30	
BZ#8	0.00244	0.00027	mg/kg wet	0.003333		73	40-140	3	30	
BZ#8 [2C]	0.00274	0.00027	mg/kg wet	0.003333		82	40-140	2	30	
Surrogate: Tetrachloro-m-xylene	*0.00232*		mg/kg wet	*0.003333*		*70*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00235*		mg/kg wet	*0.003333*		*71*	*30-150*			

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

Notes and Definitions

Z-08	See Attached
U	Analyte included in the analysis, but not detected
Q	Calibration required quadratic regression (Q).
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
B+	Blank Spike recovery is above upper control limit (B+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: GEI Consultants, Inc.
Client Project ID: Hadley Bridge Rehabilitation - 401WQ ESS Laboratory Work Order: 24K1020

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Thielsch
DIVISION OF THE RISE GROUP

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
cts.thielsch.com
Let's Build a Solid Foundation

Client Information:		Project Information:	
ESS Laboratory		**24K1020**	
Cranston, RI		**PO# 2407720**	
401-467-7181		Project Number:	24K1020
Project Contact:	ESS Project Management	Summary Page:	1 of 1
Collected By:	Client	Report Date:	12/3/2024

LABORATORY TESTING DATA SHEET, Report No.: 7424-L-276

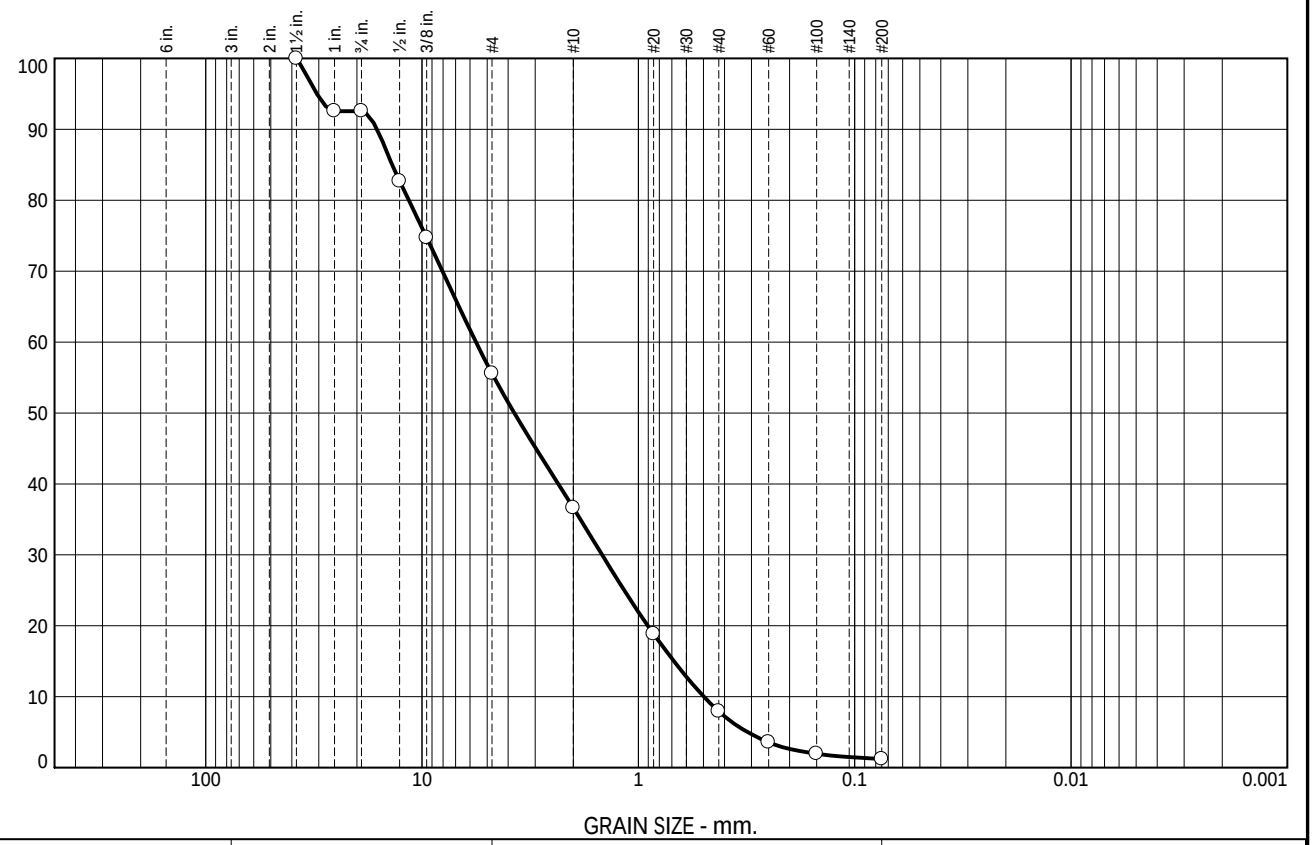
Material Source	Sample ID	Depth (ft)	Laboratory No.	Identification Tests									Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Rcvd Moisture Content %	LL %	PL %	OD LL	Gravel %	Sand %	Fines %	Org. %	pH	g_d MAX (pcf) W_{opt} (%)	g_d MAX (pcf) W_{opt} (%) (Corr.)	Dry unit wt. (pcf)	Test Moisture Content %	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318			D6913			D2974	D4792	D1557								
Sediment	24K1020-01	-	24K1020-01	14.2				44.4	54.4	1.2											Brown poorly graded sand with gravel
Sediment	24K1020-03	-	24K1020-03	18.7				21.7	69.3	9.0											Brown well-graded sand with silt and gravel

Date Received: **11/25/2024** Reviewed By: Date Reviewed: **12/3/2024**

This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.
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These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.4	37.0	19.0	28.7	6.7	1.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	92.6		
3/4"	92.6		
1/2"	82.7		
3/8"	74.7		
#4	55.6		
#10	36.6		
#20	18.8		
#40	7.9		
#60	3.6		
#100	2.0		
#200	1.2		

* (no specification provided)

Source of Sample: Sediment Depth: -
Sample Number: 24K1020-01

Soil Description
Brown poorly graded sand with gravel

Atterberg Limits
PL= NP LL= NV PI= NP

Coefficients
D_{90}= 16.1344 D_{85}= 13.7439 D_{60}= 5.6325
D_{50}= 3.7451 D_{30}= 1.4712 D_{15}= 0.6846
D_{10}= 0.4982 C_u= 11.31 C_c= 0.77

Classification
USCS= SP AASHTO= A-1-a

Remarks

Date: 12.2.24

Thielsch Engineering Inc.
Cranston, RI

Client: ESS Laboratory
Project: 24K1020
PO# 2407720
Project No: 24K1020

Fig. 24K1020-01

Tested By: MCS/AB/SBR Checked By: Kris Roland

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.3	18.4	13.9	34.3	21.1	9.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	96.7		
1/2"	89.8		
3/8"	86.6		
#4	78.3		
#10	64.4		
#20	45.1		
#40	30.1		
#60	19.3		
#100	12.8		
#200	9.0		

* (no specification provided)

Source of Sample: Sediment Depth: -
Sample Number: 24K1020-03

Soil Description

Brown well-graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 12.8915 D_{85}= 8.2352 D_{60}= 1.6158
D_{50}= 1.0513 D_{30}= 0.4232 D_{15}= 0.1850
D_{10}= 0.0934 C_u= 17.30 C_c= 1.19

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Date: 12.2.24

Thielsch Engineering Inc.
Cranston, RI

Client: ESS Laboratory
Project: 24K1020
PO# 2407720
Project No: 24K1020

Fig. 24K1020-03

Tested By: MCS/AB/SBR Checked By: Kris Roland

Proposal No. 608460-130088

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GEI Consultants, Inc. - TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24K1020
Date Received: 11/22/2024
Project Due Date: 12/3/2024
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 2.3 Iced with: ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? (Yes) / No
    ESS Sample IDs: 1, 3
    Analysis: Grain Size
    TAT: 5 days
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? (Yes) / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: 11/22/24 Time: 1918 By: TD

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	618861	Yes	N/A	Yes	Driller Jar	NP	
1	618863	Yes	N/A	Yes	8 oz jar	NP	
1	618864	Yes	N/A	Yes	8 oz jar	NP	
1	618865	Yes	N/A	Yes	8 oz jar	NP	
2	618853	Yes	N/A	Yes	VOA Vial	MeOH	
2	618855	Yes	N/A	Yes	VOA Vial	DI Water	
2	618856	Yes	N/A	Yes	VOA Vial	DI Water	
2	618859	Yes	N/A	Yes	4 oz. Jar	NP	
3	618862	Yes	N/A	Yes	Driller Jar	NP	
3	618866	Yes	N/A	Yes	8 oz jar	NP	
3	618867	Yes	N/A	Yes	8 oz jar	NP	
3	618868	Yes	N/A	Yes	8 oz jar	NP	
4	618854	Yes	N/A	Yes	VOA Vial	MeOH	
4	618857	Yes	N/A	Yes	VOA Vial	DI Water	
4	618858	Yes	N/A	Yes	VOA Vial	DI Water	
4	618860	Yes	N/A	Yes	4 oz. Jar	NP	

2nd Review
Were all containers scanned into storage/lab? Initials
Are barcode labels on correct containers? (Yes) / No

Proposal No. 608460-130088

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GEI Consultants, Inc. - TB

ESS Project ID: 24K1020

Date Received: 11/22/2024

Are all Flashpoint stickers attached/container ID # circled?	Yes / No / NA
Are all Hex Chrome stickers attached?	Yes / No / NA
Are all QC stickers attached?	Yes / No / NA
Are VOA stickers attached if bubbles noted?	Yes / No / NA

Completed By: _____ Date & Time: 11/22/24 1901

Revlewed By: _____ Date & Time: 11/22/24 1918.

Chain-of-Custody Record

Laboratory: ESS

Laboratory Job # (Lab use only) 24K1020

GEI Consultants
400 Unicorn Park Drive
Woburn, MA 01801
PH: 781.721.4000

Project Information

Project Name: Hadley Bridge Rehabilitation

Project Location: Hadley, MA

Project Number: 2407720

Project Manager: Chris Ragnelli
781-721-4128 cragnelli@geiconsultants.com

Send Report to: Chris Ragnelli, Adam Grossman
labdata@geiconsultants.com
agrossman@geiconsultants.com

MCP PRESUMPTIVE CERTAINTY AND MCP ANALYTICAL METHODS REQUIRED: (YES) NO

STATE AND FEDERAL REGULATORY REQUIREMENTS/REPORT LIMITS

State/Federal Program: (MA) 401WQC Other _____ NH RI CT NY ME

MA MCP Criteria are Method 1 S-1 and GW-2/GW-3. Circle if GW-1 is required.

Sample Handling

Samples Field Filtered: YES NO (NA)

Sampled Shipped With Ice: (YES) NO

Lab Sample Number	GEI Sample ID	Collection Date	Collection Time	Matrix	No. of Bottles	Sampler(s) Initials	Preservative	Volatile organic compounds (VOCs)	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc	Polycyclic aromatic hydrocarbons (PAHs)	Polychlorinated biphenyls (PCBs) by NOMA Summation of Congeners	Extractable petroleum hydrocarbons (EPH) – fractions only	Total organic carbon (TOC)	Percent water	Toxicity Characteristic Leaching Procedure	Grain size distribution		Sample Specific Remarks
							DI H2O / MeOH	Analysis										
1	2407720-SED-2-COMP	11/21/2024	14:40	SD	4	BCJ	none		x	x	x	x	x	x	x	x		
2	2407720-SED-2-GRAB	11/21/2024	14:41	SD	4	BCJ	none	x										
3	2407720-SED-1-COMP	11/21/2024	15:50	SD	4	BCJ	none		x	x	x	x	x	x	x	x		
4	2407720-SED-1-GRAB	11/21/2024	15:51	SD	4	BCJ	none	x										
							none											
							none											
							none											
							none											
							none											
							none											
							none											
							none											

Relinquished by sampler: (signature)	Date:	Time:	Received by: (signature)
1.	11/21/2024	18:45	1. GEI Fridge
Relinquished by sampler: (signature) 2. GEI Fridge	11/22/24	14:20	2.
Relinquished by: (signature) 3.	11/22/24	1420	3. 11/22/24 1420
Relinquished by: (signature) 4. 2.3 onice	11/22/24	1722	4.
Relinquished by: (signature) 5.	Date:	Time:	Received by: (signature) 5.

Turnaround Time (Business days):

Normal __x__ 4-Day ____ 3-Day ____
2-Day ____ 1-Day ____ Other ____

Before submitting rush turnaround samples, you **must** notify the laboratory to confirm that the TAT can be achieved.

Additional Requirements/Comments/Remarks:

Run TCLP if 20x rule exceeded

Sample Matrix Abbreviations: SO = Soil GW = Groundwater SW = Surface Water SD = Sediment CO = Concrete PC = Paint Chip CLK = Caulk

ADDENDUM ATTACHMENT 5

Stormwater Management Memo

To: MassDOT

Date: February 20, 2025

Project #: 608460

From: Benesch

Re: *Bay Road (Route 47) over Fort River*

This Stormwater Management Memorandum has been prepared to show compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Water Quality Certification Regulations (314 CMR 9.00) to support the Project's Section 401 Water Quality Certificate Application.

Project Description

The Applicant, MassDOT, is proposing Project 608460 to construct a bridge replacement (the Project) located in Hadley, MA. As proposed, the Project consists of replacing two integral abutments and two pipe pile bents with reinforced concrete pile caps. New riprap will be installed at the base of the south and north abutment walls. The entire bridge superstructure will be replaced and widened using precast concrete deck beams. The proposed Bay Road roadway section on the bridge will provide two 12-foot wide lanes (one in each direction) of vehicular traffic with 5-foot wide outside shoulders, as well as a sidewalk on the east side of the bridge. A terrestrial wildlife passage is proposed adjacent to the south abutment, and a drainage channel is proposed southeast of the bridge.

Existing and Proposed Drainage Conditions

The proposed project area is approximately 740 ft of Bay Road (Route 47) and the Bay road bridge over the Fort river. In this area Bay Road is approximately 28 - 34 ft wide. The Fort River flows in the southwesterly direction. The channel width at the bridge varies approximately from 40-70 ft. Existing drainage structures in the project area include 1 deep sump catch basin and 1 drainage outfall. This outfall discharges into the Fort River. According to the FEMA Flood Insurance Rate Map (Community-Panel Number 2501630002B), this area of the Fort River lies within a 100-year flood zone. At the bridge the 100-year flood is at an elevation of 123 ft.

The project will include construction of new drainage structures, the restoration and relocation of existing outfall, the construction of a drainage channel, and an increase in impervious surface area of 2900 sf. This increase is required to provide ADA compliant cement concrete sidewalk along the bridge, and to widen Bay Road to accommodate two 12 ft lanes with 5 ft shoulders. On the South side of the bridge, one deep sump catch basin will be constructed as well as a drainage manhole. An outfall with a concrete headwall and drainage channel is proposed southeast of the bridge. The proposed deep sump catch basin and the proposed drainage manhole will be connected with 12" RCP. The proposed drainage manhole and the relocated outfall will be connected with 12" CMP. The existing catch basin will be removed. At the relocated outfall, a 195 sf drainage channel is proposed.

BMP Stormwater Management Alternatives

Many Stormwater Control Measures (SCMs) were considered, however were not considered feasible for this project. The project will improve the existing conditions by providing pre-treatment to roadway runoff prior to being outlet to the river and maintaining existing drainage patterns with existing conditions. The following were considered:

- Deep-Sump Catch Basins – the catch basin proposed as part of this project will have a deep-sump. The deep-sump catch basin will be used to replace the existing corrugated pipe (without sump or structure) that conveys water to an existing outlet.

- Sediment Forebay/Infiltration Basin – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, forebays and infiltration basins with check dams were not considered feasible or effective. A stone apron, however, is provided at the proposed outlet location to prevent erosion and reduce water velocities. The stone apron transitions to a streambed material drainage channel to aid in temperature reduction of runoff before discharge into the river.

- Open-Graded Friction Course – the design coordinated with and approved by the MassDOT Pavement Management Section does not include open-graded friction course pavement. At this stage of design, it is not feasible to change the pavement design.

- Pavement Disconnection – The existing site relies primarily on "country drainage" or sheet flow to convey water away from the roadway. Some widening of the roadway is proposed (described in Section 2.3 above), however the existing pavement disconnection was maintained to the maximum extent practicable for the site. Bridge scuppers are not proposed on this bridge, therefore all roadway drainage within the project site will either exit the roadway to natural vegetated areas or be pre-treated within a deep-sump catch basin prior to being outlet to the river.

- Leaching Basins – due to the existing site topography and proximity of the toe of slope with the river bank, a leaching basin was not considered for the project site.

- Subsurface Infiltration System – due to the scope of this project, existing site topography, proximity of the toe of slope with the river bank and existing right-of-way, a subsurface infiltration system was not considered feasible for the project.

- Porous Pavement – the design coordinated with and approved by the MassDOT Pavement Section does not include porous pavement. Since this project is primarily a roadway project, porous pavement was not considered. Also, the proposed pedestrian sidewalk is limited to the length of the bridge and will be made of cement concrete.

- Stormwater Wetland Stormwater Control Measures (SCM) – due to the scope of this project, existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, stormwater wetland SCMs were not considered feasible for this project. Although not a constructed stormwater wetland, numerous upland plantings are being proposed as part of the project in order to improve the banks compared to the existing condition. There is also a streambed material drainage channel proposed between the drainage outfall location and the river bank.

Massachusetts Department of Environmental Protection (MassDEP) – Stormwater Management Standards

As demonstrated below, the proposed Project complies with the MassDEP Stormwater Management Standards (the Standards). Under the Stormwater Management Standards, the Project is considered a redevelopment project because it involves maintenance and improvement of an existing roadway. The existing bridge superstructure will be replaced and widened, new abutments will be installed along with new rip-rap. Two 12' wide lanes, 5' wide outside shoulders, and a 5'-6" cement concrete sidewalk along the bridge is also proposed. The Project has been designed to meet the Stormwater Management Standards to the maximum extent practicable and to improve upon existing conditions.

Standard 1: No New Untreated Discharges

No new stormwater conveyance (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The Project has been designed to comply with Standard 1 fully.

An existing stormwater outfall was relocated and restored from the southwest side of the bridge to the southeast side. The outfall was moved to reduce impact to Bordering Vegetated Wetlands. A flared pipe end outfall with cement concrete headwall will be constructed at the new outfall, as well as a 38 sf area of stone for pipe ends. Adjacent to the stone for pipe ends a 195 SF drainage channel of streambed material is proposed. The purpose of the drainage channel and stone pipe end is to prevent erosion to the Fort River and Bordering Vegetated Wetlands. The proposed stone pipe end will act as an energy dissipator for outflowing stormwater. The drainage channel will allow for temperature reduction before discharging to the river.

See Standard 4 for the water quality treatment provided by the Project.

Standard 2: Peak Rate Attenuation

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

The Project has been designed to comply with Standard 2 to the maximum extent practicable. Table 1 includes a summary of impervious cover impacts, which can be used as a metric to understand impacts to peak discharge rates following development.

Table 1: Existing and proposed impervious cover

Existing Impervious Area (sq. ft)	Proposed Impervious Area (sq. ft)	Change In Impervious Area (sq. ft)	Percent Increase in Impervious Area (%)
22,700	25,600	2900	12%

The existing and proposed Peak Discharge Rates are shown below in Table 2. Due to the change in the location of drainage outlets/structures, the proposed DP-2 represents approximately the sum of the existing DP-2, DP-3, DP-4 and DP-5 areas. As reflected in Table 2, there are minor increases in peak discharge rates for each of the design storms due to the increased impervious area required to meet MassDOT design standards and ADA criteria of two 12' lanes, 5' shoulders and a 5'-6" sidewalk. The proposed catch basin and restored outfall will allow for the collected stormwater from proposed DP-1 to be discharged to the Fort River. There is likely no flooding concern as prior precipitation would have also previously drained directly to the Fort River as well.

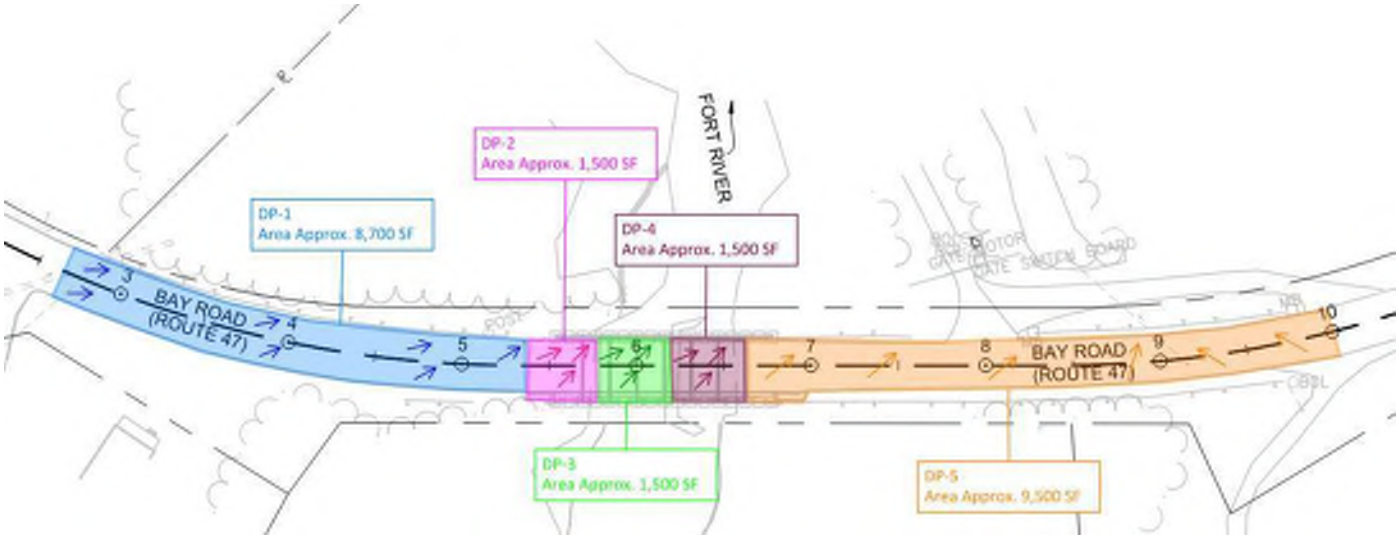
Although there is an increase in impervious, and therefore peak discharge rates, the overall drainage patterns of the site will be improved compared to the existing condition. The direct outlets to the Fort River (via bridge scuppers) will be eliminated. All stormwater drainage will either flow through the proposed deep sump catch basin or via overland flow from country drainage.

Table 2: Peak Discharge Rates (cfs)

Design Point	Existing			Proposed		
	2-year	10-year	100-year	2-year	10-year	100-year
DP-1	0.06	0.09	0.18	0.06	0.09	0.16
DP-2	0.01	0.02	0.03	0.13	0.19	0.36
DP-3	0.01	0.02	0.03	N/A	N/A	N/A
DP-4	0.01	0.02	0.03	N/A	N/A	N/A
DP-5	0.07	0.10	0.20	N/A	N/A	N/A
TOTALS	0.16	0.25	0.47	0.19	0.28	0.52

Following this page are images representing the existing and proposed drainage patterns of the project site, as well as a sample calculation showing how the peak discharge rates were calculated for DP-1.

EXISTING DRAINAGE PATTERNS OF PROJECT SITE:



PROPOSED DRAINAGE PATTERNS OF PROJECT SITE:



SAMPLE CALCULATIONS FOR PEAK DISCHARGE RATES:

Rational Method: $Q = C_a CiA$

Q = peak discharge (cfs)
C = runoff coefficient
C_a = 1.0 for 2-10 year storm; 1.25 for 100 year storm (PDDG Exhibit 8-10)
i = avg rainfall intensity (in/hr) for a storm duration equal to time of concentration (T_c) 5 min
A = drainage area (acres)

Use NOAA Atlas 14 (hdsc.nws.noaa.gov/pfds/pfds_map_cont.html) to find rainfall intensity at the project site for 2-, 10-, and 100-year storms at a duration of 5 min.
$i_{2\text{-year}}$ = 0.388 in/hr $i_{10\text{–year}}$ = 0.572 in/hr $i_{100\text{-year}}$ = 0.864 in/hr

Runoff Coefficient for Surfaces (PDGG Exhibit 8-9)
Pavement: C = 0.75 – 0.95 (say 0.83)

E.g.: Existing Discharge Rates for DP-1

Total Area A_{te} = 8700 sf
Pervious Area A_{pe} = 0 sf
Impervious Area A_{ie} = 8700 sf

Discharge rates as a factor of rainfall intensity:

$$Q_{2-year} = (0.83)\left(0.388\frac{in}{hr}\right)(8700\ sf)\left(\frac{1\ acre}{43{,}560\ sf}\right) = 0.06\ cfs$$

$$Q_{10-year} = (0.83)\left(0.572\frac{in}{hr}\right)(0.199\ acres) = 0.09\ cfs$$

$$Q_{100-year} = (1.25)(0.83)\left(0.864\frac{in}{hr}\right)(0.199\ acres) = 0.18\ cfs$$

E.g.: Proposed Discharge Rates for DP-1

Total Area A_{tp} = 8000 sf
Pervious Area A_{pp} = 0 sf
Impervious Area A_{ip} = 8000 sf

Discharge rates as a factor of rainfall intensity:

$$Q_{2-year} = (0.83)\left(0.388\frac{in}{hr}\right)(8000\ sf)\left(\frac{1\ acre}{43{,}560\ sf}\right) = 0.06\ cfs$$

$$Q_{10-year} = (0.83)\left(0.572\frac{in}{hr}\right)(0.184\ acres) = 0.09\ cfs$$

$$Q_{100-year} = (1.25)(0.83)\left(0.864\frac{in}{hr}\right)(0.184\ acres) = 0.16\ cfs$$

Standard 3: Stormwater Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater management practices and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil types. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The Project has been designed to comply with Standard 3 to the maximum extent practicable. The purpose of this standard is to replenish groundwater by ensuring that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions. The relocation of the existing outfall will include the construction of a shallow-sloped drainage channel. This channel will be constructed of streambed material and will allow for similar infiltration as the existing outfall.

With the elimination of the bridge scuppers, 4,500 SF (the sum of existing DP-2, DP-3 & DP-4) of impervious area will flow via country drainage away from the roadway instead of directly into the River below the existing bridge deck. Additionally, the 2,900 SF area of proposed increased impervious (as a result of MassDOT design standards and ADA criteria), will flow away from the roadway via country drainage. This is a total of 7,400 SF of impervious being directed to country drainage with the potential for groundwater recharge.

Standard 4: Water Quality

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a) *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
b) *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
c) *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

The Project has been designed to comply with Standard 4 to the maximum extent practicable.

Many Stormwater Control Measures (SCMs) were considered, however were not considered feasible for this project. The project will improve the existing conditions by providing pre-treatment of roadway runoff prior to being outlet to the river and maintaining existing drainage patterns with existing conditions. The following were considered:

- Deep-Sump Catch Basins – the catch basin proposed as part of this project will have a deep-sump. The deep-sump catch basin will be used to replace the existing corrugated pipe (without sump or structure) that conveys water to an existing outlet and provide 25% pre-treatment TSS removal.
- Sediment Forebay/Infiltration Basin – due to the existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, forebays and infiltration basins with check dams were not considered feasible or effective. A stone apron, however, is provided at the

proposed outlet location to prevent erosion and reduce water velocities. The stone apron transitions to a streambed material drainage channel to aid in temperature reduction of runoff before discharge into the river.

- Open-Graded Friction Course – the design coordinated with and approved by the MassDOT Pavement Management Section does not include open-graded friction course pavement.
- Pavement Disconnection – The existing site relies primarily on "country drainage" or sheet flow to convey water away from the roadway. Some widening of the roadway is proposed, however the existing pavement disconnection was maintained to the maximum extent practicable for the site. Bridge scuppers are not proposed on this bridge, therefore all roadway drainage within the project site will either exit the roadway to natural vegetated areas or be pre-treated within a deep-sump catch basin prior to being outlet to the river.
- Leaching Basins – due to the existing site topography and proximity of the toe of slope with the river bank, a leaching basin was not considered for the project site.
- Subsurface Infiltration System – due to existing site topography, proximity of the toe of slope with the river bank and existing right-of-way, a subsurface infiltration system was not considered feasible for the project.
- Porous Pavement – the design coordinated with and approved by the MassDOT Pavement Section does not include porous pavement. Since this project is primarily a roadway project, porous pavement was not considered. Also, the proposed pedestrian sidewalk is limited to the length of the bridge and will be made of cement concrete.
- Stormwater Wetland Stormwater Control Measures (SCM) – due to existing site topography, proximity of the toe of slope with the river bank, flood elevations and existing right-of-way, stormwater wetland SCMs were not considered feasible for this project. Although not a constructed stormwater wetland, numerous upland plantings are being proposed as part of the project in order to improve the banks compared to the existing condition. There is also a streambed material drainage channel proposed between the drainage outfall location and the river bank.

After considering the above SCMs, a total of 25% TSS removal will be implemented for the drainage area captured by the deep sump catch basin. All remaining drainage will flow via country drainage prior to reaching the Fort River.

A Long-Term Pollution Prevention Plan (LTPPP) has been developed for the project in compliance with Standard 4. The Standard 9 section of this document includes this LTPPP.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

For Land Uses with Higher Potential Pollutant Loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all LUHPPLs cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from LUHPPLs shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Standard 5 does not apply to the Project. There are no Land Uses with Higher Potential Pollutant Loads within the project area.

Standard 6: Critical Areas

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a)1 or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The Project has been designed to comply with Standard 6 to the maximum extent practicable. Figure 3 shows the Critical Areas in the vicinity of the project site. The Fort River is considered a Coldwater Fishery. The relocated outfall will discharge into a drainage channel which will dissipate energy and aid in the lowering of stormwater temperatures. The proposed catch basin on this project will have a deep sump for sediment collection prior to entering the existing stormwater system.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The Project is considered a redevelopment and has been designed to comply with the Stormwater Management Standards to the maximum extent practicable.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls

A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The Project has been designed to comply with Standard 8 fully.

The implementation of erosion and sediment (E&S) controls during construction is considered a standard practice for all MassDOT projects. E&S controls will be installed before any land disturbance begins for the Project and will remain in place for the duration of the Project. The E&S controls for the Project are shown on the project plans. These control measures include the use of compost filter tubes along project limits, as well as catch basin silt sacks in the existing catch basin in the project area. The project disturbs less than 1 acre and therefore does not require filing for NPDES Construction General Permit Coverage.

Standard 9: Operation and Maintenance Plan

A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Project has been designed to comply with Standard 9 fully.

MassDOT O&M plans are implemented on a programmatic level by each MassDOT district. Each MassDOT district office is responsible for providing operation and maintenance for the MassDOT stormwater management systems within their respective jurisdictions. Appendix B includes the O&M Plan for this project.

Long-term pollution prevention for the Project includes litter pick-up, inspection and maintenance of stormwater assets, maintenance of landscaped areas, snow and ice management, street sweeping, prohibition of illicit discharges, and spill prevention and response.

Standard 10: Prohibition of Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

The Project has been designed to comply with Standard 10 fully.

Illicit Discharge Statement

The project's stormwater management system, as shown on the plans submitted with this report, have been designed in full compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or resolved through MassDOT's Illicit Discharge Detention and Elimination (IDDE) Program.

ADDENDUM ATTACHMENT 6

O&M Plan and LTPPP

Bay Road (Route 47) over Fort River

Stormwater Management System Operation and Maintenance Plan and Long-Term Pollution Prevention Plan

Hadley, MA

PREPARED FOR



10 Park Plaza
Boston, MA 02116

PREPARED BY

Benesch
50 Redfield Street
Boston, MA, 02122

01/17/2024

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1

Stormwater Management System Operation and Maintenance (O&M) Plan

This Stormwater Management System Operation and Maintenance (O&M) Plan describes the approach for inspection and maintenance of drainage infrastructure and structural stormwater control measures (SCMs) to minimize contaminant loading for Bay Road (Route 47) over Fort River, town of Hadley MA. In general, inspection and maintenance activities will be conducted consistent with the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4) and MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit.

This document has been prepared per the requirements of Massachusetts Department of Environmental Protection (MassDEP) Regulations 310 CMR 10.05 (6)(k)(9) and satisfies the requirements of Massachusetts Stormwater Standard 9.

1.1 Responsible Party

In accordance with MassDOT procedures, the MassDOT District 2 office located in Northampton, MA, is responsible for the maintenance of all stormwater management systems on MassDOT roads within the project area.

Questions or concerns regarding activities associated with this O&M Plan should be addressed to MassDOT's District 2 office located at 811 North King Street, Northampton, MA 01060, phone (857)-368-2000 during regular weekday hours, or to MassDOT's Highway Operations Center located in South Boston, MA at (800) 227-0608 during all other times and days, including weekends and holidays.

1.2 Inspection and Maintenance Measures and Record-Keeping

See the Utility Plans for the proposed stormwater system within the project limits. The stormwater management system covered by this O&M Plan consists of the following measures:

- The construction of 1 deep sump catch basin, 1 drain manhole, 1 outfall relocation, and a 195 SF drainage channel.

MassDOT uses a performance-based inspection and maintenance program for SCMs and catch basins. For SCMs, MassDOT's overall approach is to inspect SCMs, and based on the results of the inspections, perform maintenance to preserve functionality. For catch basins, MassDOT's overall approach is to perform maintenance at an interval that maintains the functionality of the catch basin (e.g., sump is less than 50% full of sediment). Catch basin inspections, including documentation of sediment accumulation, and maintenance will generally occur simultaneously.

MassDOT's O&M program is data driven. Inspections and maintenance are recorded by personnel using hand-held tablets in the field to document sediment accumulation, maintenance action performed, and follow-up actions needed. Data are recorded in MassDOT's asset management system which is accessible in the field (mobile) or the office (desktop).

The table below summarizes data that is generally collected for each asset type. For all assets, the inspector and inspection date are recorded. Photo documentation of structure condition is taken and attached to the inspection record.

Inspection Form	Applicable Stormwater Assets	Information Collected
Inlets	› Catch basins › Outlet control structures	› Sediment accumulation › Trash/Debris accumulation › Signs of contamination › Frame and grate condition › Overall structure condition
SCMs	Consistent with the MassDOT Stormwater Design Guide (SDG), SCM categories include: › Infiltration SCMs › Stormwater wetland SCMs › Bioretention SCMs › Other SCMs	› SCM accessibility › Presence of standing water › Level of erosion › Sediment accumulation › Trash/Debris accumulation › Vegetation condition › Overall SCM condition
Storm Discharge Points	› Outlets to SCMs	› Presence of flow › Signs of contaminated flow › Sediment accumulation › Level of erosion › Pipe condition › Scour protection condition › Overall structure condition

Inspection and maintenance records can be made available using the asset management system through request with the MassDOT District 2 Environmental Engineer. Records will be kept for at least three years. Representatives of the Hadley Conservation Commission(s), MassDEP, and US EPA may obtain access to these records, upon request. Additionally,

MassDOT will allow members and agents of MassDEP and the Conservation Commission(s) to enter and inspect the premises, upon request, to evaluate and ensure that the Operation and Maintenance Plan requirements for each SCM are being followed.

Maintenance actions will not occur at any set frequency, but rather will be based on condition and impact to functionality. Maintenance to be performed on the stormwater system includes: Removing and disposing of trash, sediment, debris, and root intrusions, cleaning out of sumps at an interval to maintain functionality, jetting and repairing pipes, a d repairing damaged or eroded areas.

Based on the results of the inspection, repairs will be made in accordance with MassDOT standard practices. Maintenance will be prioritized given the urgency of the required maintenance and availability of staff, contracts, etc. Maintenance may require contracting if existing contracts are unavailable to perform the work. More intensive remedial activities may require permitting and/or an engineering solution.

MassDOT will continue to strive to meet DEP's frequencies listed in Volume 2, Chapter 2 of the DEP Stormwater Handbook until a programmatic operation and maintenance plan is established, which will supersede this project specific O&M plan. Per the Stormwater Handbook, deep sump catch basins are to be inspected four times per year and cleaned four times per year or whenever the depth of deposits are greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

1.3 Erosion and Sediment Control Measures during Maintenance Activities

For maintenance activities that could result in discharges of sediments or other contaminants into wetlands, waterways, or other resource areas regulated under 310 CMR 10.00, the responsible maintenance personnel will employ measures to prevent migration of these sediments/contaminants. Such temporary measures may include, but are not necessarily limited to, the use of siltation barriers, catch basin silt sacks/filter bags, pipe plugs, cofferdams deployed within the stormwater structure, turbidity curtains, or other practices designed to prevent such discharges.

Where maintenance occurs in areas that are confined, with no risk of discharge to adjacent water bodies, no special measures may be needed. Examples include, but are not limited to: (1) cleaning of a forebay under dry conditions when the work can be completed and exposed surfaces stabilized prior to placing it back into service; and (2) catch basin cleaning where the activity is limited to removing material from a sump below the elevation of the outlet pipe.

1.4 O&M Budget

MassDOT performs maintenance for stormwater management systems as part of their routine operation and maintenance budget for roadways and bridges. Budgets are managed at the district level and vary by fiscal year, depending on funding sources.

2

Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan (LTPPP) describes the approach for pollution prevention and related maintenance activities for Bay Road (Route 47) over Fort River Hadley, MA. In general, long-term pollution prevention and related maintenance activities will be conducted consistent with:

- The National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4),
- MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit, and
- Measures outlined in MassDOT's Stormwater Management Plan (SWMP).

This LTPPP satisfies the requirements related to pollution prevention under Massachusetts Stormwater Standards 4, 5, 6, and 10.

2.1 Practices for Long-Term Pollution Prevention

For the facilities covered, long-term pollution prevention includes the following measures.

2.1.1 Litter Pick-up

MassDOT will conduct litter pick-up from the stormwater management facilities in conjunction with routine road maintenance activities.

2.1.2 Inspection and Maintenance of Stormwater Assets

MassDOT will conduct inspection and maintenance of drainage infrastructure and the stormwater control measures (SCMs) in accordance with the O&M Plan, as described in Section 1.

2.1.3 Maintenance of Landscaped Areas

Routine mowing will be conducted according to standard MassDOT practices. SCM basin bottoms and embankments designed to impound water should be mowed as required to prevent establishment of woody vegetation.

Except in rare circumstances, MassDOT does not use fertilizers, herbicides, and pesticides for the maintenance of facilities. Exceptions include using fertilizer to ensure the survival of new plantings and herbicides to control invasive plants. Use of fertilizers and herbicides is reviewed and approved by the MassDOT Landscape Design Section and District 2 Environmental Engineer prior to application. Local Conservation Commission review may also be required.

2.1.4 Snow and Ice Management

Snow and Ice Management will be conducted consistent with the practices outlined in the MassDOT Snow and Ice Control Program Environmental Status and Planning Report (ESPR), formerly known as the Snow and Ice Control Generic Environmental Impact Report (GEIR).

In accordance with the Snow and Ice Control ESPR, no sand is used on MassDOT properties for snow and ice control. The exception to this rule is within reduced salt areas where high sodium levels have been found in drinking water sources.

The Fort River is a coldwater fishery and there are two Zone 1 Wellhead Protection Areas (WPAs) that intersect the project, and the entire site is in a Zone II WPA and are considered Critial Areas per 314 CMR 9.02. The use of salt for the deicing of impervious surfaces within the project site must be minimized within WPAs and coldwater fisheries.

2.1.5 Street Sweeping

Routine highway cleaning, with a brush-type street sweeper, will be conducted in accordance with standard MassDOT practices. Sweeping will occur annually in the Spring.

2.1.6 Prohibition of Illicit Discharges

The MassDEP Stormwater Management Standard 10 prohibits illicit discharges to the stormwater management system. Illicit discharges are discharges that do not consist entirely of stormwater, except for certain specified non-stormwater discharges.

In accordance with the existing MS4 permit and anticipated TS4 permit requirements, examples of discharges from the following sources are not considered illicit discharges:

- Firefighting activities*
- Foundation drains
- Water line flushing
- Footing drains
- Landscape irrigation
- Individual residential car washing
- Uncontaminated groundwater
- Rising groundwater
- Diverted stream flows
- Flows from riparian habitats/wetlands
- Potable water sources
- Dechlorinated swimming pool water
- Street wash waters
- Wash water from residential buildings (no detergents)
- Condensation from air conditioning units
- Run-on from private driveways caused by precipitation
- Lawn watering
- Water from crawl space pumps

*Water from firefighting activities is allowed and need only be addressed where they are identified as significant sources of pollutants to waters of the United States.

Based on plan review and confirmation in the field, there are no known or proposed illicit connections associated with the Bay Road (Route 47) Over Fort River. Should an interconnection to the stormwater management system be identified, the MassDOT PM will coordinate with the District Permits Engineer to confirm if the connections are authorized. For unauthorized connections, the MassDOT PM and/or MassDOT Environmental Services Section will investigate the connections and if they are determined to be illicit, the connections will be managed through MassDOT's Illicit Discharge Detection and Elimination (IDDE) program and/or through other agencies.

ADDENDUM ATTACHMENT 7

Revised Relevant Project Special Provisions or Special Provisions Not Previously Provided

ITEM 751.7 COMPOST BLANKET SQUARE YARD

REV. 2024.08.10 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS

The work under this Item shall conform to the relevant provisions of Subsection 751 and M1.06.0 Compost of the Standard Specifications and the following:

Work shall consist of furnishing and pneumatically applying compost as a thin mulch blanket (1/2-1 inch depth) over prepared soil to provide temporary soil stabilization and organic matter for plant growth.

SUBMITTALS AND MATERIALS

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance.

Contractor shall submit to the Engineer samples and certified test results no sooner than 60 days prior to application of compost. Vender certification that material delivered meets the test results shall be submitted if requested.

Compost shall meet the requirements for M1.06.0: Compost, Type 2, as referenced in the MassDOT– Highway Division Standard Specifications for Highways and Bridges, Division III: Materials Specifications, latest edition.

The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. Soil preparation shall be as specified under the applicable item for soil placement or for seeding. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Compost blanket shall be pneumatically applied (blown on) to a minimum depth of one half to one inch. Where shown on the plans or when directed by the Engineer depth may be increased to provide berms for sediment control or to otherwise prevent slope erosion.

When compost blanket is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost blanket, as specified under the relevant item for seeding.

When compost blanket is proposed for areas with planting, compost (and seed if applicable) shall be applied after planting. If compost and seed occur prior to planting, areas shall be regraded and compost and seed reapplied to the satisfaction of the Engineer and at the Contractor’s expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.7 will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost blanket shall be compensated under the applicable item for placement of loam, sand, ordinary borrow, wetland soil, topsoil rehandled and spread, tilled existing soil, or other specified substrate.

Seeding, if utilized, will be compensated for under the appropriate seeding items.

ITEM 755.45 INLAND WETLAND RESTORATION SQUARE YARD

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS) NOTE TO CONTRACTS: the below includes site specific notes regarding an existing intermittent stream

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit. Included as part of the work is the restoration of the existing intermittent stream within the limits of the inland wetland restoration.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Geotextile Fabric for Temporary Soil Protection shall be as specified under that item.

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

Wetland Mix – Part Shade
Seeding Rate: Species ecotype shall be as native to New England region as possible.
Apply this mix at 20 lbs PLS/acre.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

Plant species and sizes to be included in the Restoration Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT

Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item and shall include grading related to restoring the existing intermittent stream within the limits of wetland restoration to pre-construction condition.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall be seeded with mulch as specified below. Seeding shall immediately follow soil preparation.

Seeding with Mulch

Upon approval of prepared soil, area shall be seeded. Seeding may be hand broadcast with straw mulch applied or hydroseeded per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Compost shall be pneumatically applied (blown on) to a depth of one half to one inch at the same time that seed is broadcast such that seed is covered by a light application of compost.

When planting occurs on projects with compost topdressing and seed application, planting shall occur prior to application of compost and seed. Otherwise, compost and seed shall be re-applied to the satisfaction of the Engineer and at not cost to the contract.

Seed tags shall be submitted at time of seeding.

Planting

Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist or the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND SEED ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing

well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.

- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required, including restoration of the existing intermittent stream to pre-construction conditions.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

ITEM 765.451 PART SHADE ROADSIDE MIX SY
ITEM 765.555 WETLAND MIX – PART SHADE SY

Work under this item shall consist of furnishing and applying the mix(es) specified below at the quantity required.

SUBMITTALS

1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.

2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.

3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.

4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

   Number of tags submitted must correspond to number of bags delivered.

   Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include: variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

   A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

5) Verification of Seed Delivery. Prior to payment, contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company letterhead or a bill of lading. Supplier verification must include all information requested on

the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance. Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section

6) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

SEEDING SEASON

The appropriate seeding seasons are:

Spring: April 1 - May 15
Fall: October 1 - December 1 for dormant seeding

PERMANENT SEED MIX(ES)

Seed Mix(es) shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

Application Rate Mix

Wetland Mix – Part Shade: 20 lbs/acre PLS. No cover crop shall be applied.
Part Shade Roadside Mix: 20 lbs/acre PLS. No cover crop shall be applied.

Any species substitutions shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

50% Increase Adjustment for Field Conditions

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season
  OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Part Shade Roadside Mix and Wetland Mix Part Shade will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Part Shade Roadside Mix and Wetland Mix Part Shade will be paid at the contract unit price per pound of Pure Live Seed delivered and complete in place and upon approval of all Seed Submittal Documentation. Overseeding required to correct poor germination or establishment shall be incidental to the item.

NATIVE SEED WORKSHEET

Project Description: _____ Project No: _____

Contractor:_____ Contract No: _____

Seed Mix Number & Description: _____

Contractor: Complete Prior To Ordering

Pounds of Seed Required Per Contract:

_____lbs./acre for _____Acre(s) OR _____ SY

Additional 50% increase if required (out of season or seeding over compost blanket):

_____**lbs. Total Seed Required**

Calculated Quantity for **P**ure **L**ive **S**eed (PLS[1]):

_____ **Total Pounds PLS**

Engineer: Verification at Time of Application

Number pounds delivered to site[2]: _____ Date(s): _____

Actual Seed Bag Tag/s Received or photo documented by Engineer: _____

[1] PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).
*[2]Quantity delivered should match pounds **Total Pounds PLS** and **Verification of Seed Delivery**. Pounds should be shown on each Seed Tag.*

SUPPLIER VERIFICATION OF SEED DELIVERY FOR MASSDOT PROJECTS

Date_____

We hereby certify that (*Seed Supplier*):_____

Furnished to (*Contractor*): _____

For use on: (*Project Description*)_____

Project #: _____ Contract #:_____

Pounds of Pure Live Seed: _____

Of Mix (*Description*):_____

Lot Number _____

The material was delivered on (*Date*)_____.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): _____ Title: _____

Supplier:_____

Signature and Seal:_____

Part Shade Roadside Mix Seed Mix:

Botanical Name	Common Name	% Mix By Weight (PLS)	Approx. Cost 2021
Grass			
Festuca rubra	Creeping Red Fescue	26.0%	$0.51
Elymus virginicus	Virginia Wild Rye	24.0%	$1.44
Schizachyrium scoparium	Little Blue Stem	22.5%	$4.50
Panicum virgatum	Switch Grass	10.0%	$1.00
Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	7.0%	$1.26
Agrostis perennans	Upland Bentgrass	2.0%	$0.30
Carex vulpinoidea	Fox Sedge	2.0%	$0.92
Juncus effusus	Soft Rush	0.2%	$0.09
		93.7%	**$10.01**
Herb/Forb			
Chamaecrista fasciculata	Partridge Pea	3.0%	$0.18
Penstemon digitalis	Beard-tongue	1.0%	$1.71
Zizia aurea	Golden Alexanders	0.3%	$0.79
Solidago bicolor	White Goldenrod	0.2%	$0.68
Solidago caesia	Woodland Goldenrod	0.2%	$0.90
Rudbeckia hirta - VT ecotype	Black-eyed Susan - VT ecotype	0.2%	$0.04
Aster novae-angliae	New England Aster	0.2%	$0.97
Solidago odora	Licorice Scented Goldenrod	0.2%	$0.80
Aster divaricatus	White Wood Aster	0.2%	$0.79
Heliopsis helianthoides	Ox-Eye Sunflower	0.2%	$0.08
Pycnanthemum tenuifolium	Slender Mountain Mint	0.2%	$0.30
Monarda fistulosa	Wild Bergamot	0.1%	$0.11
Eupatorium perfoliatum	Boneset	0.1%	$1.24
Aster lateriflorus	Calico Aster	0.1%	$0.40
Oenothera fruticosa var. fruticosa	Sundrops	0.1%	$0.36
		6.3%	**$9.36**
Seeding Rate: 15.0 lbs PLS/Acre		**100.0%**	**$19.37**

Wetland Mix – Part Shade Seed Mix:

	Botanical Name	Common Name	%PLS By Weight
Grass			
	Poa palustris	Fowl Bluegrass	25.00%
	Elymus riparius	Riverbank Wild Rye	19.00%
	Carex lurida	Shallow Sedge	17.00%
	Carex vulpinoidea	Fox Sedge	10.00%
	Cinna arundinacea	Sweet Woodreed	5.00%
	Sparganium eurycarpum	Giant Bur Reed Eco PA	4.00%
	Carex scoparia	Broom sedge	4.00%
	Carex lupulina	Hop Sedge	4.00%
	Scirpus polyphyllus	Many Leaved Bulrush	3.00%
	Juncus effusus	Soft Rush	2.50%
	Carex intumescens	Bladder Sedge	2.00%
	Sparganium americanum	Burrweed	2.00%
	Scirpus cyperinus	Woolgrass	1.00%
	Carex crinita	Fringed Sedge	1.00%
	Juncus tenuis	Path Rush	0.50%
			100.00%

ITEM 767.122 SEDIMENT BARRIER – COIR LOG FOOT

The work under this item shall conform to the relevant provisions of Subsections 101, 120, 170, and 751 of the Standard Specifications and the following:

Sediment Barrier - Coir Log shall be used in wet locations where the barrier will not require removal; when barrier is placed immediately adjacent to existing wetlands; as a check dam in swales; in locations as shown on the Drawings; and/or in locations required by the Engineer.

Permits, Codes and Regulations: The Contractor shall comply with all rules, regulations, laws and ordinances of the City/Town and State, and all other authorities having jurisdiction over the Project site. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Department.

MATERIALS

Coir Log: Coir Log shall be biodegradable coir fiber cylindrical bundles. Inner core shall be 100 percent unsorted, well-cleaned, coir fiber uniformly distributed along the length of the log. The stuffed density of the coir fiber shall be a minimum of 9 pounds per cubic foot.

Outer netting shall be constructed from a minimum 3-ply high strength coir bristle twine. The netting shall have 2-inch by 2-inch rhombic openings with hand-knotted junctions. The average breaking strength of the coir twine shall be a minimum of 80 pounds. Production tolerance for all the above parameters shall not exceed plus or minus 10 percent.

Coir log diameter shall be sized as shown on the drawings. Typical lengths are supplied in 10 foot or 20-foot increments. Coir logs or coir netting may not be cut to decrease length and shall maintain the physical properties as supplied by the Manufacturer.

Notched Wood Stakes: Stakes shall be oak or southern pine with dimensions as shown on the Drawings. Stakes shall be free from knots and other defects which would cause splitting and shall have a downward-angled notch as shown in the drawing.

Coconut Fiber Cord: Coconut fiber cord shall be two-ply braided cord with a breaking strength of 80 pounds, minimum 0.25-inch diameter.

Delivery, Storage and Handling: Protect materials from deterioration during delivery and while stored at site.

CONSTRUCTION METHODS

General: Prior to initial placement of the coir log sediment barrier, the Contractor and the Engineer shall review locations specified on the plans and adjust placement, if required, to ensure that the coir log positioning and configuration will provide maximum sediment capture. Coir log sediment barrier(s) shall be in place prior to excavation work and no work shall take place outside the coir log barrier(s).

Installation: Coir logs shall be staked and secured as shown on the Drawings, as specified herein, and/or as recommended by the Manufacturer. The Contractor shall remove all underlying vegetation or debris to ensure that each coir log is securely in contact with soil, such that there is no flow beneath the log.

When used as a check dam barrier in a swale, the coir log shall be centered in the low point of the swale, perpendicular to the flow, with ends extending upslope. The log check dam barrier shall extend such that the log top elevation at the center of the swale is lower than the lowest elevation at the end log, to ensure that sediment-laden runoff will flow either through or over the coir log but not around it. The coir log check dam barrier shall have length such that no seams occur in the swale.

Notched wood stakes shall be driven parallel on both sides of the coir log at a typical spacing of 5 feet on center, unless site conditions warrant a closer spacing distance to ensure logs are firmly secured to the underlying soil. Stakes shall not extend more than 1 foot beyond the top of the log. Coir twine shall lash the logs to notched stakes in a cross-lashing fashion between stakes, throughout the length of the log barrier.

When utilizing multiple logs for sediment control, each coir log shall be laced together end-to-end (creating a seam) with coir twine to create a continuous length. End-to-end lacing may be completed before or after placement, to facilitate handling.

Maintenance: Maintenance of the coir log sediment barrier shall be per the Stormwater Pollution Prevention Plan (SWPPP).

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. The Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract. Under no condition shall sediment be allowed to accumulate more than 4 inches above the original ground line.

If a breach or other failure of the barrier occurs, the barrier shall be immediately restored. Repair shall include replacement of entire defective segments or for short breaches, revetment with additional coir logs, set directly adjacent to the downslope side of the breech. Revetment coir logs must overlap breech by a minimum of 2 feet on each side. The Engineer must approve breech repair means and methods as well as outcome.

If the coir log sediment barrier is damaged by equipment or undergoes a significant washout or other major failure, the Contractor shall replace the component in its entirety, at the discretion and approval of the Engineer. Any delay in maintaining the barrier shall be cause to immediately suspend the work as provided for in Subsection 8.09: Delay and Suspension of Work.

Disposition/Removal**:** For naturalized areas, coir logs and wooden stakes may be left in place to decompose on-site. For areas where, in the determination of the Engineer, aesthetics are a concern, logs, errant coir fiber material, and stakes may require removal.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.122 Sediment Barrier - Coir Log will be measured for payment by the FOOT, complete in place and will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for coir log(s) follow-up maintenance and repairs, or disposal (if required), but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 983.521 STREAMBED RESTORATION CUBIC YARD

DESCRIPTION

This work shall consist of removing, stockpiling, and replacing river bed material in the proposed bridge replacement and the upstream and downstream approaches in the limits of work. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, rougness, shape, profile, and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel.

The Contractor shall coordinate with his/her subcontractors to ensure all required equipment is available on-site to complete the work in this manner. The streambed restoration is required to comply with environmental permits issued for the project. MassDOT Environmental Services will provide a Fluvial Geomorphologist (Geomorphologist) to provide a pre-construction meeting, on-site oversight during construciton, and assistance during streambed restoration construction to ensure the restoration is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an initial (virtual or inperson) meeting with MassDOT's Geomorphologist, Contractor, and Resident Engineer. At this meeting, the Geomorphologist will provide an overview of the restoration work. The Contractor should be prepared to discuss the anticipated means, methods, and schedule.

Process Approval:

In lieu of a mockup, the Contractor shall schedule an onsite meeting to discuss the streambed restoration with the Geomorphologist and respective parties from MassDOT. The Geomorphologist shall be onsite during initial streambed restoration. The Contractor shall provide the Geomorphologist adequate access to observe, direct, and inspect the channel restoration work throughout the duration of the removal, stockpile, and reinstallation of the existing streambed material. If material is being brought to the site for streambed restoration, the Contractor shall provide the Geomorphologist with photographs to see the material.

MATERIAL

The stremabed material excavated from the existing streambed shall be removed and regraded to create a smooth streambed. The excavated streambed material shall also be reused to fill the voids in the proposed riprap placed below the ordinary high water/bank line within the area of streambed restoration.

In the event that the excavated material is not suitable or there is not enough available suitable material, additional streambed restoration material shall be locally sourced that matches the composition of the existing native river bed. The following gradation sampled from a similar streambed surface shall be used as a guide.

Stream Bed Material Gradation

Particle	Percent (%) Composition
+ 3" diameter	0
Gravel	21.7
Sand	69.3
Fines	9

The streambed material shall be approved by the Resident Engineer and Geomorphologist prior to use.

Related Items

Riprap Stone shall conform to the requirements of Item 983. and shall be paid for under that item.

CONSTRUCTION

Channel

The streambed material shall be reinstalled over riprap (MassDOT Item 983.522, as depicted on the plans, to an average thickness of 1 foot, with variations in thickness as necessary to replicate existing channel conditions. The initial placement of streambed material shall fill the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

Reinstallation of the stockpiled streambed material shall be placed on top of the riprap to restore streambed habitat and fish passage. The streambed materials shall be installed during normal low water conditions behind cofferdams in accordance with the environmental permits.

Completion

Once all material has been placed in the stream channel and approved by the Geomorphologist and Resident Engineer, the Contractor shall remove the cofferdams in such a way as to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed shall maintain the general configuration of the existing streambed bedform and there shall be minimal subsurface flow upon final inspection by the Resident Engineer and Geomorphologist. The project must be passable by fish and other aquatic organims following construction.

The streambed restoration to be measured for payment will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Resident Engineer and Geomorphologist.

BASIS OF PAYMENT

The accepted streambed restoration will be paid for on a lump sum basis. Payment will be full compensation for excavating, stockpiling, transporting, and placing the material specified and for furnishing all labor, tools, equipment, testing, and incidentals necessary to complete the work.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

SPECIAL PROVISION ATTACHMENTS

TURTLE PROTECTION PLAN

WOOD TURTLE (*Glyptemys insculpta*) PROTECTION PLAN

General

This section outlines the requirements of the Natural Heritage and Endangered Species Program (NHESP) of the Division of Fisheries and Wildlife (DFW) for projects that occur in the vicinity of high-priority wood turtle (*Glypemys insculpta*) populations. The requirements consist of monitoring and protecting turtles during the replacement of the Bay Road Bridge over the Fort River in Hadley, Massachusetts (MassDOT Project 608460/NHESP File: 23-6213)

One Time Sweeps – Prior to Vegetation Clearing and In-water Cofferdam Installation

The Turtle Monitor (the Monitor) shall be a MassDOT biologist (David J. Paulson, (857) 262-3378, david.j.paulson@dot.state.ma.us; or a representative from MassDOT Wildlife and Endangered Species Unit) approved by the Natural Heritage and Endangered Species Program (NHESP). The Monitor shall obtain a scientific collecting permit from the NHESP to handle wood turtles. The Monitor shall visit the site prior to the start of work, and the Contractor and/or Resident Engineer shall coordinate this site visit with the Monitor at least 60 days prior to construction commencement. The Monitor shall sweep the site prior to any site clearing, grubbing, earth disturbance, or site preparations. The Monitor shall inspect vegetation within 200' of the stream, prior to the establishment of the limit of work line and Turtle Exclusion Fence Barrier.

In addition, the Monitor shall provide a sweep of the site prior to any work in water. The Monitor shall inspect all areas of land under water where cofferdams are to be installed, paying close attention to overhanging banks and in water coarse woody debris.

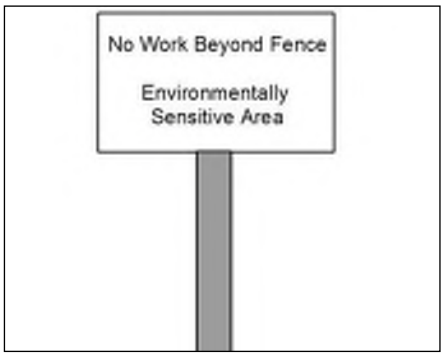
The Monitor shall visually sweep the described areas immediately before machines enter the area and relocate any turtles to suitable habitat immediately beyond the construction site. The Monitor shall provide contact information to the project supervisor in the event a wood turtle is discovered on-site. The Monitor may visit the site on only one day if the vegetation clearing and in-water work are initiated on the same day. Upon completion of the monitoring, the Monitor shall provide the NHESP with a summary of activities at the construction site. This report shall include the number and duration of visits and rare species observation forms for all state-listed species encountered. In the event of finding an injured turtle, the turtle shall be transported to a suitable veterinarian. In the event of finding a turtle with a radio transmitter, the NHESP and the contact on the transmitter shall be alerted immediately.

Additionally, since the road will remain open to traffic during construction, the Resident Engineer trained by a qualified MassDOT Biologist shall provide a sweep of the site prior to each workday and relocate any turtles to suitable habitat immediately beyond the construction site. In the event a wood turtle is discovered on site, the Registered Engineer must contact the Monitor. Contact information of the Monitor will be provided to the Resident Engineer.

All state-listed species encountered in or near the project shall be reported to the NHESP through a Rare Animal/Plan Observation Report with the required supporting materials within 10 days of the observation. No state-listed species may be removed from the project site unless under the direct supervision of the Monitor or the NHESP.

Establishment of a Limit of Work Barrier

Following the sweep of the work site, a limit of work barrier shall be installed. This line shall consist of staked compost filter tubes and Turtle Exclusion Fence Barrier (silt fence as the outer boundary) and shall contain signage clearly identifying it as the limits of work in all four quadrants. Refer to the attached sketch for the approximate location of the Turtle Exclusion Fence Barrier.



Example limit of work sign.

Installation of the barrier must be conducted using methods that result in a minimum of disturbance (i.e., hand-dug, "2-man" trencher or auger). It is not appropriate to clear large access paths prior to sweeps for turtle. No clearing may occur outside the limit of work approved by the NHESP without additional review and approval by the NHESP.

1. The barrier must be composed of at least 2 1/2 feet of vertical barrier above ground and an additional 4-6 inches buried below ground.
2. The face of the material must be relatively smooth. Materials commonly used are staked at 6 - 10 foot intervals and include tightly woven geotextile, aluminum flashing, or other such materials stapled or tacked to stakes. Loosely woven geotextile fabrics, hay/straw bales, wattles or tubular materials are not generally sufficient.
3. The bottom of the silt fencing must be carefully buried in a 4-6 inch deep trench. The trench must be backfilled and compacted. If it is not possible to dig a trench, then the bottom of the barrier must be affixed to the surface.
4. If project phasing and the traffic management plan allow, the barrier shall only include a single gap at each limit of the project large enough for vehicle passage to access the construction area. These gaps must be closed each night during the turtle active season (March 15 – October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations. The turtle barrier gate must be keyed into the barrier so that turtles cannot enter the construction area.
5. If hay or straw bales are to be used with silt fencing, they shall be installed on the work-side of the silt fence to avoid turtles using these to breach the barrier.
6. Once installed, the barrier shall be taut between the stakes. Slumps or loose materials will undermine the effectiveness of the barrier. In some circumstances, geotextile fabrics may need to be reinforced with backer material to ensure integrity. Backer material is typically similar to hardware cloth.

Once per week, a person familiar with silt barrier maintenance and installation shall inspect the barrier and facilitate any repairs or alterations. The limit of work barrier should remain taut between stakes and any holes along the bottom repaired. MassDOT shall provide the NHESP with the name and contact information of the Resident Engineer responsible for coordinating necessary sweeps and maintaining appropriate barriers.

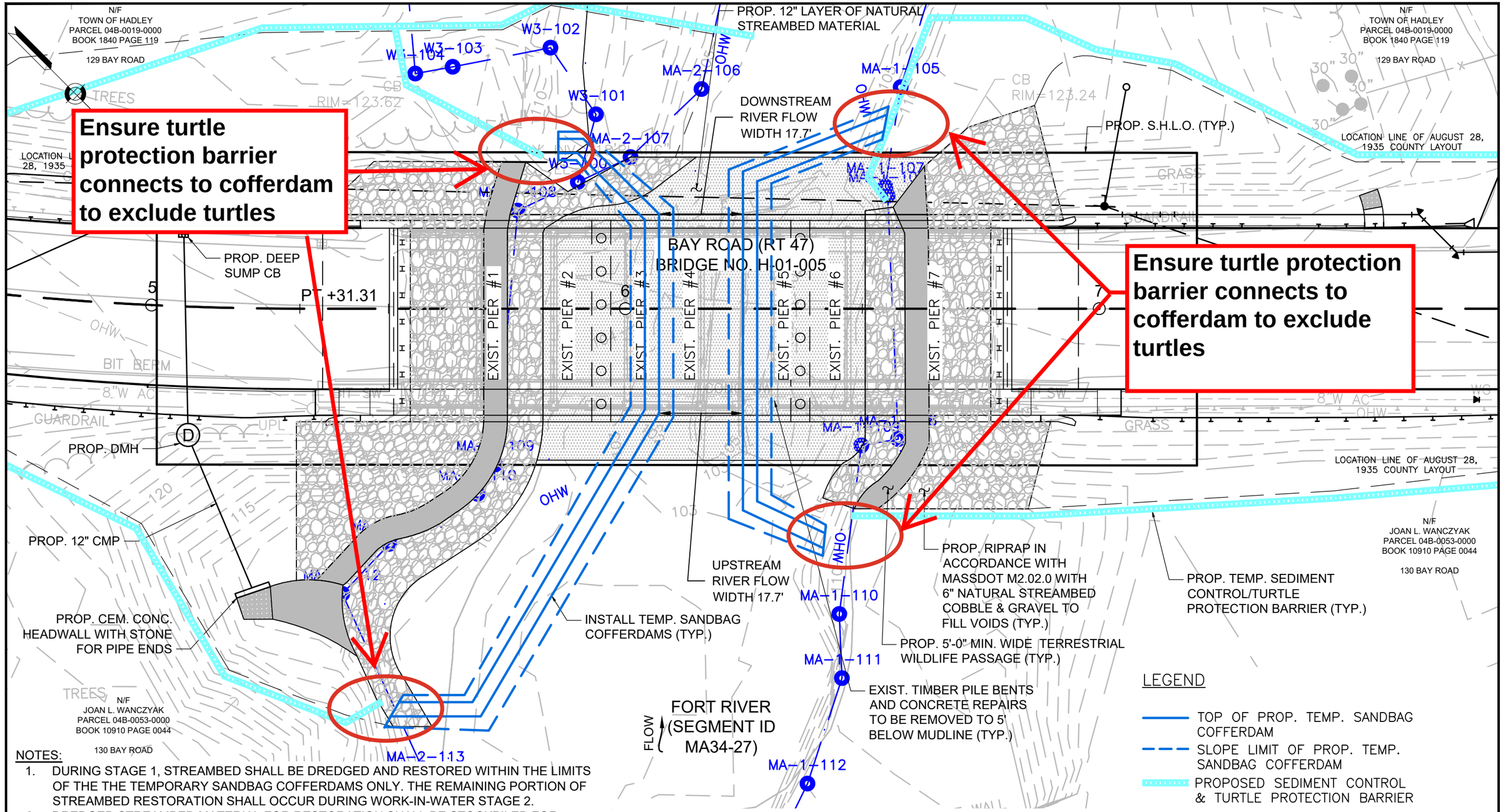
Construction Worker Training:
The Monitor shall provide to the construction foreperson wood turtle identification and handling pamphlets. All construction, landscaping, and other sub-contractors associated with the Project shall be informed in writing of the likely presence of State-listed Species on the Property and what measures (observation and injury protection) should be implemented to minimize direct harm to State-listed Species.

Further, no wildlife shall be removed from the Property without approval of a qualified wildlife biologist or the Division except as necessary to receive veterinary treatment in the case of harm during construction.

This protocol may require only one to three days of labor, including field surveys and correspondence with the NHESP.

Basis of Payment:
There will be no payment for the work conducted by the Turtle Monitor, as the Monitor will be provided to the Contractor as a free service by MassDOT.

Installation of a limit of work barrier, turtle barrier gates, and limit of work signage shall be considered incidental under ITEM 767.121 SEDIMENT CONTROL BARRIER.



NOTES:

1. DURING STAGE 1, STREAMBED SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY. THE REMAINING PORTION OF STREAMBED RESTORATION SHALL OCCUR DURING WORK-IN-WATER STAGE 2.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

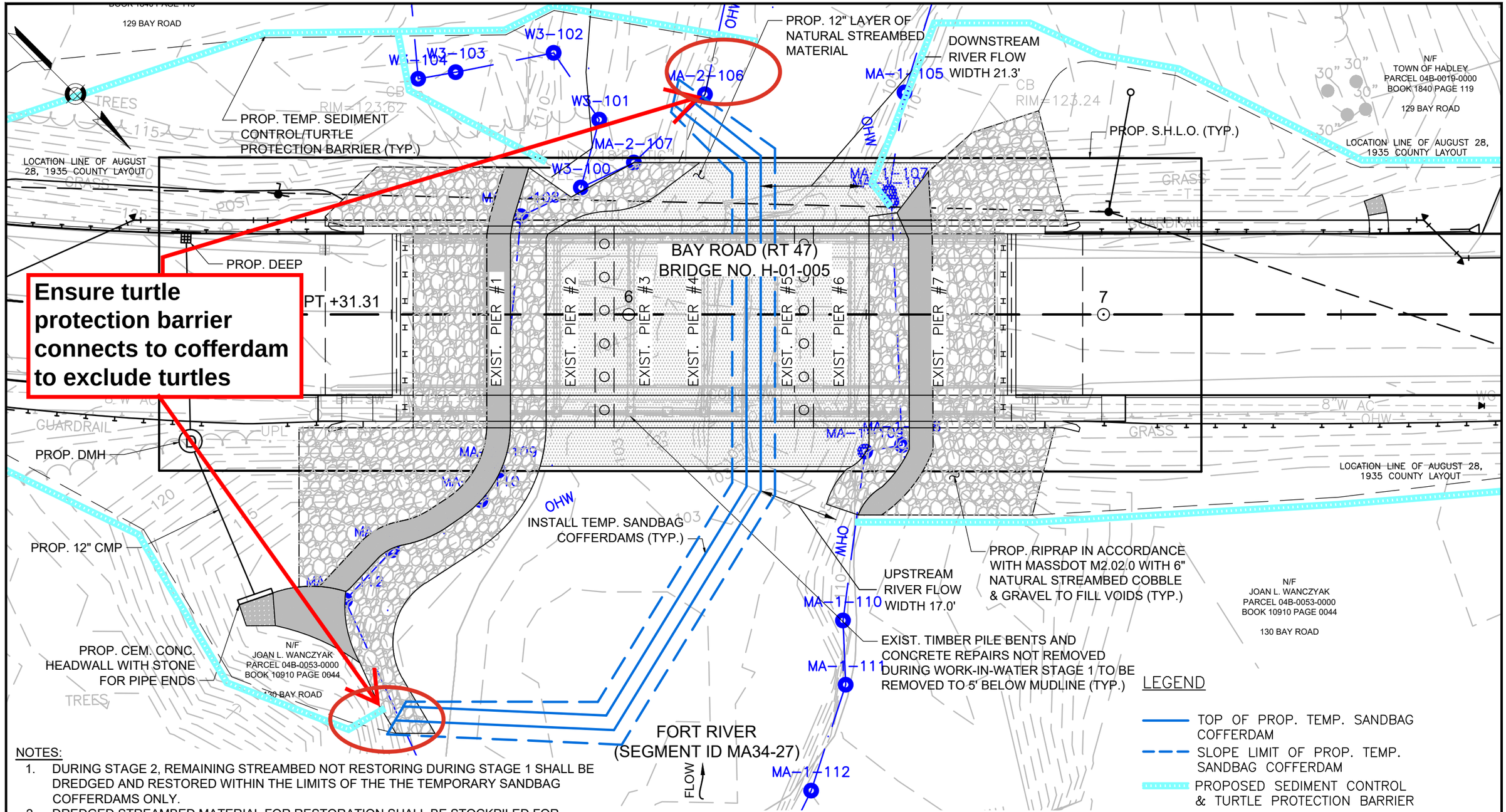
WORK-IN-WATER STAGE 1

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

Turtle Protection Plan Sketch, Page 1
See Turtle Protection Plan Special Provision for details
For further guidance, contact the MassDOT Wildlife Unit
David Paulson, MassDOT Wildlife Unit Supervisor

(david.j.paulson@state.dot.ma.us)



NOTES:

1. DURING STAGE 2, REMAINING STREAMBED NOT RESTORING DURING STAGE 1 SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

WORK-IN-WATER STAGE 2

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

Turtle Protection Plan Sketch, Page 2
See Turtle Protection Plan Special Provision for details
For further guidance, contact the MassDOT Wildlife Unit
David Paulson, MassDOT Wildlife Unit Supervisor

(david.j.paulson@state.dot.ma.us)

HIGHWAY GUARD DETAILS

RIGHT SIDE:
STA. 4+69 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

LEFT SIDE:
STA. 2+80 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

DRAINAGE DETAILS

SEE UTILITY SHEET 16

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS

The gap in the road must be closed at the end of each workday during the turtle active season (March 15 - October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations.

Ensure turtle barrier connects to cofferdams to exclude turtles

Ensure turtle barrier connects to cofferdams to exclude turtles

Turtle Protection Plan Sketch, Page 3
See Turtle Protection Plan Special Provision for detailsßor further guidance, contact the MassDOT Wildlife UnitŸavid Paulson, MassDOT Wildlife Unit Supervisor
david.j.paulson@state.dot.ma.us)

NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.

FOR PROFILE: SEE SHEET NO. 12

0 20 50 100
SCALE: 1" = 20'

CONTINUED ON SHEET NO. 11

608460_HD10-11 (CONST).DWG Plotted on 24-Aug-2021 4:51 PM

HIGHWAY GUARD DETAILS

RIGHT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 9+72	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

LEFT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 7+79	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3
STA. 8+26 TO STA. 9+76	GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

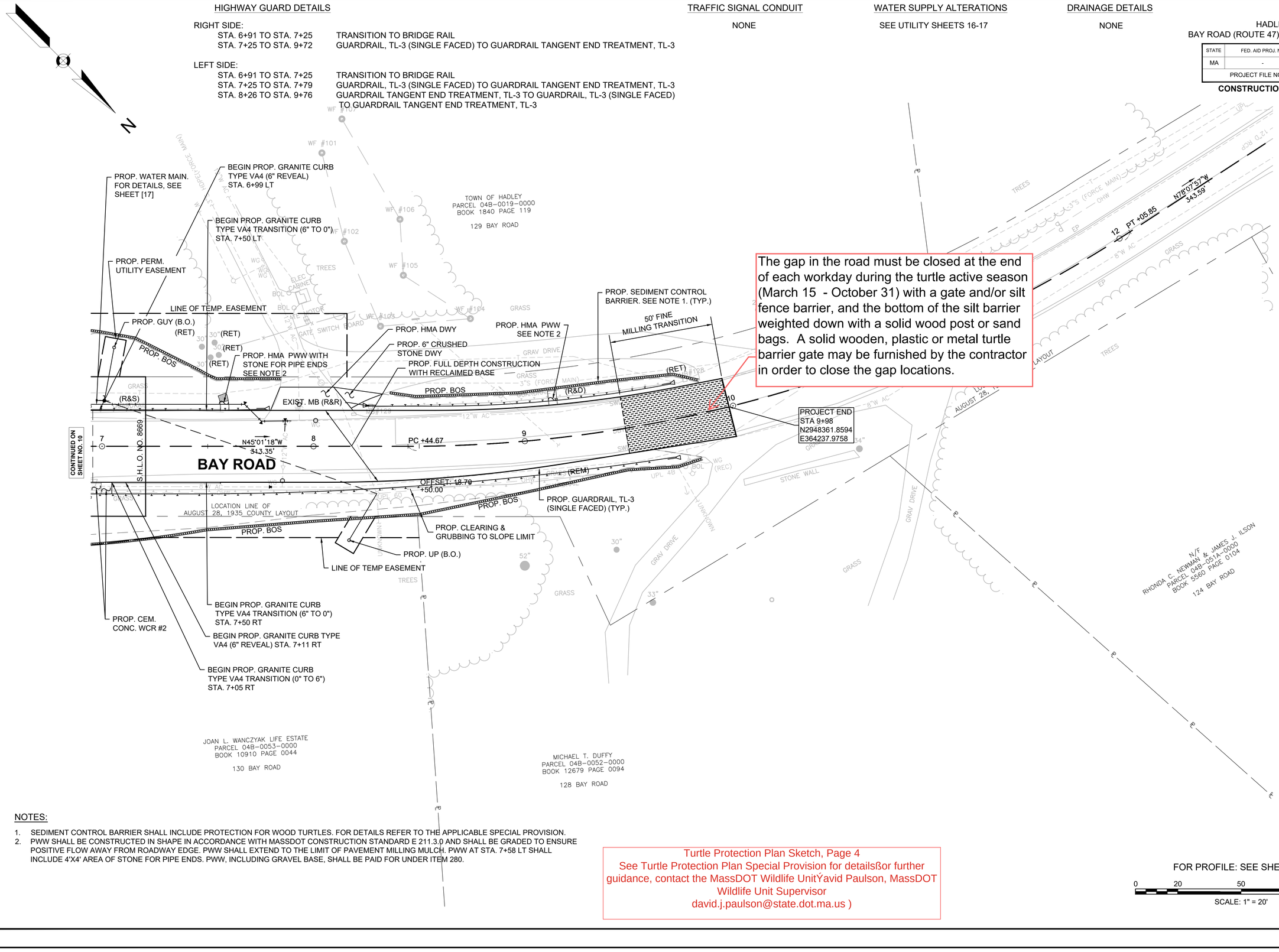
DRAINAGE DETAILS

NONE

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS



The gap in the road must be closed at the end of each workday during the turtle active season (March 15 - October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations.

NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.
2. PWW SHALL BE CONSTRUCTED IN SHAPE IN ACCORDANCE WITH MASSDOT CONSTRUCTION STANDARD E 211.3.0 AND SHALL BE GRADED TO ENSURE POSITIVE FLOW AWAY FROM ROADWAY EDGE. PWW SHALL EXTEND TO THE LIMIT OF PAVEMENT MILLING MULCH. PWW AT STA. 7+58 LT SHALL INCLUDE 4'X4' AREA OF STONE FOR PIPE ENDS. PWW, INCLUDING GRAVEL BASE, SHALL BE PAID FOR UNDER ITEM 280.

Turtle Protection Plan Sketch, Page 4
See Turtle Protection Plan Special Provision for detailsßor further guidance, contact the MassDOT Wildlife UnitŸavid Paulson, MassDOT Wildlife Unit Supervisor
david.j.paulson@state.dot.ma.us)

FOR PROFILE: SEE SHEET NO. 13

0 20 50 100
SCALE: 1" = 20'

608460_HD10-11 (CONST).DWG Plotted on 24-Aug-2021 4:51 PM

ADDENDUM ATTACHMENT 8

NHESP Coordination

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

October 30, 2024

Julia Hoogeboom
10 park plaza
Boston, MA 02116

RE: Applicant: Julia Hoogeboom
Project Location: BAY ROAD (ROUTE 47) OVER THE FORT RIVER
Project Description: 608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER
NHESP File No.: 23-6213

Dear Applicant:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") received the MESA Project Review Checklist and supporting documentation for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

The MESA is administered by the Division, and prohibits the Take of state-listed species. The Take of state-listed species is defined as "in reference to animals…harm…kill…disrupt the nesting, breeding, feeding or migratory activity…and in reference to plants…collect, pick, kill, transplant, cut or process…Disruption of nesting, breeding, feeding, or migratory activity may result from, but is not limited to, the modification, degradation, or destruction of Habitat" of state-listed species (321 CMR 10.02).

The Division has determined that this Project, as currently proposed, will occur **within** the actual habitat of the following species:

Scientific Name	Common Name	Taxonomic Group	State Status
Carex grayi	Gray's Sedge	Plant	Threatened
Glyptemys insculpta	Wood Turtle	Reptile	Special Concern
Gomphurus fraternus	Midland Clubtail	Dragonfly/Damselfly	Endangered
Lota lota	Burbot	Fish	Special Concern

These species and their habitats are protected in accordance with the MESA.

Based on the information provided and the information contained in our database, the Division finds that a portion of this project, as currently proposed, **must be conditioned** to avoid a prohibited Take of state-listed species (321 CMR 10.18(2)(a)). **To avoid a prohibited Take of state-listed species, the conditions attached to this letter must be met.**

Provided the attached conditions are fully implemented and there are no changes to the project plans, this project will not result in a Take of state-listed species. We note that all work is subject to the anti-segmentation provisions (321 CMR 10.16) of the MESA. This determination is a final decision of the Division of Fisheries and Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Melany Cheeseman, Endangered Species Review Assistant, at Melany.Cheeseman@mass.gov, (508) 389-6357.

Sincerely,



Jesse Leddick
Assistant Director

cc: david paulson, Massachusetts Department of Transportation
Julia Hoogeboom, Massachusetts Department of Transportation

Attachment: List of Conditions

List of Conditions

Applicant: Julia Hoogeboom
Project Location: BAY ROAD (ROUTE 47) OVER THE FORT RIVER
Project Description: 608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER
NHESP File No.: 23-6213
Heritage Hub Form ID: RC-88660
Approved Plan: Massachusetts Department of Transportation Plan and Profile of Bay Road (Route 47) Over Fort River (Bridge NO. H-01-005 (C1H))
Plan date: 8/9/21

To avoid a prohibited Take of state-listed species, the following condition(s) must be met:

1. **Turtle Protection Plan:** Prior to the start of work (including vegetation clearing or soil disturbance), the Applicant shall submit a Wood Turtle Protection Plan to the Division for review and written approval. Said Plan shall detail procedures for protecting state-listed turtles during construction, and be prepared and implemented by a qualified, Division-approved wildlife biologist. The Division is available for consultation on Plan development and can provide contact information for qualified biologists. The Division-approved Plan shall be implemented as written; any proposed changes to the Plan must be submitted to the Division for review and written approval prior to implementation of said changes. By December 31st of any year in which work occurs, the qualified biologist shall submit: a) a summary report to the Division detailing project status and compliance with the Plan; and b) any observations of state-listed turtles at https://www.mass.gov/how-to/report-rare-species-vernal-pool-observations.

ADDENDUM ATTACHMENT 9

NOAA Coordination

From: Richards, Todd (FWE)
To: Kautza, Adam (FWE); Burns, Trevor B. (DOT)
Cc: Hoogeboom, Julia A. (DOT); Walker, Courtney L. (DOT); Joa, Michael A. (DOT); Paulson, David J. (DOT)
Subject: Re: MassDOT 608460 Hadley Fort River
Date: Wednesday, January 29, 2025 3:10:25 PM

No TOY restrictions on my part at this location, but I wonder if this is a good test case to review our layers for the SWTAP. This would not be intended to slow things down, but review our data as it relates to infrastructure.

Todd Richards
Assistant Director of Fisheries
Massachusetts Division of Fisheries & Wildlife
email: Todd.Richards@mass.gov
mass.gov/masswildlife | facebook.com/masswildlife

From: Kautza, Adam (FWE) <adam.kautza@mass.gov>
Sent: Wednesday, January 29, 2025 3:07 PM
To: Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Cc: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>; Walker, Courtney L. (DOT) <Courtney.L.Walker@dot.state.ma.us>; Joa, Michael A. (DOT) <Michael.A.Joa@dot.state.ma.us>; Richards, Todd (FWE) <todd.richards@mass.gov>
Subject: Re: MassDOT 608460 Hadley Fort River

Hi Trevor,

The Fort River is a CFR but the proposed work at Bay Road is located pretty far downstream of what would be considered coldwater habitat in this system. I don't think we would ask for a TOY restriction in this case.

Todd may (or may not) want to chime in here based on the other work that is supposed to be happening in and along the Fort River.

Adam Kautza PhD | Coldwater Fisheries Project Leader
Massachusetts Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581
(857) 275-6961
adam.kautza@mass.gov

From: Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>

Sent: Wednesday, January 29, 2025 12:16 PM
To: Kautza, Adam (FWE) <adam.kautza@mass.gov>
Cc: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>; Walker, Courtney L. (DOT) <Courtney.L.Walker@dot.state.ma.us>; Joa, Michael A. (DOT) <Michael.A.Joa@dot.state.ma.us>; Richards, Todd (FWE) <todd.richards@mass.gov>
Subject: MassDOT 608460 Hadley Fort River

Hi Adam ,

MassDOT is proposing a bridge replacement on Bay Road (Route 47) over the Fort River in the town of Hadley (42°19'58.0"N 72°34'43.5"W) , as well as reconstructing the roadway approaches. The project requires work within Waters of the United States, including approximately 1,500 square feet (SF) of permanent waterway impacts, 8,720 SF of temporary waterway impacts, 374 cubic yards of dredging and 940 SF of temporary Bordering Vegetated Wetland impacts.

MassDOT is reaching out to the Massachusetts Division of Fisheries and Wildlife regarding potential Time of Year restrictions and/or in-water sediment management for the species listed in the regulation.

Please let us know if you have any comments or need more information. Attached are plans, maps and NHESPs determination that noted one fish species.

Trevor Burns
Wildlife Biologist
Environmental Services
MassDOT Highway Division

DOCUMENT A00831

ARMY CORPS OF ENGINEERS

GENERAL PERMIT

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT OFFICE
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

April 10, 2025

Regulatory Division
Transportation & Utility Section
File Number: NAE-2016-02256

Courtney Walker
Massachusetts Department of Transportation - Highway Division
10 Park Plaza, Suite 7360
Boston, Massachusetts 02116
Via Email: courtney.l.walker@dot.state.ma.us

Dear Ms. Walker:

This letter is in response to the application you submitted to the U.S. Army Corps of Engineers (USACE), New England District, on October 7, 2024, for a Department of the Army general permit verification. We have assigned this project file number NAE-2016-02256, which you should reference in all correspondence with this office. This letter follows a provisional notification letter from this office, dated March 17, 2025.

A review of the information provided indicates the proposed work includes the permanent discharge of fill material within 1,546 square feet below the Ordinary High Water (OHW) mark of the Fort River and an unnamed intermittent stream associated with the replacement of the bridge conveying Bay Road over the Fort River, at Latitude 42.332720º and Longitude -72.578700º, in Hadley, Hampshire County, Massachusetts. The existing pile-supported bridge will be removed and replaced with a new pile-supported bridge in the same alignment. The number of pile bents will be reduced from seven to two. Following removal of the existing piles the streambed will be restored. Rip-rap overtopped with 12" of natural streambed material will be placed in front of the abutments, with wildlife shelves on each side. The upper portion (approximately 11 linear feet) of an intermittent stream below a stormwater outfall in the southwest bridge quadrant will be permanently impacted by grading. The project also includes temporary impacts within 8,790 square feet below the OHW mark of the Fort River and the unnamed intermittent stream, and within 895 square feet of wetlands, due to temporary construction access, cofferdams, and associated dewatering. The work is shown on the enclosed plans titled “BAY ROAD (ROUTE 47) OVER FORT RIVER (segment ID MA34-27) HADLEY, MA,” on 20 sheets dated 3/17/2025.

Based on the information you have provided, we verify that the activity is authorized under General Permit 23 of the June 2, 2023, federal permit known as the Massachusetts General Permits (GPs). If the extent of the project area and/or nature of the authorized impacts to waters are modified, a revised application must be submitted to this office for written approval before work is initiated. You can find a copy of these

permits at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/.

Any deviation from the terms and conditions of the permit, or your submitted plans, may subject the permittee to the enforcement provisions of our regulations. Therefore, in the event changes to this project are contemplated, it is recommended you coordinate with this office prior to proceeding with the work. This office must approve any changes before you undertake them. You must perform this work in compliance with the terms and conditions of the GPs listed above, and also in compliance with the following special conditions:

Project Specific Special Conditions:

1. The permittee shall complete and return the enclosed Work-Start Notification Form to this office at least two weeks prior to the anticipated construction start date.

2. The permittee shall complete and return the enclosed Completion Certification Form to this office at least one month following the completion of the authorized work.

3. All construction shall be completed in accordance with the limits of construction and construction sequences detailed on the enclosed plan drawings, titled “BAY ROAD (ROUTE 47) OVER FORT RIVER (segment ID MA34-27) HADLEY, MA”, on 20 sheets, and dated 3/17/2025. If you change the plans or construction methods for work within or adjacent to the Fort River, please contact us immediately to discuss modification of this authorization. USACE must approve any changes before you undertake them.

4. A conditioned Water Quality Certification (WQC) has been issued by the Massachusetts Department of Environmental Protection for your project and is attached. You must comply with the conditions specified in the WQC.

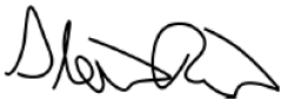
This verification is valid until June 1, 2028. You must commence or be under contract to commence the work authorized herein by June 1, 2028 and complete the work by June 1, 2029. If not, you must contact this office to determine the need for further authorization before beginning or continuing the activity. It is recommended that you contact this office before this authorization expires to discuss if permit reissuance is a possibility.

This GP verification and any associated authorizations does not preclude the necessity to obtain any other federal, state, or local permits, licenses, and/or certifications, which may be required.

If you have any questions related to this verification or have issues accessing documents referenced in this letter, please contact Dan Vasconcelos, Project Manager at 978-318-8653, or by email at daniel.b.vasconcelos@usace.army.mil. This agency continually strives to improve our customer service.

To better serve you, please complete the Customer Service Survey located at: https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,



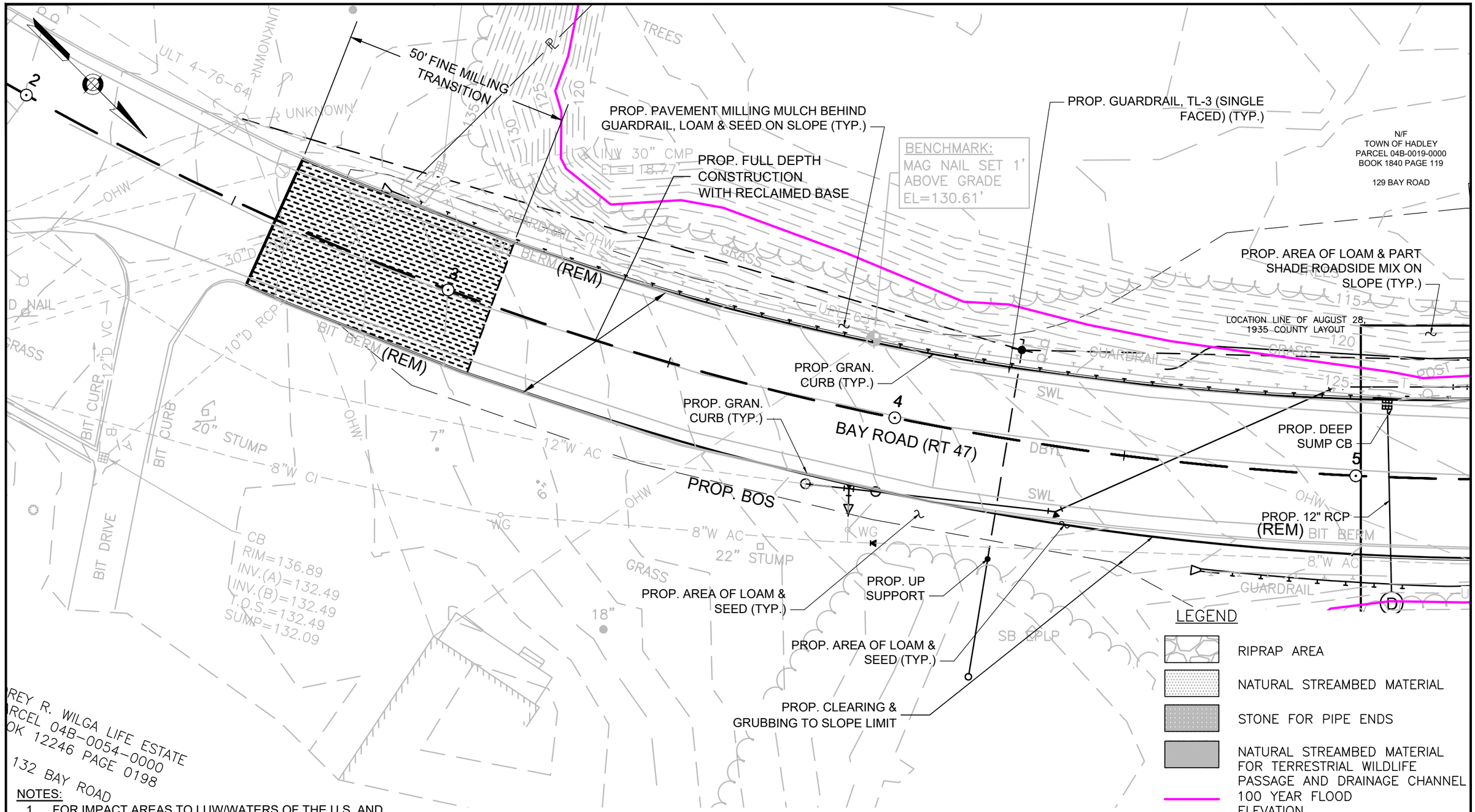
Stephen Rochette
Acting Chief, Technical Support Branch
Regulatory Division

Enclosures

cc (w/enclosures):

Ed Reiner, U.S. EPA, Region 1 (via reiner.ed@epa.gov)
Heidi Davis, MassDEP (via heidi.davis@mass.gov)
Jaime Iannelli, MassDEP (via Jaime.Iannelli@mass.gov)
Hadley Conservation Commission (via conservation@hadleyma.gov)
Michael Joa, MassDOT Highway Division (via michael.a.joa@dot.state.ma.us)

3/17/2025



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

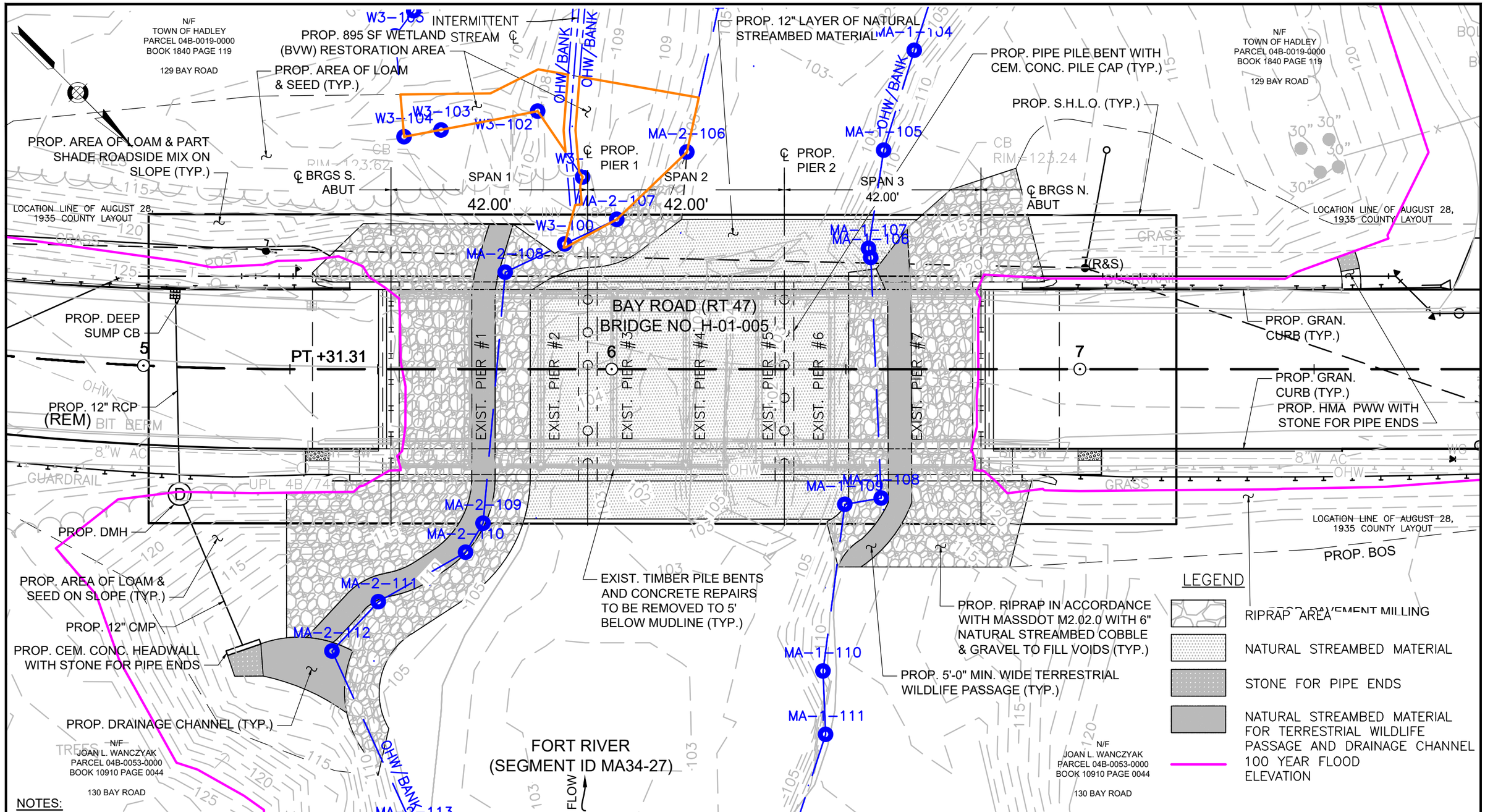
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 1 OF 20



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

PLAN VIEW

0 20 40 80

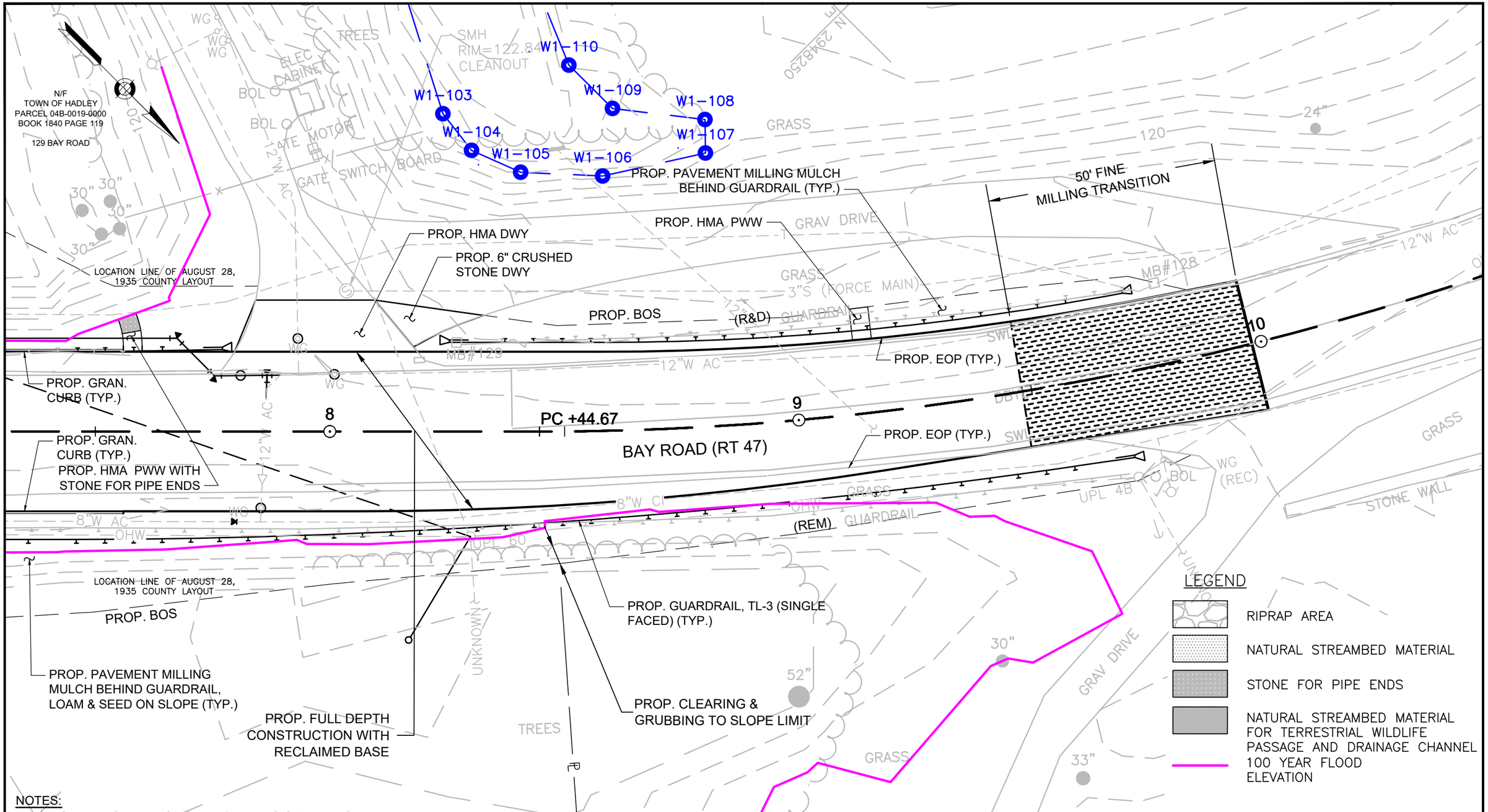
SCALE: 1" = 20'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 2 OF 20



NOTES:

1. FOR IMPACT AREAS TO LUW/WATERS OF THE U.S. AND BVW/VEGETATED WETLANDS, SEE EXHIBITS 9 AND 14 RESPECTIVELY.
2. FOR FULL CONSTRUCTION PLAN SET, REFER TO ATTACHMENT M OF THE 401/404 APPLICATION.

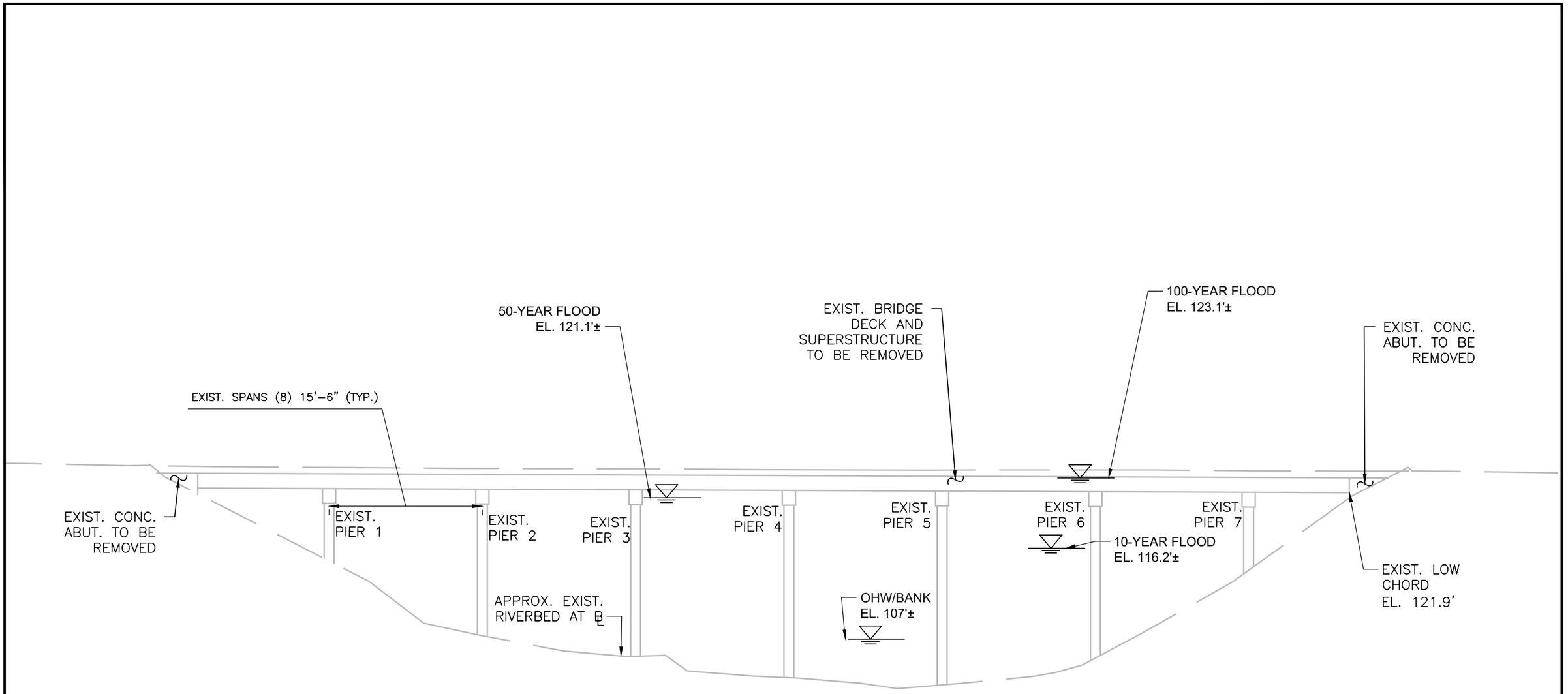
PLAN VIEW

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 3 OF 20



EXISTING EAST ELEVATION

0 10 20 40

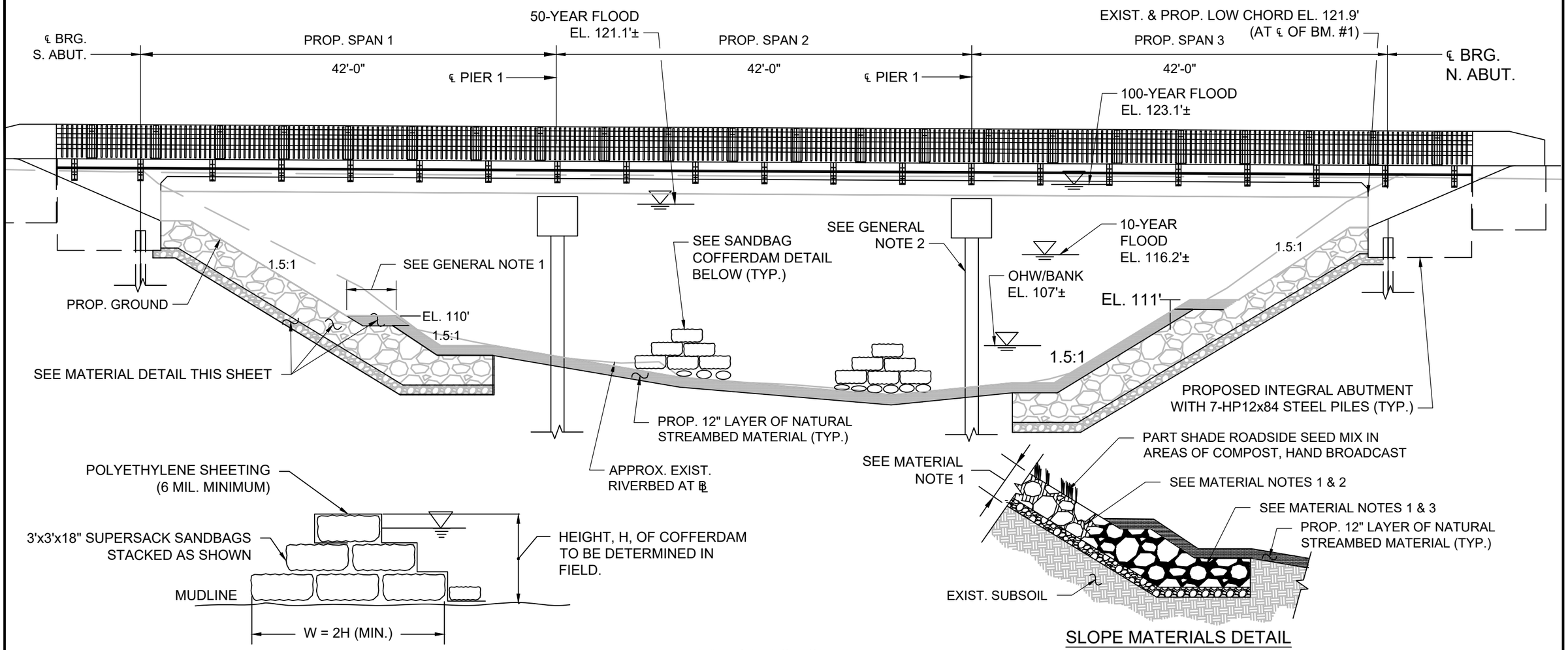
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 4 OF 20



SANDBAG COFFERDAM DETAIL
NOT TO SCALE

SLOPE MATERIALS DETAIL
NOT TO SCALE

GENERAL NOTES:

1. 5'-0" MIN. WIDE NATURAL STREAMBED MATERIAL FOR TERRESTRIAL WILDLIFE PASSAGE (TYP.)
2. PROP. PILE BENT WITH 16" Ø PIPE PILES WITH CONCRETE PILE CAP (TYP.)

SANDBAG NOTES:

1. SANDBAG COFFERDAM IS TO BE CONSTRUCTED IN A PYRAMID SHAPE BASED ON THE REQUIRED HEIGHT AND NUMBER OF BAGS REQUIRED.
2. THE SANDBAGS ARE TO BE PLACED OVERLAPPING ALONG THE LENGTH OF THE COFFERDAM.

MATERIAL NOTES:

1. PROP. 3'-0" LAYER OF RIPRAP (M2.02.0) OVER 12" LAYER OF CRUSHED STONE OVER GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL
2. AT ELEVATIONS HIGHER THAN THE OHW/BANK LINE, OR TERRESTRIAL WILDLIFE PASSAGE (WHERE PRESENT), MODIFIED ROCKFILL SHALL BE APPLIED OVER RIPRAP SUCH THAT MODIFIED ROCKFILL FILLS THE VOIDS AND IS 4" BELOW THE SURFACE OF THE STONES. COMPOST SHALL THEN BE PLACED OVER MODIFIED ROCKFILL TO AN ELEVATION AT OR SLIGHTLY BELOW THE TOP OF RIPRAP STONES. NOT ALL RIPRAP STONES WILL BE COMPLETELY COVERED. COMPOST IS NOT TO BE USED BELOW THE OHW/BANK LINE. PART SHADE ROADSIDE MIX SHALL BE HAND BROADCAST IN AREAS OF COMPOST.
3. AT ELEVATIONS LOWER THAN THE OHW/BANK LINE, OR AT TERRESTRIAL WILDLIFE PASSAGE (WHERE PRESENT), NATURAL STREAMBED MATERIAL SHALL BE PLACED TO FILL IN VOIDS IN THE RIPRAP TO CREATE A SMOOTH SURFACE PRIOR TO PLACEMENT OF 12" LAYER OF NATURAL STREAMBED MATERIAL OVER RIPRAP.

PROPOSED EAST ELEVATION

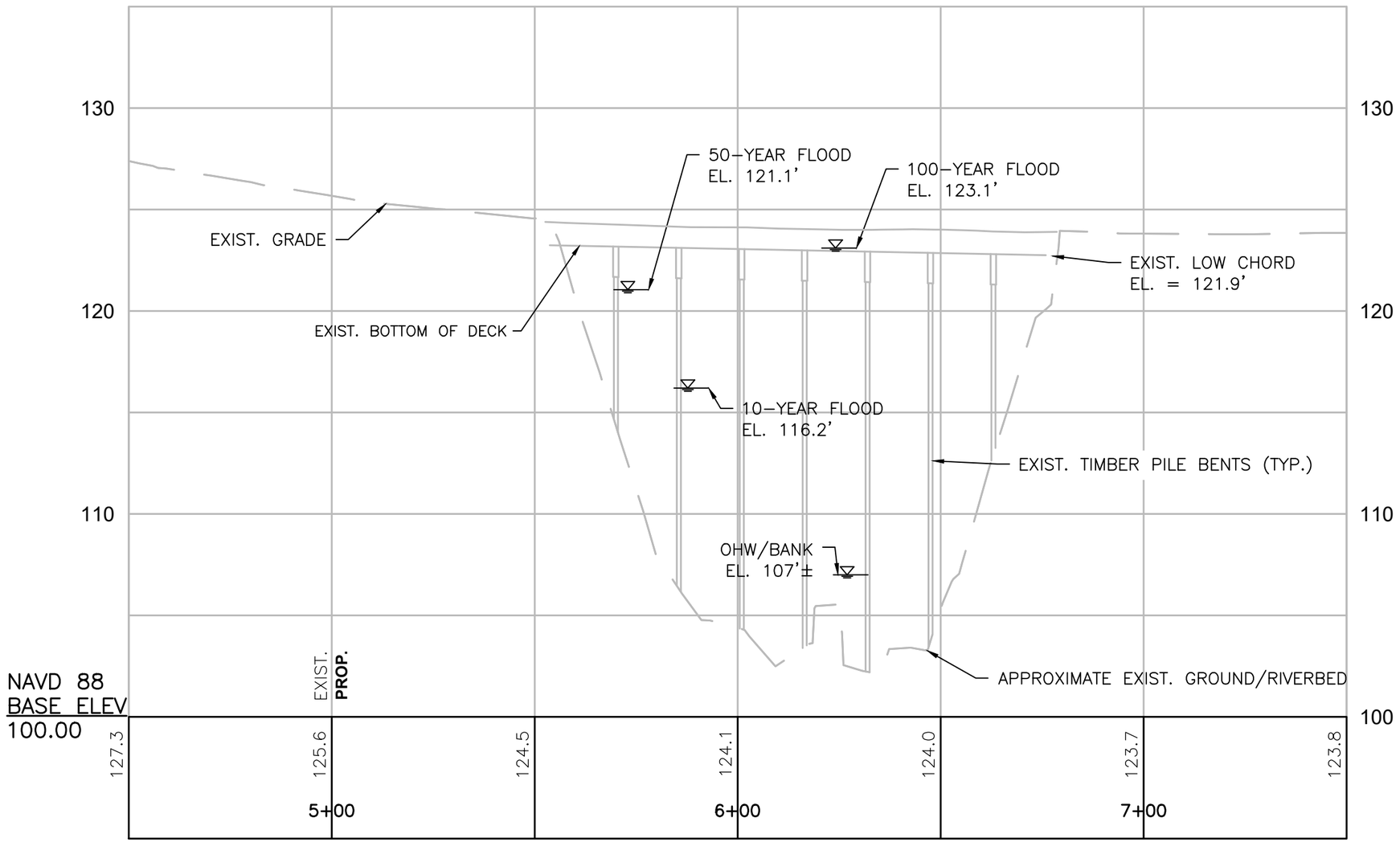
0 10 20 40
SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 5 OF 20



HOR. SCALE IN FEET
30 0 30 60
6 0 6 12
VER. SCALE IN FEET

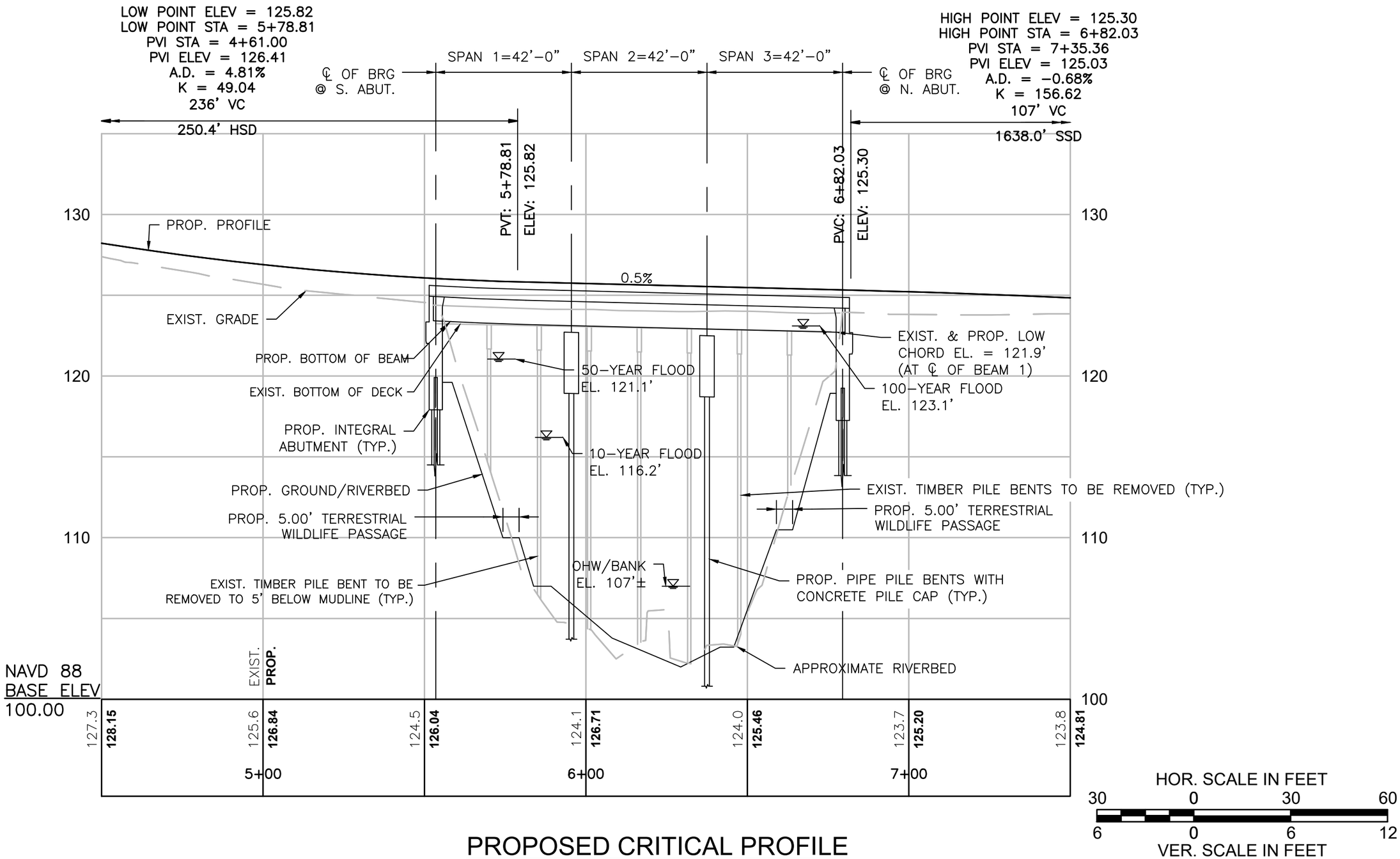
EXISTING CRITICAL PROFILE

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 30'

EXHIBIT NO. 6 OF 20



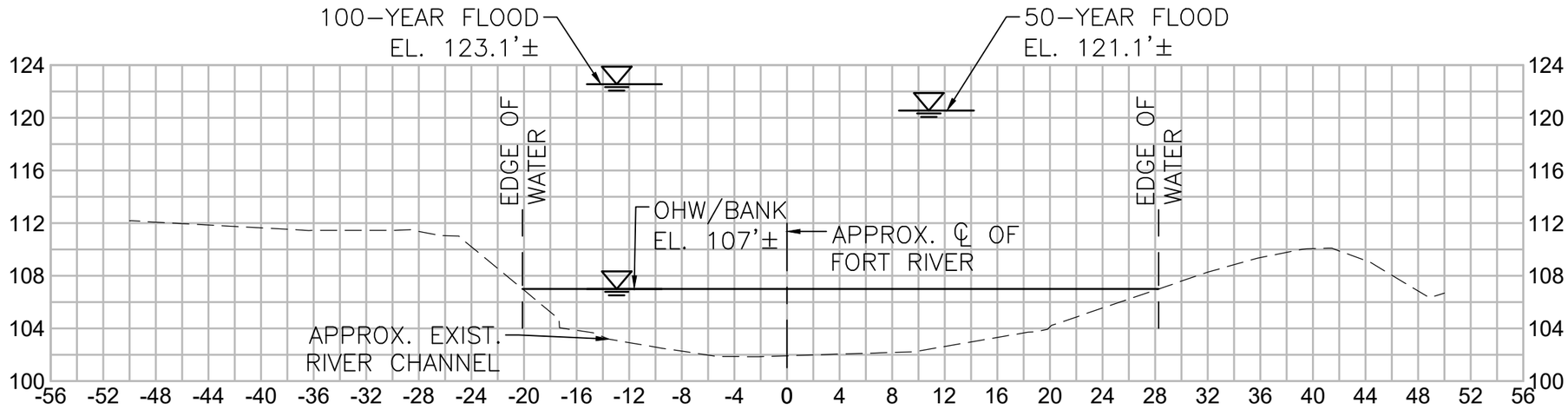
PROPOSED CRITICAL PROFILE

benesch

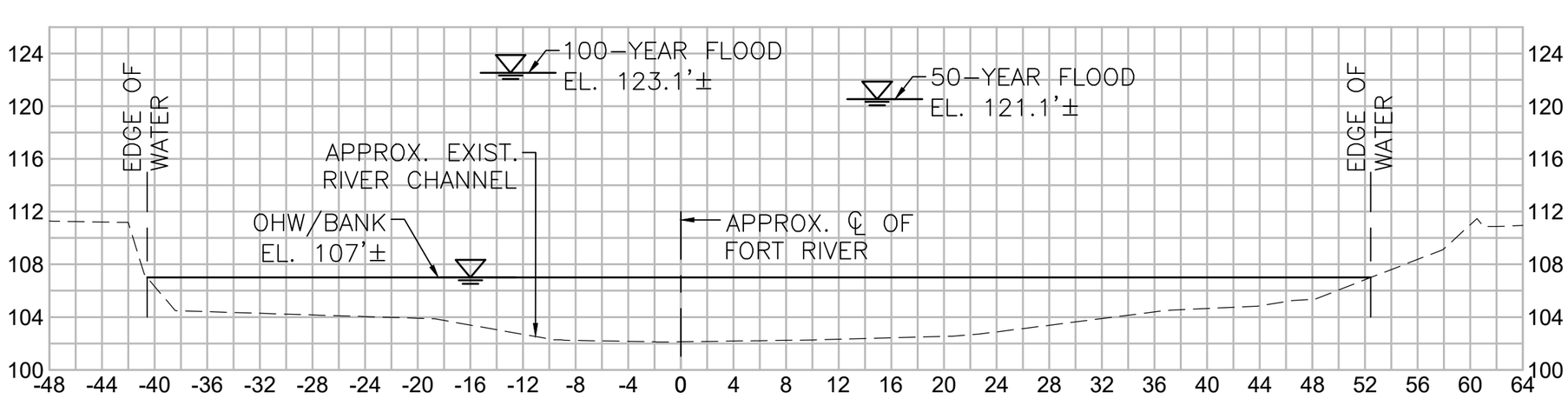
BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 30'

EXHIBIT NO. 7 OF 20



50 FT DOWNSTREAM OF WEST FASCIA
(LOOKING UPSTREAM)



50 FT UPSTREAM OF EAST FASCIA
(LOOKING UPSTREAM)

HOR. SCALE IN FEET
10 0 10 20
10 0 10 20
VER. SCALE IN FEET

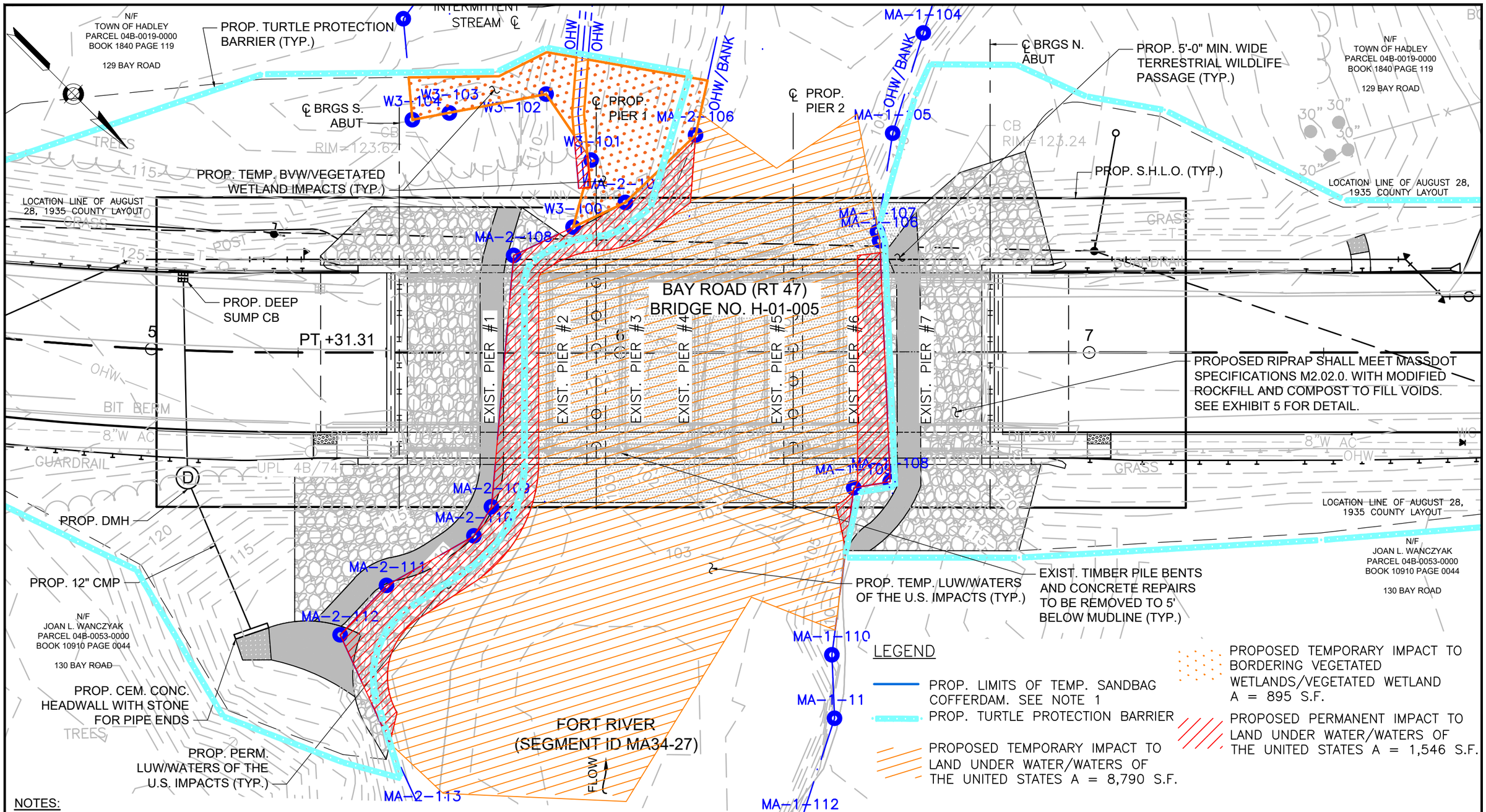
CHANNEL SECTIONS

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 8 OF 20



NOTES:

1. FOR WORK-IN-WATER SEQUENCING DURING STAGED CONSTRUCTION, SEE EXHIBITS 11 AND 12.
2. THE BANK IS COINCIDENT WITH THE OHW LINE. FOR BANK IMPACTS, SEE EXHIBIT 10.

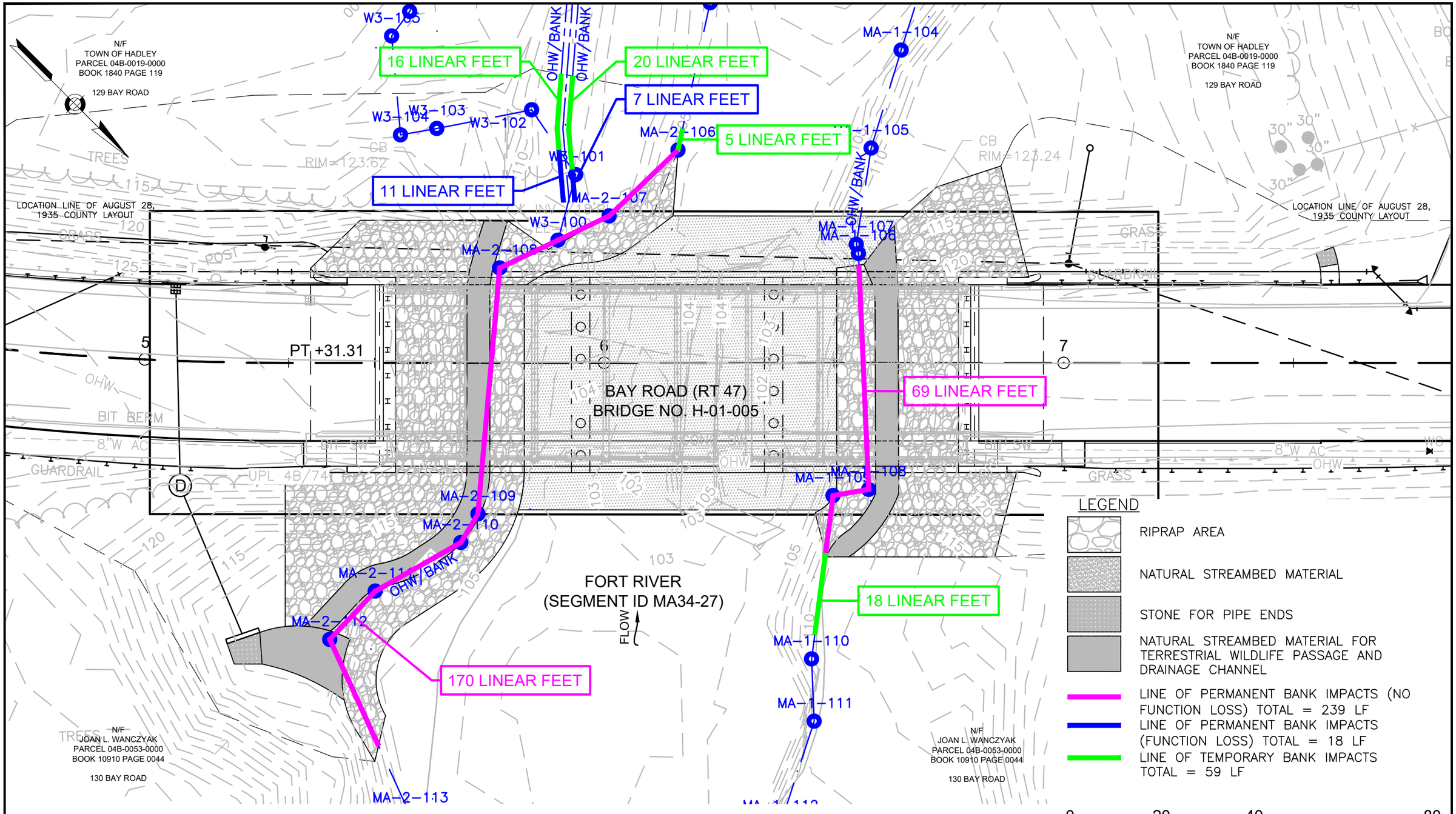
TEMPORARY & PERMANENT IMPACTS

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 9 OF 20

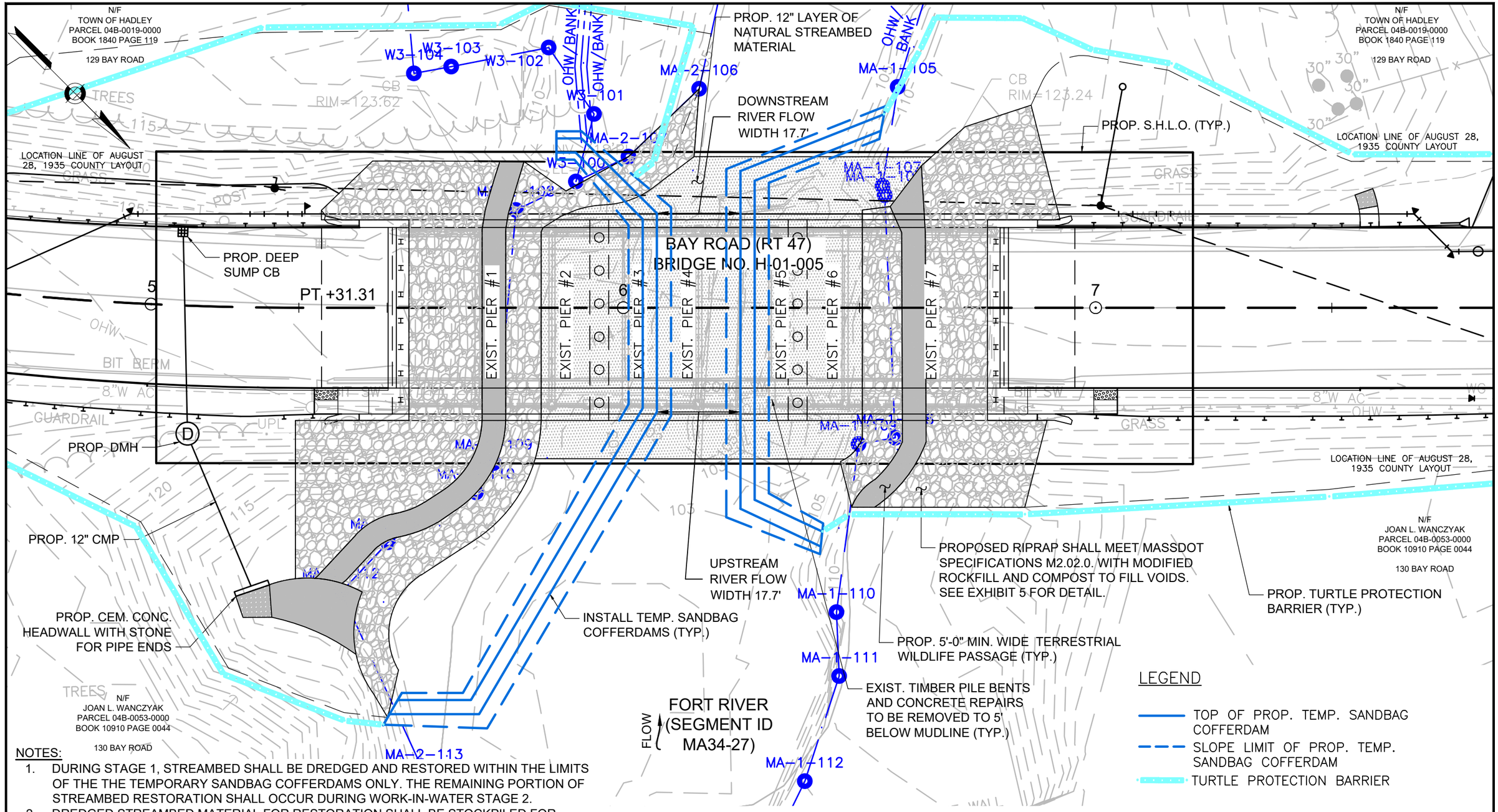


BANK IMPACTS

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 10 OF 20



NOTES:

1. DURING STAGE 1, STREAMBED SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY. THE REMAINING PORTION OF STREAMBED RESTORATION SHALL OCCUR DURING WORK-IN-WATER STAGE 2.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

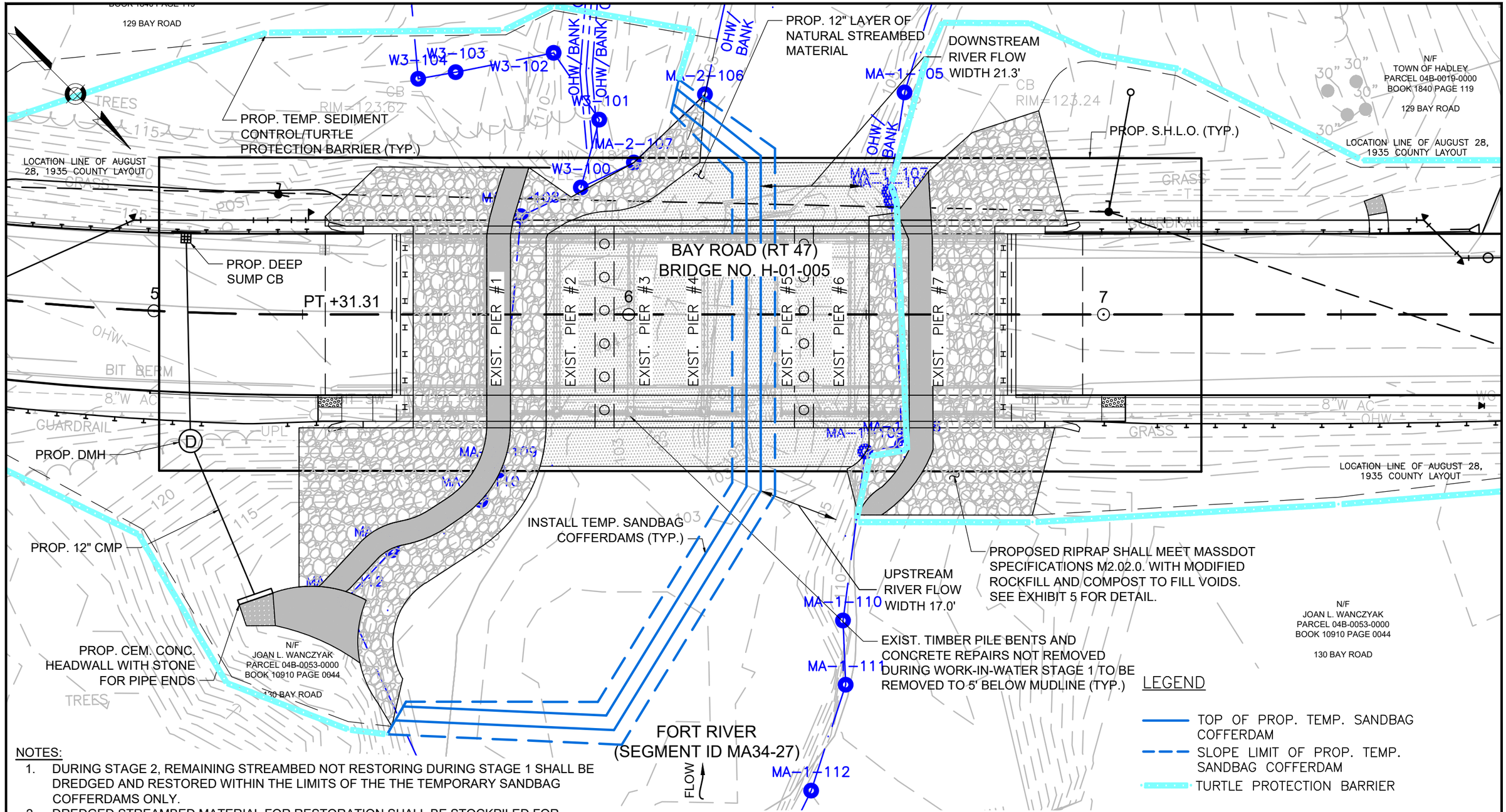
WORK-IN-WATER STAGE 1

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 11 OF 20



NOTES:

1. DURING STAGE 2, REMAINING STREAMBED NOT RESTORING DURING STAGE 1 SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

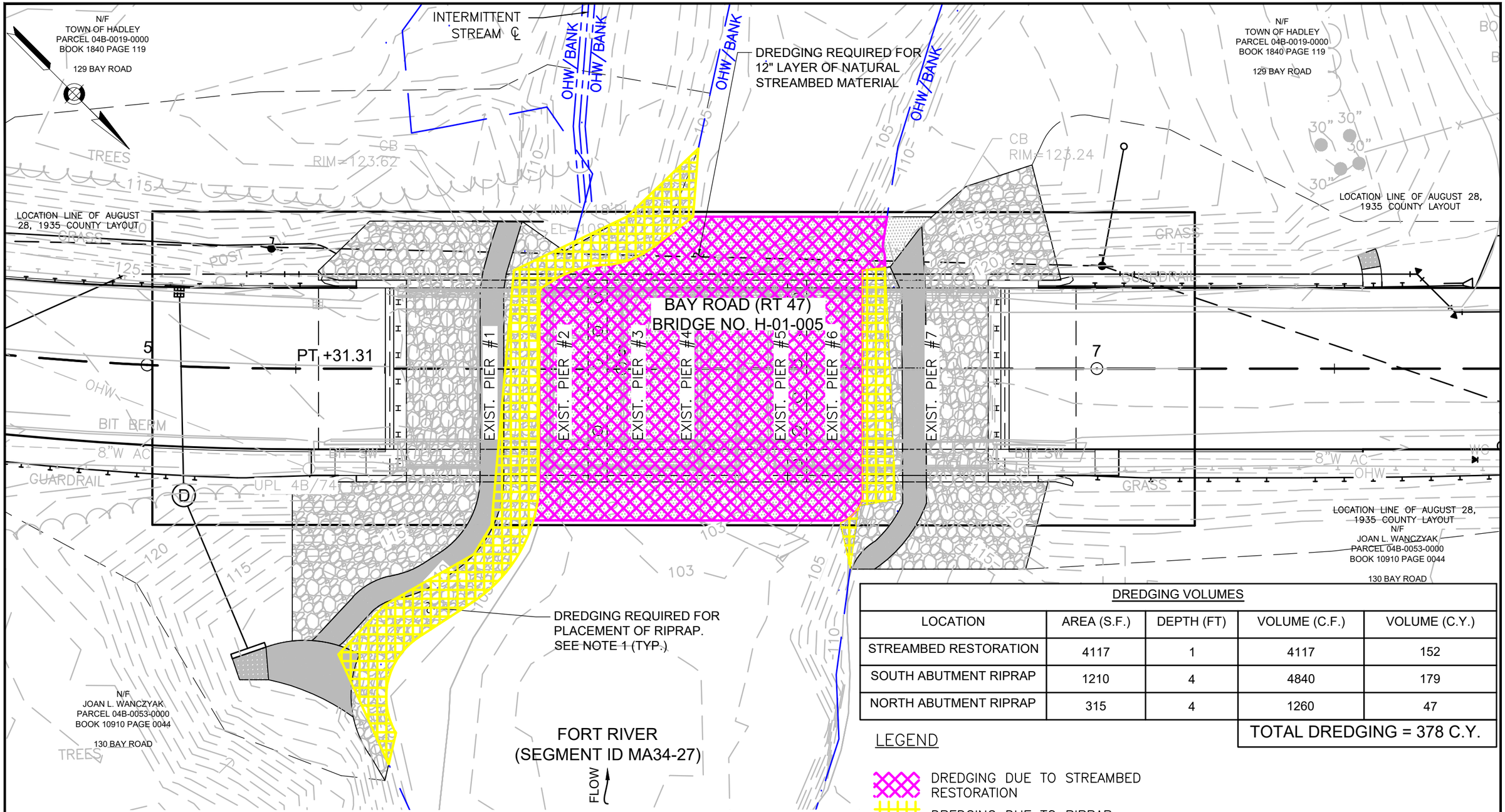
WORK-IN-WATER STAGE 2

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 12 OF 20



DREDGING VOLUMES				
LOCATION	AREA (S.F.)	DEPTH (FT)	VOLUME (C.F.)	VOLUME (C.Y.)
STREAMBED RESTORATION	4117	1	4117	152
SOUTH ABUTMENT RIPRAP	1210	4	4840	179
NORTH ABUTMENT RIPRAP	315	4	1260	47
			TOTAL DREDGING = 378 C.Y.	

LEGEND

DREDGING DUE TO STREAMBED RESTORATION

DREDGING DUE TO RIPRAP

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH MODIFIED ROCKFILL AND COMPOST TO FILL VOIDS. SEE EXHIBIT 5 FOR DETAIL.

0 20 40 80

SCALE: 1" = 20'

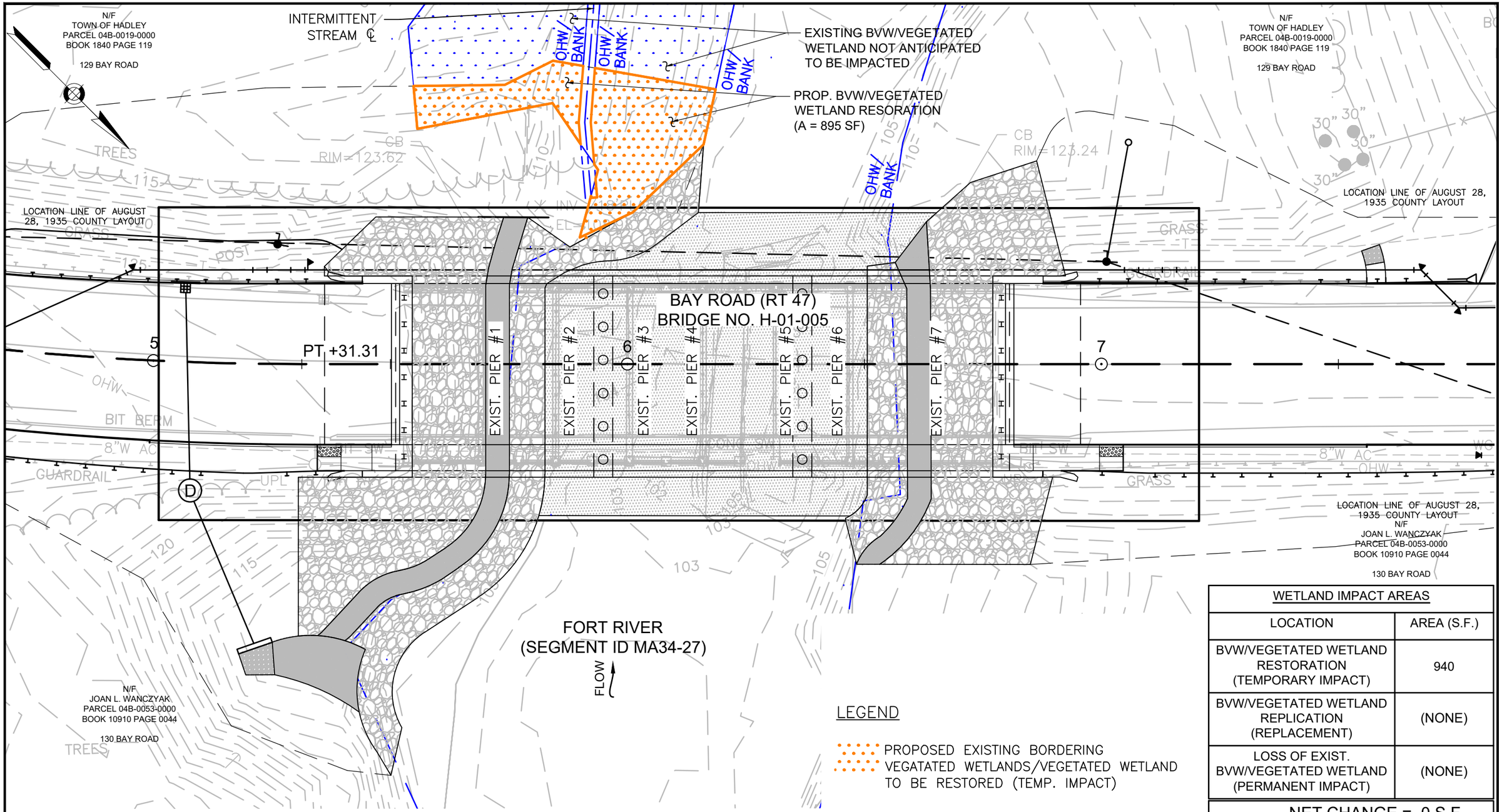
DREDGING LOCATION PLAN

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 13 OF 20



WETLAND IMPACT AREAS	
LOCATION	AREA (S.F.)
BVW/VEGETATED WETLAND RESTORATION (TEMPORARY IMPACT)	940
BVW/VEGETATED WETLAND REPLICATION (REPLACEMENT)	(NONE)
LOSS OF EXIST. BVW/VEGETATED WETLAND (PERMANENT IMPACT)	(NONE)
NET CHANGE = 0 S.F.	

NOTES:

1. PROPOSED RIPRAP SHALL MEET MASSDOT SPECIFICATIONS M2.02.0. WITH MODIFIED ROCKFILL AND COMPOST TO FILL VOIDS. SEE EXHIBIT 5 FOR DETAIL.

0 20 40 80

SCALE: 1" = 20'

WETLAND MITIGATION PLAN

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 20'

EXHIBIT NO. 14 OF 20

SEDIMENT CONTROL BARRIER (TYP.)
BARRIER SHALL BE PLACED AS REQUIRED TO MANAGE SEDIMENT DURING CONSTRUCTION, AS WELL AS AFTER GRADING AND PRIOR TO SEED IF REQUIRED FOR SEDIMENT CONTROL DURING PLANT ESTABLISHMENT. LOCATIONS SHOWN ARE DIAGRAMMATIC ONLY. ACTUAL LOCATION SHALL BE AS REQUIRED BY THE ENGINEER.

OHW/BANK
OHW/BANK
OHW/BANK

W3-104
W3-103
W3-102
W3-101
W3-100
MA-2-106
MA-2-107
MA-2-108

895 SF WETLAND RESTORATION AREA

LEGEND
- EXISTING WETLANDS TO BE RESTORED
- WILDLIFE PASSAGE AREA (NATURAL STREAMBED MATERIAL)
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER
- TURTLE PROTECTION BARRIER

WETLAND RESTORATION AREA
PLAN VIEW

0 8 16 24 32

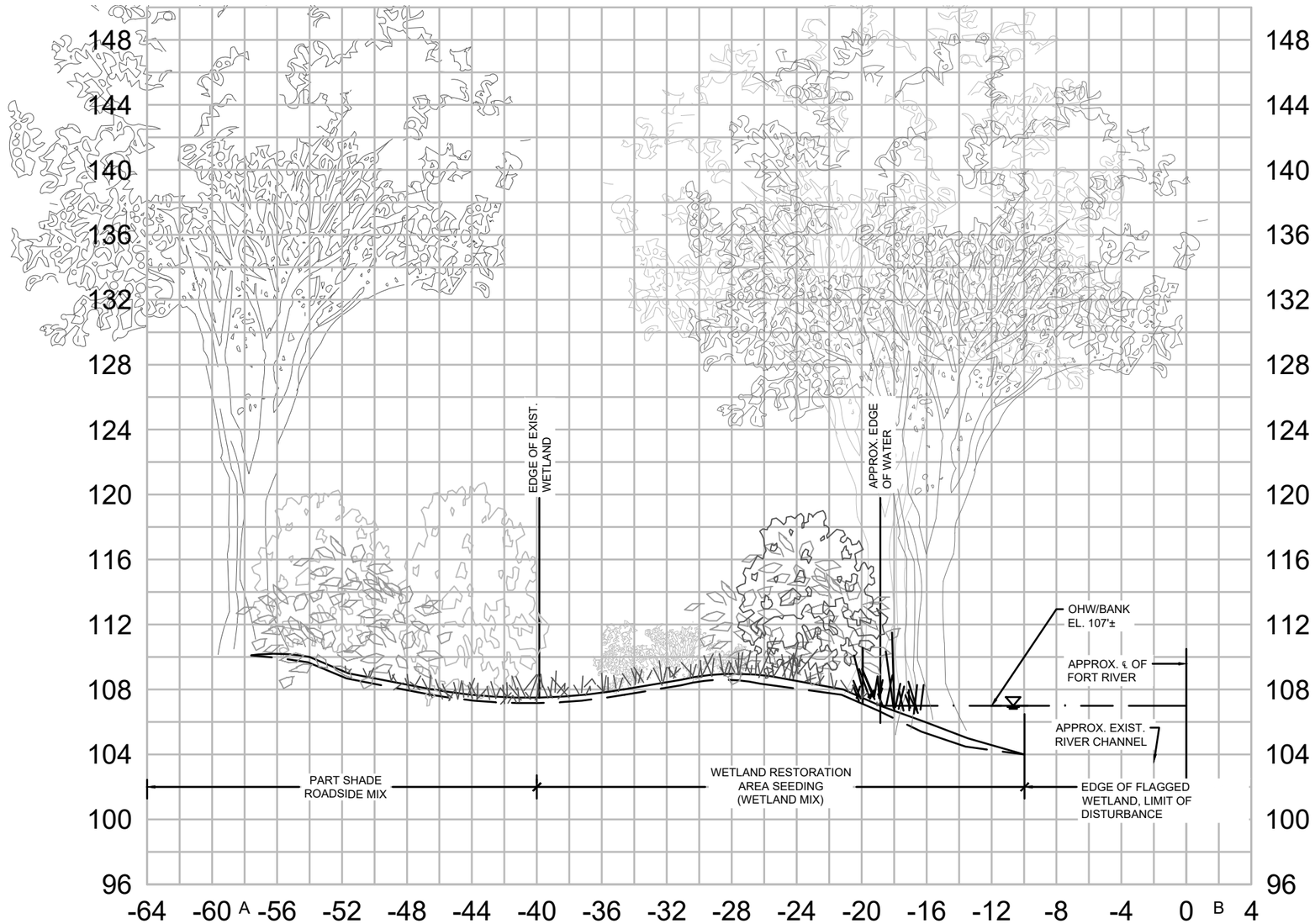
SCALE: 1" = 8'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 8'

EXHIBIT NO. 15 OF 20



WETLAND RESTORATION SECTION A-B
(LOOKING WEST)

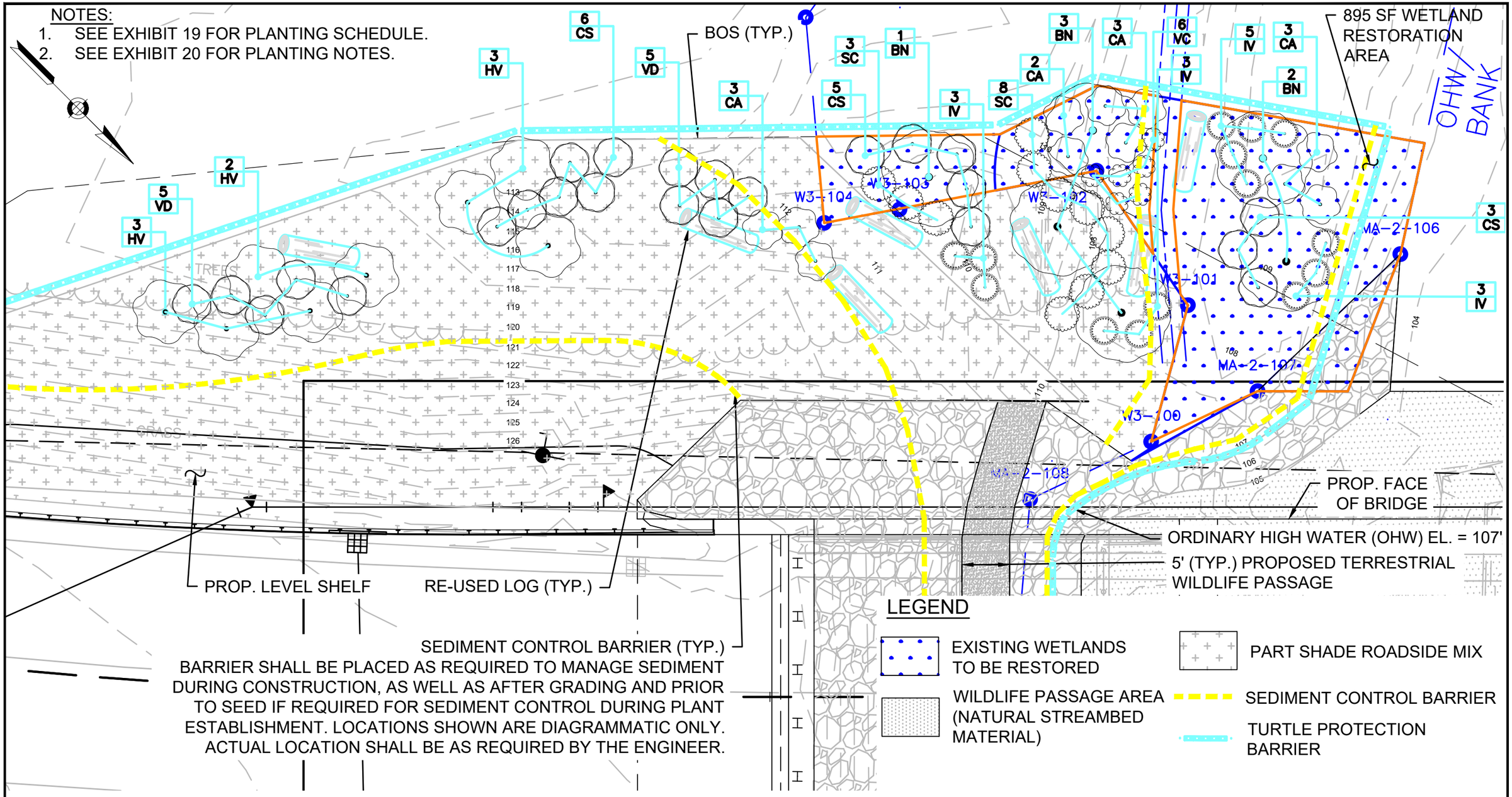
benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: NTS

EXHIBIT NO. 16 OF 20

NOTES:
1. SEE EXHIBIT 19 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 20 FOR PLANTING NOTES.



WETLAND RESTORATION AND PROPOSED WETLAND AND UPLAND PLANTINGS (WEST OF BRIDGE)

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 17 OF 20

NOTES:

1. SEE EXHIBIT 19 FOR PLANTING SCHEDULE.
2. SEE EXHIBIT 20 FOR PLANTING NOTES.

PROP. DMH

PROP. FACE OF BRIDGE

CONTRACTOR TO REMOVE EXISTING BITTERSWEET VINE (TYP.)

5' (TYP.) PROPOSED TERRESTRIAL WILDLIFE PASSAGE

ORDINARY HIGH WATER (OHW) EL. = 107'

SEDIMENT CONTROL BARRIER (TYP.)
BARRIER SHALL BE PLACED AS REQUIRED TO MANAGE SEDIMENT DURING CONSTRUCTION, AS WELL AS AFTER GRADING AND PRIOR TO SEED IF REQUIRED FOR SEDIMENT CONTROL DURING PLANT ESTABLISHMENT. LOCATIONS SHOWN ARE DIAGRAMMATIC ONLY. ACTUAL LOCATION SHALL BE AS REQUIRED BY THE ENGINEER.

CEM. CONC. HEADWALL WITH CHECK VALVE

1 AS
5 CS
1 BN
4 CA
3 IV
5 SC
1 BN
5 CS
1 AS
7 SC
1 BN
3 IV
1 BN

GUARDRAIL
BIT SW
CONC SW
TREES
OHW / BANK

LEGEND

- RIPRAP AREA
- WILDLIFE PASSAGE AREA & DRAINAGE CHANNEL AREA (NATURAL STREAMBED MATERIAL)
- STONE FOR PIPE ENDS
- PART SHADE ROADSIDE MIX
- SEDIMENT CONTROL BARRIER
- TURTLE PROTECTION BARRIER

PROPOSED WETLAND AND UPLAND PLANTINGS (EAST OF BRIDGE)

0 10 20 30 40

SCALE: 1" = 10'

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: 1" = 10'

EXHIBIT NO. 18 OF 20

PLANT LIST (WEST OF BRIDGE)						
PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	3 + 8*	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	7 + 7*	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	6 + 8*	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	7 + 4*	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
	HV	8	HAMAMELIS VIRGINIANA	WITCH HAZEL	2'-2.5'	5' TYP.
	VD	10	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-2.5'	5' TYP.
	VC	6*	VACCINIUM CORYMBOSOM	HIGHBUSH BLUEBERRY	2'-3'	
TREES						
	BN	2 + 4*	BETULA NIGRA	RIVER BIRCH	5'-6'	

PLANT LIST (EAST OF BRIDGE)						
PLANT TYPE	LABEL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
SHRUBS						
	CA	4	CORNUS AMOMUM	SILKY DOGWOOD	2'-2.5'	3'-5' TYP.
	CS	14	CORNUS SERICEA	REDOSIER DOGWOOD	2'-2.5'	3'-5' TYP.
	IV	6	ILEX VERTICILLATA	WINTERBERRY	2'-2.5'	3'-5' TYP.
	SC	12	SAMBUCUS CANADENSIS	ELDERBERRY	2'-2.5'	3'-5' TYP.
TREES						
	AS	2	ACER SACCHARINUM	SILVER MAPLE	5'-6'	
	BN	4	BETULA NIGRA	RIVER BIRCH	5'-6'	

* THE QUANTITIES MARKED WITH AN ASTERISK ARE LOCATED WITHIN THE AREAS OF WETLAND RESTORATION. ALL OTHER QUANTITIES ARE LOCATED WITHIN UPLAND AREAS.

PROPOSED WETLAND AND UPLAND PLANTING SCHEDULE

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: N/A

EXHIBIT NO. 19 OF 20

GENERAL NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE SILT FENCE TO SERVE AS WOOD TURTLE BARRIER. REFER TO THE APPLICABLE SPECIAL PROVISION.
2. ORDINARY HIGH WATER IS AT EL. 107'.

PLANTING NOTES:

1. FOR WETLAND RESTORATION INSTRUCTIONS, REFER TO SPECIAL PROVISION ITEM 755.45.
2. RESTORATION WORK SHALL NOT COMMENCE UNTIL ALL WORK IN WATER AND SLOPE RECONSTRUCTION HAS BEEN COMPLETED TO AVOID DAMAGE TO MITIGATION AREA.
3. REFER TO CONSTRUCTION PLANS FOR LIMIT OF CLEARING AND GRUBBING. AS SHOWN ON THE PLANS AND PER SPECIAL PROVISION ITEM 767.122, TREES SHALL BE SELECTED TO BE REUSED ON SITE. PLACEMENT OF LOGS AT TIME OF WETLAND CONSTRUCTION SHALL BE PER THE WETLAND SPECIALIST (PLAN LOCATIONS ARE SYMBOLIC ONLY.)
4. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
5. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
6. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
7. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
8. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
9. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

PROPOSED WETLAND AND UPLAND PLANTING NOTES

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

SCALE: N/A

EXHIBIT NO. 20 OF 20

Work-Start Notification Form

File Number: NAE-2016-02256 State: Massachusetts County: Hampshire

Permittee: Massachusetts Department of Transportation - Highway Division, Courtney Walker
Date Verification Issued: 4/10/2025
Project Manager: Dan Vasconcelos

At least two weeks prior to commencing the activity authorized by this permit, sign this certification and return it to the following address:

US ARMY CORPS OF ENGINEERS
New England District
Attn: Dan Vasconcelos
696 Virginia Road
Concord, MA 01742
or
daniel.b.vasconcelos@usace.army.mil and cenae-r-tu@usace.army.mil
978-318-8653

Please note that your permitted activity is subject to a compliance inspection by a U. S. Army Corps of Engineers (USACE) representative. Failure to comply with any terms or conditions of this authorization may result in the USACE suspending, modifying or revoking the authorization and/or issuing a Class I administrative penalty, or initiating other appropriate legal action.

The people (e.g. contractor) listed below will do the work, and they understand the permit's conditions and limitations.

Contractor Name/Contractor Firm: _____
Business Address: _____
_____
Contractor Phone and Email: _____

Proposed Construction Dates: Start: _____ Finish: _____

_____ _____
Signature of Permittee Date

Compliance Certification Form

File Number: NAE-2016-02256 State: Massachusetts County: Hampshire

Permittee: Massachusetts Department of Transportation - Highway Division, Courtney Walker
Date Verification Issued: 4/10/2025
Project Manager: Dan Vasconcelos

Within one month of completion of the activity authorized by this permit and any mitigation required by the permit (you must submit this form after mitigation is complete, but not the mitigation monitoring, which requires separate submittals), sign this certification and return it to the following address:

US ARMY CORPS OF ENGINEERS
New England District
Attn: Dan Vasconcelos
696 Virginia Road
Concord, MA 01742
or
daniel.b.vasconcelos@usace.army.mil and cenae-r-tu@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U. S. Army Corps of Engineers (USACE) representative. Failure to comply with any terms or conditions of this authorization may result in the USACE suspending, modifying, or revoking the authorization and/or issuing a Class I administrative penalty, or initiating other appropriate legal action.

I hereby certify that the work, and mitigation (if applicable), authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit including any general or specific conditions.

Date Authorized Work Started: _____ Completed: _____

Describe any deviations from permit (attach drawing(s) depicting the deviations):

_____

_____

***Note: The description of any deviations on this form does not constitute approval by the USACE.**

_____ _____

Signature of Permittee **Date**

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
100 Cambridge Street Suite 900 Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

March 21, 2025

Massachusetts Department of Transportation Highway Division
10 Park Plaza, Suite 7360
Boston, MA 02116
ATTN: Courtney Walker

RE: 401 WATER QUALITY CERTIFICATION
BRP WW 10, Major Fill Project
BRP WW 08, Minor Dredge Project
Bridge Replacement (H-01-005), Bay Road (Route 47) over Fort River
Hadley, Massachusetts

401 WQC Filing Number: 24-WW26-0055-APP
USACE Application No. NAE-2016-02256
MassDOT File Number: 608460

Dear Ms. Walker:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed your application for a Water Quality Certification (WQC), as referenced above. This application was deemed complete on March 5, 2025. In accordance with the provisions of MGL Ch. 21, §§26-53 and Section 401 of the Federal Clean Water Act as amended (33 U.S.C. §1251 et seq.), it has been determined there is reasonable assurance the proposed project will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law.

The proposed project consists of the replacement of the existing bridge (Bridge No. H-01-005) that carries Bay Road (Route 47) over the Fort River in Hadley (the Project). The Project also includes stormwater improvements, scour protection installation, full-depth reconstruction of the approaches, vegetation removal, and streambed and wetland restoration. The bridge is stated as needing replacement due to age and various structural deficiencies.

Existing Conditions

The existing bridge, constructed in 1936, is oriented in a northwest/southeast direction with the Fort River flowing northeast to southwest under the bridge. The bridge is approximately 124 feet long, 39 feet wide, and carries two travel lanes (one in each direction) and a single sidewalk. Two reinforced

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TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

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concrete abutments and seven timber piles comprise the substructure that supports the superstructure. Stormwater from the southeast portion of the Project area flows to an existing catch basin just east of the bridge that connects to an outfall and discharges into the Fort River via an intermittent stream south of the bridge. On the bridge, stormwater discharges directly into the river without pretreatment through bridge scuppers. Stormwater drainage for the remaining portion of the Project area is country drainage.

The Fort River is a tributary of the Connecticut River and is mapped as a Coldwater Fishery Critical Area. The bridge is within a mapped 1% annual chance of flood zone with a Base Flood Elevation (BFE) of 124-feet NAVD (Zone A). The intermittent stream runs parallel to Fort River and flows through a forested Bordering Vegetated Wetland (BVW). In addition, the Project is located within Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitat of Rare Species (PH 2084).

Project Description

The Project will demolish the existing concrete bridge, abutments, and timber piers and construct a new bridge in the same location. The replacement bridge will be comprised of three-spans with a total span length of 126 feet and width of 42.5 feet. The increased bridge width will accommodate two 12-foot-wide travel lanes with 5-foot-wide shoulders, a single 5.5-foot-wide sidewalk, and guard rails on either side. The existing timber piers will be cut 5 feet below the mudline. New integral concrete abutments and two pipe pile bents with concrete pile caps will support the new bridge. Each embankment will be comprised of a 12-inch-deep crushed stone layer topped with a 3-foot-deep layer of riprap. In addition, 5-foot-wide terrestrial wildlife passages consisting of level, natural streambed material will be created on each embankment above the ordinary high water mark (OHWM). The bridge will be raised 15 inches in profile to maintain the lowest elevation of the superstructure and the approaches will be raised slightly to meet the grade of the higher bridge. Full depth pavement reconstruction of the approaches will occur approximately 310 feet southeast and 315 feet northwest of the bridge. To facilitate the bridge replacement, two utility poles will be permanently relocated to the southwestern side of the bridge.

During construction, the roadway will be reduced to one lane to demolish and reconstruct the bridge substructure and superstructure one half at one time. Erosion and sedimentation controls will be installed prior to demolition and construction to prevent the migration of sediment to adjacent resource areas. Sandbag cofferdams will be installed within BVW and Land Under Water (LUW) associated with the Fort River and dewatered to create dry working conditions while maintaining flow. The cofferdams will also act as a sediment control by confining bridge debris. Vegetation will be cleared and grubbed to facilitate construction access and provide clearance to overhead utility lines. Following grading of the side slopes, a native seed mix and plantings will be applied.

LUW and BVW Impacts and Restoration

Installation of riprap scour protection around the abutments will account for 1,525 square feet (sf) of permanent fill and 378 cubic yards (cy) of dredging. In addition, there will be 21 sf of permanent impact to the intermittent stream due to grading, loaming, and seeding. A total of 8,790 sf of temporary impact to LUW is required for construction access, placement of sandbag cofferdams and streambed following construction. A portion of the native dredged material will be stockpiled and used to restore the streambed throughout the Fort River LUW restoration area. Once the new abutments and piers are

installed, the dredged area within LUW will be restored with the placement of geo-textile fabric, 3-feet of riprap over 12-inches of crushed stone, and topped with 12-inches of native streambed material. All LUW restoration will be conducted under the supervision of a qualified fluvial geomorphologist.

The Project will not result in permanent impact to BVW. Temporary impact of 895 sf will occur within BVW for placement of the sandbag cofferdams. Following removal of the cofferdams, the area will be restored by decompacting soil compressed by the sandbags, applying a wetland seed mix, and planting river birch (*Betula nigra*), elderberry (*Sambucus canadensis*), red osier dogwood (*Cornus sericea*), silky dogwood (*Cornus amomum*), and winterberry (*Ilex verticillata*).

Table 1. BVW and LUW Impacts

Wetlands/Waters	Permanent Impact	Temporary Impact	Restoration
LUW	1,546 sf	8,790 sf	8,790 sf
BVW	0 sf	895 sf	895 sf
Dredge	378 cy	N/A	N/A

Alternatives Analysis

An alternatives analysis was completed in accordance with 314 CMR 9.00. The existing bridge is structurally deficient and presents a risk to driver safety and downstream areas of the Fort River should the bridge fail; therefore, a no-build alternative is not practicable to meet project goals. A wider bridge to accommodate the ideal number and width of sidewalks and shoulders was considered, but rejected due to the increased cost, utility pole relocations, and impact on the surrounding environment and abutting properties. The selected alternative of a two-lane bridge with 5-foot-wide shoulders and a single sidewalk requires fewer utility pole relocations and minimizes the overall impact to adjacent resource areas.

Stormwater Management Standards

The Project meets the Stormwater Management Standards to the maximum extent practicable per 314 CMR 9.06(6). The proposed widening of Bay Road will increase impervious surfaces in the Project area by 2,900 sf. Through a complete evaluation, it was determined that structural Stormwater Control Measures (SCMs) were limited due to the narrow right-of-way, site topography, and bordering resource areas. However, stormwater drainage patterns in the southeast portion of the Project area will be improved through replacement of the existing catch basin east of the bridge with a new deep sump catch basin. The new catch basin will connect underneath Bay Road to a new drainage manhole. From there, stormwater will be carried through a 12-inch corrugated metal pipe (CMP) and outlet at a constructed drainage channel at the toe of slope in the northeast quadrant of the Project area. This proposed drainage pattern will redirect stormwater away from the intermittent stream southwest of the bridge. In addition, direct discharges of untreated stormwater to the river will be eliminated with removal of the bridge scuppers. Stormwater from the bridge will be conveyed to a new deep sump catch basin and piped to a stone splash pad west of the bridge.

Stormwater drainage patterns in the remaining portion of the Project area will be maintained, utilizing existing country drainage to avoid creating point source discharges. The new deep sump catch basins will provide 25% pre-treatment total suspended solids (TSS) removal, and installation of the drainage channel and stone splash pad, as well as intentional grading and planting within adjacent upland areas, will slow flow velocities and promote infiltration. Stormwater Management Standards 2, 3, and 4 will be met to the maximum extent practicable.

Stream Crossing Standards

The Project meets or exceeds all Stream Crossing Standards. At the bridge crossing, the bankfull width of the Fort River is approximately 75 feet, which equals a 1.2 times bankfull width of 90 feet. Given the proposed bridge span of 126 feet, Stream Crossing Standard 3 has been sufficiently met. Regarding Stream Crossing Standards 4 through 7, natural streambed materials will be reused throughout areas of LUW restoration. Water depth and velocity of the proposed channel will be comparable to the native channel as it will closely match existing conditions upstream and downstream of the bridge crossing. Based on the site plans, the height from the bottom of the stream channel to the bottom of the proposed superstructure will be greater than 15 feet, creating an openness ratio of 39.5 feet. In addition, dry wildlife passages with at least 10 feet of clearance will be created underneath the bridge on both sides of the stream. Banks at each corner of the bridge abutments will match the horizontal profile of the existing stream and banks.

Sediment Chemistry

Two soil borings were completed in accordance with 314 CMR 9.07(2)(b)4.; one boring southwest and downstream of the bridge and one boring east and upstream of the bridge. Sediment sample analytical results were compared to the Reportable Concentration (RC) S-1 criteria of the Massachusetts Contingency Plan (MCP). Results of the sediment samples analyzed indicated the presence of metals and Polycyclic Aromatic Hydrocarbons (PAHs) in concentrations below the RCS-1 criteria. As such, dredged sediment may be reused onsite.

Invasive Species

All invasive species within the project limits will be treated as part of the Project. Specifically, non-native invasive Asiatic bittersweet (*Celastrus orbiculatus*) will be treated east of the bridge. Treatment of invasives species will be managed in accordance with an Invasive Plant Management Strategy (IPMS) to be approved by MassDEP as conditioned herein.

Wetland and Rare Species

In an email dated January 29, 2025, the Division of Fisheries and Wildlife (DFW) stated no time of year (TOY) restrictions or other Best Management Practices are required for the Project. However, NHESP issued a Conditional No-Take Determination for the Project on October 30, 2024. The Project is required to incorporate a NHESP-approved construction-period Wood Turtle Protection Plan (TPP) to avoid a prohibited Take, as conditioned herein.

Based on a review of information provided by the applicant, MassDEP finds that this project complies with the standards described under 314 CMR 9.06 and 9.07. Public notice was provided in the Daily

Hampshire Gazette on October 10, 2024. No comment letters were received during the public comment period.

Therefore, based on information currently in the record, MassDEP grants a WQC for this project subject to the following conditions to maintain water quality, to minimize impact on waters and wetlands, and to ensure compliance with appropriate state law. The Department further certifies in accordance with 314 CMR 9.00 that there is reasonable assurance the project or activity will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law. Finally, the Department has determined that upon satisfying the conditions and mitigation requirements of this approval, the project provides a level of water quality necessary to protect existing uses and accordingly finds that the project to be implemented satisfies the Surface Water Quality Standards at 314 CMR 4.00.

Pursuant to 314 CMR 9.09(1)(d); 314 CMR 9.06(6)(a); 310 CMR 9.06(2); 314 CMR 9.07; 314 CMR 9.07(1); 314 CMR 9.09(7)(5)(c); 314 CMR 9.11; and 314 CMR 9.09(1)(e), the following Special Conditions are necessary to ensure that construction practices and stormwater controls are implemented in such a manner as to prevent degradation to wetlands and waters; ensure that practicable steps have been taken which will avoid and minimize impacts to wetlands and waters; minimize turbidity and sediment caused by construction activities; ensure that water quality is not degraded, and that biology of the waters are not negatively impacted by potential discharges; and/or maintain a record of the dredged material for reference and to ensure accountability in its transportation.

Those Special Conditions that require direct submittals to MassDEP for either review, or review and approval, are denoted by the following notation (Submittal) at the end of the condition and are summarized in Attachment A. In addition, those conditions with the (Submittal) designation shall be included in the Special Provisions and, as applicable, reviewed at the Pre-Construction Meeting.

1. All work shall be performed in accordance with the following documents and plans:

    - Application for Water Quality Certification. Prepared by Benesch on behalf of MassDOT, dated October 7, 2024, with cover letter and attachments. 401 WQC Filing Number: 24-WW26-0055-APP.
    - Plans entitled: “Bay Road (Route 47) over Fort River (Bridge No. H-01-005 (C1H))”. Sheets 1 through 77. Prepared by Benesch. Dated April 25, 2018, last revised August 9, 2021.
    - MassDEP Administrative Completeness and Technical Deficiency Review. 401 Water Quality Certification, Combined Fill and Dredge Project Certification. Bay Road (Route 47) over Fort River Bridge Replacement, Hadley, MA. Dated October 28, 2024.
    - MassDOT Responses to MassDEP Technical Deficiency Review, with attachments. Prepared by Benesch on behalf of MassDOT. 401 Water Quality Certification, Combined Fill and Dredge Project Certification. Bay Road (Route 47) over Fort River Bridge Replacement, Hadley, MA. Dated February 20, 2025.
    - MassDOT Supplemental Responses to MassDEP Technical Deficiency Review, with attachments. Prepared by Benesch on behalf of MassDOT. 401 Water Quality

Certification, Combined Fill and Dredge Project Certification. Bay Road (Route 47) over Fort River Bridge Replacement, Hadley, MA. Dated March 4, 2025.

- DFW Comments via email. RE: MassDOT 608460 Hadley Fort River. Dated January 29, 2025.
- NHESP Conditional No-Take Determination. NHESP File No. 23-6213. Dated October 30, 2024.
- NHESP Approval of the TPP via email. NHESP File No. 23-6213. Dated December 12, 2024.

Pre-Construction

2. A qualified **Wetland Scientist** (WS) with a minimum of five years of relevant professional experience with wetland and stream restoration projects shall be employed to oversee all BVW and LUW restoration activities as proposed in the application, including but not limited to soil decompaction, seeding, vegetation plantings, and placement of terrestrial wildlife passages. The name, contact information, and qualifications of the WS shall be provided to MassDEP for approval prior to the Pre-Construction Meeting required in Condition 5. The name and contact information of the approved WS shall be provided to the Hadley Conservation Commission prior to the start of work. **(Submittal)**

3. A qualified **Fluvial Geomorphologist** (FGM) with a minimum of five years of relevant professional experience in stream replacement and restoration projects shall be employed to oversee all LUW replacement and restoration activities as proposed in the application. The name, contact information, and qualifications of the FGM shall be provided to MassDEP for approval with a copy to the Hadley Conservation Commission prior to the Pre-Construction Meeting required in Condition 5. **(Submittal)**

4. Prior to the Pre-Construction Meeting required in Condition 5, the applicant shall provide MassDEP with the name and contact information of the Resident Engineer (RE) responsible for ensuring that all work complies with the conditions of this WQC. **(Submittal)**

5. A minimum of 21 days prior to the start of vegetation clearing, MassDOT shall contact MassDEP to schedule an onsite Pre-Construction Meeting to review the approved plans and terms and conditions of this WQC. The RE, the construction contractor, the WS, a representative from the MassDOT Environmental Section and/or the District Environmental Engineer shall attend the Pre-Construction Meeting. **No work shall commence prior to the Pre-Construction Meeting.**

6. MassDEP shall be copied on applicable submittals to the U.S. Army Corps of Engineers (USACE). These include but are not limited to: Self-Verification Notification Form (SVNF); Pre-Construction Notification (PCN); Work-Start Notification Form; Mitigation Work-Start Notification Form; and Compliance Certification Form. The Work-Start Notification Form shall be submitted at least 14 days before the anticipated start of work and the Compliance Certification Form shall be submitted within 30 days following the completion of the authorized work. **(Submittal)**

7. A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (CP/PP) shall be developed and implemented as required by 314 CMR 9.06(6)(a)8. A minimum of 14 days prior to the start of work, MassDOT shall submit the CP/PP for review and approval. If the Environmental Protection Agency (EPA) Construction General Permit (CGP) applies, the Stormwater Pollution Prevention Plan (SWPPP) may serve as the CP/PP, providing it includes the measures required to be in the CP/PP per these Special Conditions, in addition to the measures specifically required by the CGP. Any subsequent changes to the Final CP/PP (defined herein as including the construction period SWPPP if applicable) must be approved by MassDEP. **(Submittal)**

8. Training regarding erosion and sedimentation controls is required. The RE, CP/PP Inspector, and any other relevant personnel responsible for erosion and sedimentation controls shall complete the EPA CGP Inspector Training, or other training that meets the CGP requirements, as well as complete a comprehensive review of the Final CP/PP. Proof of completion of the training shall be submitted to MassDEP prior to the start of work. **(Submittal)**

9. The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to BVW and LUW, proposed dewatering methods and locations, proposed stockpile locations and their proximity to catch basins or other drainage conveyances that discharge to wetland resource areas, and the location of construction-period erosion and sedimentation controls. Stockpiles shall be located no less than 50 feet from BVWs, LUW, catch basins, or other drainage conveyances that discharge to BVWs or LUW.

10. A minimum of 14 days prior to the start of work, MassDOT shall submit a Control of Water Plan for review and approval. The Plan shall include a description of proposed methods to isolate and dewater work areas within streams while maintaining stream flow, including but not limited to the method of isolation (e.g., steel sheeting or sandbag cofferdam), dewatering methods and locations and specifications for stream bypass systems as applicable. The Control of Water Plan shall include a plan depicting BVW and LUW boundaries, and the location of all relevant methods and materials which shall be located within the BVW and LUW impact areas approved herein. The plan shall meet requirements of the CP/PP and be specific to the Project. Dewatering and stream bypasses shall be conducted under the supervision of the RE or other project staff with knowledge of these practices and comply with the applicable conditions identified herein. **(Submittal)**

11. Prior to the start of work, approved erosion and sedimentation control measures shall be installed per the approved CP/PP and as applicable, the manufacturer specifications. Erosion and sedimentation control measures may consist of, but are not limited to, silt fence, staked straw bales, silt/turbidity curtains, compost filter tubes, etc.

12. Prior to the Pre-Construction Meeting, the boundaries of BVW and LUW shall be re-flagged where they are within 50 feet of the limits of work. In the event BVW and LUW boundaries overlap, the outermost boundary (i.e., closest to the proposed work) shall be flagged. All boundary markers, once in place, shall remain in place throughout construction until all disturbed surfaces have been permanently stabilized. Boundary markers shall be fully evaluated annually and refreshed where needed. Implementation of and compliance with this

requirement shall be documented by the WS or RE. All construction personnel shall be made aware of these markers.

13. A Flood Contingency Plan shall be submitted to MassDEP for review and approval that addresses areas that fall within the 1% annual chance of flooding zone within project limits. The Plan shall address the potential need for temporary relocation of construction and auxiliary equipment during flood events to designated upland locations above the Base Flood Elevation. The Plan shall be approved by MassDEP prior to any work within the 1% annual chance of flooding zone, including mobilization or storage of equipment and materials. **(Submittal)**

14. The Contractor shall develop an Invasive Plant Management Strategy (IPMS) to be submitted to MassDEP for review and approval prior to the Pre-Construction Meeting. The IPMS shall be implemented as approved. **(Submittal)**

15. If needed, use of herbicides to control invasive species shall be implemented in accordance with the approved IPMS and with the following requirements:

    a. Herbicides can only be applied by a Licensed Applicator;

    b. Applicant must provide MassDEP Material Safety Data Sheets (MSDS) of the product being used and must also keep MSDS sheets on site;

    c. Product registration in MA with Massachusetts Pesticide Product Registration Number must be confirmed with Massachusetts Department of Agricultural Resources Pesticide Division;

    d. EPA Registration Number for the product must be identified;

    e. Product label restricted use provisions must be followed; and

    f. Applicant must contact MassDEP Wetlands Program, Dredge Unit to determine if a BRP WM 04 herbicide permit is required.

16. Final Construction Plans (the plans provided to the contractor) shall be submitted for review at least 30 days prior to the Pre-Construction Meeting. Sufficient supporting information, explanation, and documentation shall be provided to MassDEP and the Hadley Conservation Commission for any changes, and MassDEP may at its discretion require additional supporting documentation as a condition of review. Once MassDEP provides written approval, the updated set of plans shall become the "Final Plan of Record." The Plan shall be prepared and signed by a Professional Engineer in the Commonwealth of Massachusetts and shall incorporate all revisions and additions to the original plans that have been approved as discussed herein. Specifically, the plans should include the invert elevation of the pipe end that will connect the proposed deep sump catch basin west of the bridge to the 5-foot-long stone splash pad. **(Submittal)**

Construction Period

17. No more than **895 sf** of temporary impacts to BVW shall occur. No more than **1,546 sf** of permanent and **8,790 sf** of temporary impacts to LUW shall occur. No more than **378 cy** of dredging in LUW shall occur. All work shall avoid unapproved impacts to BVW and LUW.

18. The Project shall identify one individual with at least three years of experience with construction period erosion and sedimentation control to be responsible for erosion and sedimentation control inspections (CP/PP Inspector). Under the direction of the CP/PP Inspector, inspection and maintenance of erosion and sediment controls in active work areas may be performed by both the Contractor and RE or other MassDOT project staff. Maintenance is the responsibility of the Contractor; however, the permittee shall be ultimately responsible for erosion and sedimentation control failure. The RE and/or contractor shall immediately notify MassDEP and the Hadley Conservation Commission if any unauthorized discharges to BVW or LUW occur.

19. CP/PP inspections shall occur at least once every seven calendar days and within 24 hours of a storm event that produces 0.5 inches or more of rain within a 24-hour period, or at a more stringent frequency if the CP/PP requires.

20. Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

21. Disturbed areas shall be stabilized immediately after activities have permanently ceased or will be temporarily inactive for 14 or more calendar days. The installation of stabilization measures shall be implemented as soon as practicable, but no later than 14 calendar days after stabilization has been initiated.

22. Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Hadley Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the RE or other project staff with knowledge of these practices prior to use to ensure consistency with the approved Control of Water Plan, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to BVW or LUW. Any discharges shall be visibly free of sediment.

23. Additional erosion and sedimentation control materials shall be stored on-site at all times for emergency and routine replacement. Materials shall be kept covered, dry, and accessible at all times. The CP/PP Inspector shall be responsible for anticipating the need for and installation of additional erosion and sedimentation controls and shall have the authority to require additional erosion control measures to protect wetland resource areas beyond what is shown on the plans if field conditions or professional judgment dictate that additional protection is necessary.

24. The Contractor shall monitor the National Weather Service forecast for updates, and upon issuance of a flood watch for the 1% annual chance of flooding zone, shall implement the flood contingency plan referenced in Condition 13.

25. Any storm drains with potential to receive discharge from stockpiled materials or construction operations shall be managed to inhibit the inflow of sediment while not increasing the likelihood

of roadway flooding during periods of precipitation. The CP/PP shall specify measures to implement this. Filter fabric stretched under storm drain inlet grates are not acceptable for this purpose.

26. The contractor shall have designated washout areas for concrete equipment that will be comprised of impermeable material and sized to contain project concrete wastes and wash water. Concrete wash out areas shall be located no less than 50 feet from BVW, LUW, and catch basins or other drainage conveyances that discharge directly or indirectly to BVW or LUW.

27. Refueling, washing, and cleaning of vehicles and other construction equipment shall not take place within 50 feet of BVW or LUW and any wash water shall be contained such that it does not drain toward BVW or LUW. MassDEP shall explicitly approve in writing any deviation to this condition for oversized stationary vehicles.

28. The contractor shall have spill containment kits on site. In the event of a release of fuels and/or oils, the local fire department, MassDEP Emergency Response and MassDEP Wetlands Program Highway Unit shall be contacted, and in addition, the MassDEP Bureau of Waste Site Cleanup shall be notified per the requirements of the Massachusetts Contingency Plan, 310 CMR 40.0000.

29. The Turtle Protection Plan shall be implemented as approved by NHESP on December 12, 2024.

30. Construction vehicles and equipment shall not enter the BVW or LUW unless authorization is provided by way of this permit or amendment. The Contractor shall use equipment with boom reach capabilities and other measures to avoid inadvertent impacts to jurisdictional resource areas as a result of excavation, riprap placement, and/or bridge/pier demolition materials.

31. A temporary shielding or containment system shall be in place beneath the bridge structure prior to removal and concrete excavation to prevent debris from falling into the water below. In the event that any debris accidentally enters the Fort River, it shall be immediately retrieved. Notice shall be provided to MassDEP if debris enters the river and that it has been removed with photo-documentation (if practicable) submitted by email.

Dredging

32. MassDEP shall be notified one week prior to the start of dredging so that staff may inspect the work for compliance throughout the project.

33. No later than 21 days prior to commencement of dredging activity, a Dredged Material Dewatering Plan shall be submitted to MassDEP for review and approval. At a minimum, the Plan shall include but not be limited to the type of containment, method of dewatering (i.e. mechanical or by gravity), method of collecting the dewatered effluent and method of disposal. **(Submittal)**

34. Best Management Practices (BMPs) shall be employed by the contractor to protect resource areas located adjacent to the proposed staging/temporary dredged material stockpiling and dewatering areas. Sediment stockpiles shall be constructed in accordance with the MassDEP

approved project plans, stabilized, bottom-lined if not placed on paved surfaces and securely covered with wind tear resistance tarpaulin, polyethylene sheeting or similar impermeable material at all times, and properly labeled. Stockpile covers shall be securely weighed down. Stockpiles shall also be secured to restrict access by the public and shall be set back at least 10 feet from temporary construction access roads or other areas and activities which could disturb the stockpiles and associated erosion controls; if the 10-foot setback cannot be met, then a MassDEP-approved barrier shall be provided. Inspection of the sediment containment and dewatering location and associated erosion controls shall be conducted daily and within 24 hours of a storm that produces 0.5 inches or more of rain. Any observed deficiency shall be corrected or repaired in a timely manner.

35. In the event of a precipitation or storm event, the site shall be secured beforehand in such a way as to protect resource areas and waters on site and downstream of the site, including covering of stockpiles of dredged material. Sediment stockpile areas shall be inspected in line with the frequency of the CP/PP required in Condition 19. Any observed deficiency shall be corrected or repaired in a timely manner to prevent discharge from the stockpiled material. If stormwater runoff and erosion is observed from stockpiled dredged material, additional erosion and/or damage prevention controls measures shall be implemented.

36. Measures shall be in place to prevent turbid waters, due to dredging, demolition, or debris removal activities, from extending past the limits of work into the Fort River. These measures can be items such as turbidity curtains and/or sheet piles.

37. If visual turbidity escapes the controls in place, as described in Condition 34, work shall stop immediately and MassDEP shall be notified within 24 hours. Work shall not resume until the issue is corrected and to the satisfaction of MassDEP.

38. All turbidity controls shall be inspected daily by the RE or a designated MassDOT project staff. If any damage is observed the controls in place will be replaced or repaired immediately.

39. If excavated sediment is disposed of off-site, MassDEP shall be notified in writing of the name and location of the upland licensed facilities accepting the dredged material for disposal or reuse for review and approval. If the licensed facility is located out of state, documentation shall be provided to MassDEP that the dredged material disposal/reuse has been approved and will be accepted by the receiving State. The dredged material shall not be transported to the facility without concurrence of MassDEP.

40. If excavated sediment is disposed of off-site, BMPs shall be implemented during transportation of the dredged material to the licensed receiving facility. At a minimum, when transported upon public roadways, all dredged material shall have no free liquid as determined by the Paint Filter Test or other suitably analogous methodology acceptable to MassDEP, and a tarpaulin or other means shall be used to cover the dredged material during transport.

Wetland Mitigation

41. A minimum of **895 sf** of wetland restoration shall be completed in coordination with an approved WS. The WS shall oversee all BVW restoration, including final grading, seeding, and

planting. The WS shall confirm that the constructed BVW restoration area has adequate soils and hydrology to promote wetland plant species prior to seeding and installation of plantings and shall recommend measures to amend soils and promote wetland hydrology as needed.

42. Planting and seeding shall not take place between November 15th and April 15th, except as allowed by MassDEP in writing. The WS shall inspect trees and shrubs to ensure they are healthy prior to planting. Trees and shrubs deemed unhealthy in the professional judgment of the WS shall be replaced. Plantings and seed mixes shall consist of native and non-invasive species. Species may be substituted at the recommendation of the WS, and review and approval by MassDEP.

43. At least 75% of the surface area of the BVW restoration area shall be vegetated with indigenous wetland plant species within two growing seasons, or the period required by the Section 404 permit, whichever is longer. Additionally, evidence of hydrology, including hydric soil formation shall be submitted at the same time. Annual monitoring reports shall be submitted by the WS no later than January 15th each year. Monitoring reports shall include an assessment based on the approved success criteria, representative photos, and recommended corrective actions as needed. **(Submittal)**

44. MassDEP reserves the right to determine the success or failure of the BVW restoration area, and reserves the right to require additional plantings, regrading, or other measures deemed necessary to promote success.

Stream Mitigation

45. The FGM shall oversee all LUW restoration. Placement of streambed materials shall take place in no- or low-flow conditions. The Control of Water Plan required in Condition 10 shall include measures to create no-flow conditions for this work such as a pump bypass system or other dewatering method, if needed. Placement of streambed materials during greater than low-flow conditions shall require a placement plan, with a narrative describing turbidity control measures, submitted to MassDEP for review and approval.

46. A minimum of 14 days prior to installation of the streambed materials, the FGM shall meet with the contractor to determine the suitability of stockpiled streambed material for reuse.

47. Upon completion of the LUW restoration, the FGM shall provide photographs and a summary of the completed work to MassDEP and the Hadley Conservation Commission. **(Submittal)**

48. Water shall be slowly introduced back into the restored and dewatered LUW work areas as to not cause erosion and sedimentation. This work shall be overseen by the WS

49. MassDEP reserves the right to determine the success or failure of the LUW restoration areas and reserves the right to require additional measures deemed necessary to promote success.

Post-Construction

50. All temporary erosion controls shall be removed at the conclusion of work once the surrounding area has achieved final stabilization.

General Conditions

51. Any proposed alterations, minor plan changes, or amendment requests, as well as any required submittals shall be sent by email for review and approval to heidi.davis@mass.gov and jaime.iannelli@mass.gov. **(Submittal)**

52. This WQC remains in effect for the same duration as the Section 404 permit that requires it.

53. No Special Condition set forth herein shall be construed or operate to prohibit MassDEP from taking enforcement against the MassDOT or its contractors for any failure to comply with the terms and requirements of this WQC.

54. No activity authorized by this WQC may begin prior to expiration of the 21-day appeal period, or until a final decision is issued by MassDEP in the event of an appeal.

Failure to comply with this Certification is grounds for enforcement, including civil and criminal penalties, under MGL Ch. 21 §42, MGL Ch. 21A §16, or other possible actions/penalties as authorized by the General Laws of the Commonwealth.

This Certification does not relieve the applicant of the obligation to comply with other appropriate state or federal statutes or regulations.

NOTICE OF APPEAL RIGHTS

a.) Appeal Rights and Time Limits

Certain persons shall have a right to request an adjudicatory hearing concerning certifications by MassDEP when an application is required: (a) the applicant or property owner; (b) any person aggrieved by the decision who has submitted written comments during the public comment period; (c) any ten (10) persons of the Commonwealth pursuant to M.G.L. c.30A where a group member has submitted written comments during the public comment period; or (d) any governmental body or private organization with a mandate to protect the environment which has submitted written comments during the public comment period. Any person aggrieved, any ten (10) persons of the Commonwealth, or a governmental body or private organization with a mandate to protect the environment may appeal without having submitted written comments during the public comment period only when the claim is based on new substantive issues arising from material changes to the scope or impact of the activity and not apparent at the time of public notice. To request an adjudicatory hearing pursuant to M.G.L. c.30A, § 10, a Notice of Claim must be made in writing, provided that the request is made by certified mail or hand delivery to MassDEP, with the appropriate filing fee specified within 310 CMR 4.10 along with a DEP Fee Transmittal Form within twenty-one (21) days from the date of issuance of this Certificate, and addressed to:

Case Administrator
Department of Environmental Protection

100 Cambridge Street, 9th Floor
Boston, MA 02114

A copy of the request shall at the same time be sent by certified mail or hand delivery to the Department of Environmental Protection at:

Department of Environmental Protection
Commissioner's Office
100 Cambridge Street, Suite 900
Boston, MA 02114

b.) Contents of Hearing Request

A Notice of Claim for Adjudicatory Hearing shall comply with MassDEP's Rules for Adjudicatory Proceedings, 310 CMR 1.01(6), and shall contain the following information pursuant to 314 CMR 9.10(3):

3. the 401 Certification Transmittal Number;
4. the complete name of the applicant and address of the project;
5. the complete name, address, and fax and telephone numbers of the party filing the request, and, if represented by counsel or other representative, the name, fax and telephone numbers, and address of the attorney;
6. if claiming to be a party aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found at 314 CMR 9.02;
7. a clear and concise statement that an adjudicatory hearing is being requested;
8. a clear and concise statement of (1) the facts which are grounds for the proceedings, (2) the objections to this Certificate, including specifically the manner in which it is alleged to be inconsistent with the MassDEP's Water Quality Regulations, 314 CMR 9.00, and (3) the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written Certification; and
9. a statement that a copy of the request has been sent by certified mail or hand delivery to the applicant, the owner (if different from the applicant), the conservation commission of the city or town where the activity will occur, the Department of Conservation and Recreation (when the certificate concerns projects in Areas of Critical Environmental Concern), the public or private water supplier where the project is located (when the certificate concerns projects in Outstanding Resource Waters), and any other entity with responsibility for the resource where the project is located.

c.) Filing Fee and Address

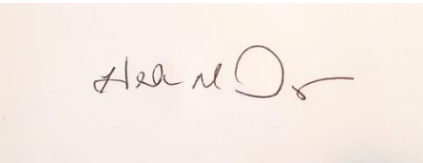
The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
Commonwealth Master Lockbox
PO Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. MassDEP may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Should you have any questions relative to this permit, please contact myself or Jaime Iannelli at heidi.davis@mass.gov and jaime.iannelli@mass.gov.

Very truly yours,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP WERO – Michael McHugh
USACE – Dan Vasconcelos
USACE – Kevin Newton
MassDOT – Michael Joa
MassDOT – Anthony Christakis
Benesch – Ashley Bomley
Hadley Conservation Commission – Kayla Loubriel

ATTACHMENT A
PRE-CONSTRUCTION SUBMITTAL CHECKLIST

Bridge Replacement (H-01-005), Bay Road (Route 47) over Fort River
Hadley, Massachusetts

THIS CHECKLIST MUST BE COMPLETED PRIOR TO THE START OF WORK. NOTE THAT SOME CONDITIONS REQUIRE THAT INFORMATION BE SUBMITTED A SPECIFIC NUMBER OF DAYS PRIOR TO THE START OF WORK OR THE PRE-CONSTRUCTION MEETING.

Pre-Construction Meeting Date: _____

Condition	Required Submittal	Due Date	Date Submitted	Date Approved
PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS				
2 and 3	Name, contact information, and qualifications of the WS and FGM, including specific experience and years to meet requirement	Prior to Pre-Construction Meeting		
4	Name and contact information of the RE	Prior to Pre-Construction Meeting		
6	USACE Work-Start Notification Form	14 days prior to work start		
7	CP/PP	14 days prior to work start		
8	RE, CP/PP Inspector, and other relevant personnel Verification of SWPPP Training	Prior to Work Start		
10	Control of Water Plan	14 days prior to work start		
13	Flood Contingency Plan	Prior to any work within 1% annual chance of flooding zone		
14	Invasive Plant Management Strategy	Prior to Pre-Construction Meeting		
16	Final Construction Plans	30 days prior to Pre-Construction Meeting		

重要 महत्वपूर्ण σημαντικός Important կարեւոր quan trọng مهم

Communication for Non-English-Speaking Parties

This document is important and should be translated immediately.

If you need this document translated, please contact MassDEP's Director of Environmental Justice at the telephone number listed below.

Español Spanish

Este documento es importante y debe ser traducido inmediatamente. Si necesita traducir este documento, póngase en contacto con el Director de Justicia Ambiental de MassDEP (*MassDEP's Director of Environmental Justice*) en el número de teléfono que figura más abajo.

Português Portuguese

Este documento é importante e deve ser traduzido imediatamente. Se você precisar traduzir este documento, entre em contato com o Diretor de Justiça Ambiental do MassDEP no número de telefone listado abaixo.

繁體中文 Chinese Traditional

本文檔很重要，需要即刻進行翻譯。
如需對本文檔進行翻譯，請透過如下列示電話號碼與 MassDEP 的環境司法總監聯絡。

简体中文 Chinese Simplified

这份文件非常重要，需要立即翻译。
如果您需要翻译这份文件，请通过下方电话与 MassDEP 环境司法主任联系。

Ayisyen Kreyòl Haitian Creole

Dokiman sa a enpòtan epi yo ta dwe tradui l imedyatman. Si w bezwen tradui dokiman sa a, tanpri kontakte Direktè. Jistis Anviwònmantal MassDEP a nan nimewo telefòn ki endike anba a.

Việt Vietnamese

Tài liệu này và quan trọng và phải được dịch ngay. Nếu quý vị cần bản dịch của tài liệu này, vui lòng liên hệ với Giám Đốc Phòng Công Lý Môi Trường của MassDEP theo số điện thoại được liệt kê bên dưới.

ប្រទេសកម្ពុជា Khmer/Cambodian

ឯកសារនេះមានសារៈសំខាន់
ហើយគប្បីត្រូវត្រូវបានបកប្រែភ្លាមៗ។.
ប្រសិនបើអ្នកត្រូវការអោយឯកសារនេះបកប្រែ
សូមទាក់ទងនាយកផ្នែកយុត្តិធម៌បរិស្ថានរបស់
MassDEPតាមរយៈលេខទូរស័ព្ទដែលបានរាយដូចខាងក្រោម។

Kriolu Kabuverdianu Cape Verdean

Es dokumentu sta important i tenki ser tradusidu immediatamenti. Se nho ta presisa ke es dokumentu sta tradisidu, por favor kontata O Diretor di Justisia di Environman di DEP ku es numero di telifoni menxionadu di baixo.

Contact Deneen Simpson 857-406-0738
Massachusetts Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114
TTY# MassRelay Service 1-800-439-2370 • https://www.mass.gov/environmental-justice
(Version revised 8.2.2023) 310 CMR 1.03(5)(a)

Русский Russian

Это чрезвычайно важный документ, и он должен быть немедленно переведен. Если вам нужен перевод этого документа, обратитесь к директору Департамента экологического правосудия MassDEP (MassDEP's Director of Environmental Justice) по телефону, указанному ниже.

العربية Arabic

هذه الوثيقة مهمة وتجب ترجمتها على الفور.

إذا كنت بحاجة إلى ترجمة هذه الوثيقة، فيرجى الاتصال بمدير العدالة البيئية في MassDEP على رقم الهاتف المذكور أدناه.

한국어 Korean

이 문서는 중대하므로 즉시 번역되어야 합니다.
본 문서 번역이 필요하신 경우, 매사추세츠 환경보호부의 "환경정의" 담당자 분께 문의하십시오. 전화번호는 아래와 같습니다.

հայերեն Armenian

Այս փաստաթուղթը կարևոր է, և պետք է անհապաղ թարգմանել այն:
Եթե Ձեզ անհրաժեշտ է թարգմանել այս փաստաթուղթը, դիմեք Մասաչուսեթսի շրջակա միջավայրի պահպանության նախարարության (MassDEP) Բնապահպանական հարցերով արդարադատության ղեկավարին (Director of Environmental Justice)՝ ստորև նշված հեռախոսահամարով

فارسی Farsi Persian

این نوشتار بسیار مهمی است و باید فوراً ترجمه شود.
اگر نیاز به ترجمه این نوشتار دارید لطفاً با مدیر عدالت محیط زیستی MassDEP در شماره تلفن ذکر شده زیر تماس بگیرید.

Français French

Ce document est important et doit être traduit immédiatement. Si vous avez besoin d'une traduction de ce document, veuillez contacter le directeur de la justice environnementale du MassDEP au numéro de téléphone indiqué ci-dessous.

Deutsch German

Dieses Dokument ist wichtig und muss sofort übersetzt werden. Wenn Sie eine Übersetzung dieses Dokuments benötigen, wenden Sie sich bitte an MassDEP's Director of Environmental Justice *(Direktor für Umweltgerechtigkeit in Massachusetts)* unter der unten angegebenen Telefonnummer.

Ελληνική Greek

Το έγγραφο αυτό είναι πολύ σημαντικό και πρέπει να μεταφραστεί αμέσως. Αν χρειάζεστε μετάφραση του εγγράφου αυτού, παρακαλώ επικοινωνήστε με τον Διευθυντή του Τμήματος Περιβαλλοντικής Δικαιοσύνης της Μασαχουσέτης στον αριθμό τηλεφώνου που αναγράφεται παρακάτω

Italiano Italian

Questo documento è importante e deve essere tradotto immediatamente. Se hai bisogno di tradurre questo documento, contatta il Direttore della Giustizia Ambientale di MassDEP al numero di telefono sotto indicato.

Język Polski Polish

Ten dokument jest ważny i powinien zostać niezwłocznie przetłumaczony. Jeśli potrzebne jest tłumaczenie tego dokumentu, należy skontaktować się z dyrektorem ds. sprawiedliwości środowiskowej MassDEP pod numerem telefonu podanym poniżej.

हिन्दी Hindi

यह दस्तावेज महत्वपूर्ण है और इसका अनुवाद तुरंत किया जाना चाहिए। यदि आपको इस दस्तावेज का अनुवाद कराने की जरूरत है, तो कृपया नीचे दिए गए टेलीफोन नंबर पर MassDEP के पर्यावरणीय न्याय निदेशक से संपर्क करें।

Contact Deneen Simpson 857-406-0738
Massachusetts Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114
TTY# MassRelay Service 1-800-439-2370 • https://www.mass.gov/environmental-justice
(Version revised 8.2.2023) 310 CMR 1.03(5)(a)

DOCUMENT A00834

ARMY CORPS OF ENGINEERS

GENERAL PERMIT FOR THE COMMONWEALTH OF MASSACHUSETTS

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General Permit No.: NAE-2022-02649 Final Effective Date: June 2, 2023
Applicant: General Public, Commonwealth of Massachusetts Expiration Date: June 1, 2028

Department of the Army
General Permits for the Commonwealth of Massachusetts

The New England District of the U.S. Army Corps of Engineers (USACE) hereby issues twenty-five (25) regional general permits (GPs) for activities subject to USACE jurisdiction in waters of the U.S., including wetlands, navigable waters within the Commonwealth of Massachusetts and adjacent ocean waters to the seaward limit of the outer continental shelf. The Massachusetts GPs (hereafter referred to as the MA GP or GP) are issued in accordance with USACE regulations at 33 CFR 320 – 332 [see 33 CFR 325.5(c)(1)]. These GPs establish criteria and contain permit conditions to ensure that the authorized activities have no more than minimal individual and cumulative adverse impacts to the environment.

This document contains the following sections:		Pages
SECTION I	Statutory Authorities & Regulated Activities	2
SECTION II	Review Categories & Application Procedures	3-7
SECTION III	Massachusetts General Permits	8-34
SECTION IV	General Conditions	35-51
SECTION V	Mitigation Standards	52-54
SECTION VI	Federal & State Agency Contact Information & Websites	55-56
SECTION VII	Definitions & Acronyms	57-66
APPENDIX A	Guidance for Section 106 NHPA Compliance in Massachusetts	67-71
APPENDIX B	Pre-Construction Notification	72-77
APPENDIX C	Self-Verification Notification	78-81
APPENDIX D	Pre-Construction Notification Application Checklist	82-88

In issuing these GPs, the Federal Government does not assume any liability for the following: (a) damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes; (b) damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the U.S. in the public interest; (c) damages to persons, property or to other permitted or unpermitted activities or structures caused by the activity authorized by any of the GPs; (d) design or construction deficiencies associated with the permitted work; or (e) damage claims associated with any future modification, suspension or revocation of these permits.

Tammy R. Turley 02 June 2023

Tammy R. Turley Date
Chief, Regulatory Division

SECTION I. STATUTORY AUTHORITES & REGULATED ACTIVITIES

1. Work Requiring USACE Authorization

a. Section 10: Work and structures that are located in, over, under or that affect navigable waters of the United States (U.S.) (see 33 CFR 329). The USACE regulates these activities under section 10 of the Rivers and Harbors Act of 1899 (see 33 CFR 322).

b. Section 404: The discharge of dredged or fill material into waters of the U.S (see 33 CFR 328). The USACE regulates these activities under Section 404 of the Clean Water Act (CWA). The term "discharge of dredged or fill material" also includes certain discharges resulting from excavation. Applicants should contact USACE to determine if a particular excavation discharge occurring within waters of the U.S., is a regulated activity. See 33 CFR 323.4 of the CWA for exempted activities.

For additional information on the limits of USACE jurisdiction, please see: https://www.nae.usace.army.mil/Portals/74/docs/regulatory/JurisdictionalLimits/Jurisdictional_Limits_Brochure.pdf

2. Authority to Issue General Permits

a. In accordance with 33 CFR 322.2(f), 325.2(e)(2), and 325.5(c), USACE may issue regional general permits authorizing activities under Section 10 of the RHA.

b. In accordance with Section 404(e) of the CWA, 33 USC 1344(e), and 33 CFR 323.2(h), 325.2(e)(2), and 325.5(c), after notice and opportunity for public hearing, USACE may issue regional general permits for any category of activities involving discharges of dredged or fill material if the activities in such category are similar in nature, will cause only minimal adverse environmental effects when performed separately, and will only have minimal cumulative adverse effect on the environment.

3. Related Laws

33 CFR 320.3 includes a list of related laws including, but not limited to, Section 408 of the Rivers and Harbors Act of 1899, Section 401 of the Clean Water Act, Section 402 of the Clean Water Act, Section 307(c) of the Coastal Zone Management Act of 1972, Section 106 of the National Historic Preservation Act of 1966, Section 7 of the Endangered Species Act, the Fish and Wildlife Coordination Act of 1956, the Magnuson-Stevens Fishery Conservation and Management Act, the Fish and Wildlife Coordination Act, Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972, Section 7(a) of the Wild and Scenic Rivers Act, the Golden Eagle Protection Act, and the Migratory Bird Treaty Act.

SECTION II. REVIEW CATEGORIES & APPLICATION PROCEDURES

To qualify under these GPs, the design, construction, and maintenance associated with each proposed activity must meet the terms and eligibility criteria listed in Section III, all applicable general conditions (GCs) in Section IV, and any specific mitigation requirements in Section V. Applicants should first review the GPs to see if a project is eligible for authorization under one or more of the GPs within this document. Any activity not specifically listed may still be eligible for authorization under these GPs; applicants are advised to contact USACE for specific eligibility determination.

Please note that these GPs allow for Self-Verification (SV) contingent upon meeting all criteria and with full adherence to all GCs. Projects that do not qualify for SV, may meet criteria for Pre-Constriction Notification (PCN). Tables are provided under each activity, which outline criteria for SV and PCN. Activities that do not meet criteria for SV or PCN may require review as an Individual Permit (IP). Activities may require a PCN or IP as noted in Sections III and/or IV of this GP. Notwithstanding compliance with the terms of these GPs, USACE retains discretionary authority to require either PCN review or IP review on a case-by-case basis for any project based on concerns for the environment or for any of the other public interest factors found in 33 CFR 320.4(a). These GPs also do not replace or change those activities identified as exempt from USACE regulation (33 CFR 323.4).

1. Pre-Application Assistance

Prospective applicants may request a pre-application meeting to address any questions they may have. USACE may also request a pre-application meeting or additional information to facilitate review of the request. Pre-application meetings and/or site visits help streamline the authorization process by alerting the prospective applicant to potentially time-consuming factors that may arise during the evaluation of their project (e.g., avoidance, minimization and compensatory mitigation requirements, historic properties, endangered species, essential fish habitat, impacts to federal projects, and/or dredging of contaminated sediments).

To schedule a pre-application meeting, present questions, or if you need further assistance, please contact USACE at:

Email: cenae-r-ma@usace.army.mil (strongly preferred) Phone: (978) 318-8338

Mail: U.S. Army Corps of Engineers
New England District
Regulatory Division, Massachusetts Section
696 Virginia Road
Concord, MA 01742

2. Submitting a Request

Please follow the procedures outlined in Sections II.2-5 when requesting an SV or applying for PCN authorization for activities covered by these GPs. The GPs are provided in Section III below. For SV-eligible projects, the Self-Verification Notification (SVN) must be submitted within 30 days of commencing work. Otherwise, a Pre-Construction Notification (PCN) must be submitted for work that is not SV-eligible. Please include appropriate drawings and attachments and submit your request using the mailbox identified in Section II.4 or II.5 below. USACE will promptly confirm receipt of your request and notify you in the event additional information is required. Guidance on

how to submit electronic correspondence is located on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/Submitting-Electronic-Correspondence.

3. Local, State & Federal Approvals

Applicants are responsible for applying for and obtaining any required local, state, and federal permits or approvals. These must be obtained prior to the commencement of work in waters. Such authorizations may include a Water Quality Certification, a Coastal Zone Management Act consistency determination, and other approvals as noted below. Authorization under these GPs does not obviate the need for the permittee to obtain other Federal, State, or local permits, approvals, or authorizations required by law.

I. Water Quality Certification under Section 401 of the Federal Clean Water Act (33 USC 1341).
Applicants are responsible for determining the appropriate 401 Water quality Certification (WQC) requirements and submitting this information to the USACE at the time of their PCN application or when completing their SVN. Applicants that are unsure of whether their activity has been certified should contact MassDEP, or EPA Region 1 when the activity is located on tribal lands, for a determination. The 401 WQC requirement must be satisfied by acquiring one of the following WQCs from MassDEP (see GC 8):

General 401 WQC: The MassDEP issued a WQC on April 21, 2023 conditionally certifies all activities in GPs 1 – 24 eligible for SV and PCN so long as the activity is described in 314 CMR 9.03, and is not an activity described in 314 CMR 9.04, and so long as the activity meets all other requirements, terms and conditions of this WQC. The MassDEP WQC also conditionally certifies activities described in GP 25 so long as the activity meets all other conditions of the WQC. Emergency projects described in GP 25 must obtain an emergency certification or otherwise be authorized pursuant to 310 CMR 10.06, qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) issued by the MassDEP, or meet the requirements of 9.12(2) or (3) in order to be certified under the WQC

Applicants should refer to the following link to determine if their activity is eligible: *https://www.nae.usace.army.mil/Missions/Regulatory/ State-General-Permits/ Massachusetts-General-Permit/*. If eligible, you must comply with all applicable WQC conditions. Activities listed in 314 CMR 9.03 that are not exempt from the Wetland Protection Act must have a valid Final Order of Conditions (OOC) or Final Restoration Order of Conditions pursuant to 310 CMR 10.00 to be eligible under the General 401 WQC.

Individual 401 WQC: In the event the proposed activity is not covered by the general WQC, applicants shall contact MassDEP and apply for an individual 401 WQC if their activity does not qualify for a General 401 WQC as outlined above. MassDEP may issue, waive, or deny the individual 401 WQC on a case-by-case basis. All activities listed in 314 CMR 9.04 must obtain an individual 401 WQC from MassDEP to be eligible under these GPs. When an Individual 401 WQC is required for *PCN activities*, the applicant shall submit their Individual 401 WQC application concurrently to MassDEP and the USACE to comply with 40 CFR 121.

Activities Proposed on Tribal Lands: When an activity is proposed on Tribal lands, the applicant shall refer to the general 401 WQCs granted by the Environmental Protection Agency (EPA), Region 1 on May 15, 2023. These 401 WQCs are located on the USACE Regulatory website: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

II. Coastal Zone Management Act Federal Consistency Concurrence pursuant to Section 307 of the CZMA of 1972, as amended. Federal consistency concurrence is required for all activities located within the coastal zone, unless determined otherwise by the Massachusetts Office of Coastal Zone Management (MA CZM) (see GC 9). As applicable, this requirement must be satisfied by acquiring one of the following from the MA CZM:

General CZM Federal Consistency Concurrence (General Concurrence): MA CZM has granted General Concurrence for all SV and PCN activities for GPs 1-25 and this can be found at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. The applicant must obtain all applicable permits and approvals prior to the commencement of work in USACE jurisdiction (i.e., construction begins on site). For SVs, General Concurrence is automatically granted and no further action is required from the applicant. For PCNs, the USACE will coordinate with MA CZM to acquire General Concurrence as part of the PCN application review. During review of the PCN application, USACE may request additional information from the applicant to support CZM's evaluation of the activity.

Individual CZM Federal Consistency Concurrence (Individual Concurrence): In certain cases, MA CZM may elevate any GP activity 1-25 to require Individual Concurrence. The applicant must contact MA CZM and follow the procedures to obtain Individual Concurrence as determined appropriate by MA CZM.

The MA CZM program includes five regional offices that serve 78 coastal municipalities. The following map provides more information about these offices: https://www.mass.gov/service-details/czm-regions-coastal-communities-and-coastal-zone-boundary

III. Other Approvals: Approvals typically required in Massachusetts include, but are not limited to, a Chapter 91 Permit/License, Massachusetts Environmental Protection Act (MEPA) review, Wetlands Protection Act Order of Conditions, and/or Aquaculture Certification. *Applicants should also be aware that USACE may not be able to render a permit decision in the event the proposed activity is denied by another local, state and/or federal agency.*

4. Procedures for Self-Verification (SV) Eligible Projects

If the activity is eligible for an SV, the Self-Verification Notification (SVN) must be completed prior to the start of project construction and submitted to USACE within 30 days of commencing work. The purpose of the SVN is to provide applicants with a tool to assist them when determining if the activity as proposed is SV-eligible. The following GPs do not require submission of the SVN: GP 1 (SV #1), GP 3 (SV #2-3), GP 4 (SV #2), GP 11, GP 12 (note #2), GP 14 (see note), GP 15 (see note), and GP 24 (SV #3). **For the activities not listed above, the SVN must be completed prior to the start of work and be kept on site at all times during project construction.** The applicant shall not begin work for SV-eligible activities until they have completely verified the bulleted items below.

Digital submittals by email are **strongly encouraged** to facilitate the most efficient processing of the SVN submittal. Please communicate with USACE staff if you are unable to provide a digital copy. Addresses are cenae-r-ma-sv@usace.army.mil (email) or Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751 (mail).

Eligible SV Activities:

- Are subject to USACE jurisdiction (see GC 2); and
- Qualify for one or more of the GPs within this document (Section III); and
- Meet the GCs within this document (Section IV); and

- When required, are supported by a complete SVN (Appendix C); and
- Receive all other required local, State, and/or Federal approvals.

5. Procedures for Pre-Construction Notification (PCN) Eligible Projects

For activities that require a PCN, an application to and written authorization from USACE is required. *No work requiring a PCN may proceed until the applicant receives written authorization from USACE verifying that the activity is authorized.* The verification letter may include special conditions that the applicant must comply with. When possible, it is *highly* recommended that PCN application materials are submitted at least 90 days before the target start date to allow for USACE evaluation and any necessary agency consultations. PCN applications shall demonstrate in writing how the proposed activity complies with all GCs, as applicable to their activity.

Digital submittals by email are **strongly encouraged** to facilitate the most efficient processing of the PCN application. Please communicate with USACE staff if you are unable to provide a digital copy. Addresses are cenae-r-ma@usace.army.mil or Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751 (mail).

Eligible PCN Activities:

- Are subject to USACE jurisdiction (see GC 2); and
- Qualify for one or more of the GPs within this document (Section III); and
- Meet the GCs within this document (Section IV); and
- Comply with the Mitigation Standards within this document (Section V); and
- Are supported by a complete PCN document (Appendix B); and
- When required, are supported by the submittal of project information to the appropriate parties identified in Appendix A; and
- Receive all other required local, State, and/or Federal approvals.

6. Interagency Review Procedures

The USACE reserves the opportunity to coordinate PCN activities with Federal and State agencies to ensure that the proposed activity results in no more than a minimal impact to the aquatic environment. In some cases, USACE may require project modifications involving avoidance, minimization, and/or compensatory mitigation for unavoidable impacts to ensure the net effects of a project are minimal. The USACE determines, after review and coordination with the agencies and/or the applicant, if PCN applications:

a. Meet the terms and conditions of the GP as proposed;
b. Require additional information;
c. Require avoidance, minimization, compensatory mitigation, construction sequencing, project modification, or other special conditions to avoid or minimize adverse impacts to the aquatic environment;
d. Require individual permit review regardless of whether the terms and GCs of these GPs are met, based on concerns for the aquatic environment or any other factor of the public interest (see Section 9 below).

For activities requiring a PCN, the applicant must wait for written authorization from USACE before commencing activities in waters of the U.S. Beginning work for PCN required activities without a USACE written authorization is a violation of these GPs, and the terms and conditions of this document. The applicant may be subjected to an enforcement action by USACE and/or the Environmental Protection Agency (EPA).

7. Construction of Solid Fill Structures and Fills Along the Coastline or Baseline from Which the Territorial Sea is Measured.

Projects involving the construction of solid fill structures or discharge of fill that may extend beyond the coastline or the baseline from which the territorial sea is measured (i.e., mean low water) will require a PCN. The USACE will submit a description of the proposed work and a copy of the plans to the Solicitor, Department of the Interior, Washington, DC 20240, and request comments concerning the effects of the proposed work on the outer continental rights of the United States. These comments will be included in the administrative record of the application. After completion of permit review, the record will be forwarded to the Chief of Engineers. The decision on the application will be made by the Secretary of the Army after coordination with the Attorney General.

8. Emergency Activities

Per 33 CFR 325.2(e)(4), an emergency is limited to a situation that would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a permit is not undertaken within a time period less than the normal time needed to process an application under standard procedures. Emergency work shall be limited to that which is necessary to stabilize and secure the situation. Additional work needed for final repairs shall not be completed until approval is obtained through the appropriate, non-emergency process. Emergency work is subject to the same terms and conditions of these GPs as non-emergency work, and similarly, must qualify for authorization under these GPs; otherwise, an IP is required. *See GP 25 Emergency Situations for additional information.*

9. Individual Permit

Projects that do not meet the terms and conditions of this GP may require review as an IP (33 CFR 325.5 (b)). Proposed work in this category will require a separate Federal application for an individual permit from USACE (33 CFR 325.1). In addition, USACE retains discretionary authority on a case-by-case basis to elevate GP-eligible activities to an IP based on concerns for the environment or any other factor of the public interest (33 CFR 320.4 (a)). Applicants are required to submit the appropriate application materials directly to USACE as early as possible to expedite the permit review process. General information and application forms can be obtained at our website or by contacting our office at cenae-r-ma@usace.army.mil or (978) 318-8338. Individual 401 WQC and/or CZMA Federal consistency concurrence from the appropriate MA agencies are required before USACE can issue an individual permit. Applying for an IP does not relieve the applicant from their obligation to obtain all required Federal, State and/or local approvals.

10. Compliance

Applicants shall ensure compliance with all applicable GPs in Section III, GCs in Section IV, and any special conditions included in USACE verification letters. Noncompliance with these GPs, GCs, and special conditions may subject the applicant to criminal, civil, or administrative penalties, and/or an ordered restoration, and/or the permit may be modified, suspended or revoked by USACE. The USACE will consider any activity requiring USACE authorization to be noncompliant if that activity does not comply with all GP terms and conditions at all times, including while the project is under construction and when work is completed.

SECTION III. MASSACHUSETTS GENERAL PERMITS

Applicants are encouraged to review Sections I & II prior to submitting an application to confirm that the activity as proposed complies with all terms and conditions of the 2023 MA GPs. Applicants are also encouraged to review the definitions in Section VII, Definitions & Acronyms, of this document. Several terms are frequently used throughout the GPs, and it is important for the reader to understand these terms. If seeking verification for an activity previously verified under the 2018 MA GPs, please contact the USACE to discuss permitting needs in advance of submitting an application.

General Permits

1. Aids to Navigation and Temporary Recreational Structures
2. Maintenance
3. Moorings
4. Structures in Navigable Waters of the U.S.
5. Boat Ramps and Marine Railways
6. Utility Lines, Oil or Natural Gas Pipelines, Outfall Or Intake Structures, and Appurtenant Features
7. Dredging, Disposal of Dredged Material, Beach Nourishment, Rock Removal and Rock Relocation
8. U.S. Coast Guard Approved Bridges
9. Bank and Shoreline Stabilization
10. Aquatic Habitat Restoration, Enhancement, and Establishment Activities
11. Fish and Wildlife Harvesting and Attraction Devices and Activities
12. Response Operations, Oil and Hazardous Substances
13. Cleanup of Hazardous and Toxic Waste
14. Scientific Measurement Devices
15. Survey Activities
16. Land and Water-Based Renewable Energy Generation Facilities and Hydropower Projects
17. Residential, Commercial and Institutional Developments, and Recreational Facilities
18. Aquaculture
19. Mining Activities
20. Living Shorelines
21. Agricultural Activities
22. Reshaping Existing Drainage Ditches, Construction of New Ditches, and Mosquito Management
23. Linear Transportation Projects and Wetland/Stream Crossings
24. Temporary Construction, Access, and Dewatering
25. Emergency Situations

GP 1. AIDS TO NAVIGATION AND TEMPORARY RECREATIONAL STRUCTURES (Authority: §10)	
(a) The placement of aids to navigation and regulatory markers that are approved by and installed in accordance with the requirements of the U.S. Coast Guard (USCG). See 33 CFR, Part 66; and (b) Temporary buoys, markers, and similar structures placed for recreational use during specific events such as water skiing competitions and boat races or seasonal use. See GC 16.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. Aids to navigation and regulatory markers approved by and installed in accordance with the requirements of the USCG. 2. Temporary buoys, markers and similar structures that are: (a) placed for recreational use during specific events and removed within 30 days after event; or (b) placed during winter events on ice and removed before spring thaw. These structures must be authorized by the local harbormaster, not located within an FNP or its buffer zone, and not located in saltmarsh or tidal vegetated shallows.	1. Impacts in saltmarsh or tidal vegetated shallows. 2. Activities that are not SV eligible.
Note: An SVN submittal to USACE is not required for work authorized under SV #1 above.	

GP 2. MAINTENANCE (Authorities: §10 and §404)

Repair, rehabilitation, or replacement of any previously authorized[1], currently serviceable structure, or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 (activities occurring before certain dates), provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction technique requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above. Maintenance dredging and beach nourishment are not eligible under GP 2 (see GP 7). Stream crossing modifications (including sliplining), replacements or extensions are not eligible under GP 2 (see GPs 6, 17, 23). *See GP 25 Emergency Situations for expedited review of emergency activities.*

Not authorized under GP 2 (IP required): (a) Permanent impacts in >1 acre in non-tidal waters and/or wetlands; or (b) Permanent impacts >1/2 acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; or (c) Temporary impacts >1 acre in tidal waters; >5000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >1000 SF in vegetated shallows; (d) New stream channelization or stream relocation projects (e.g., those in response to storm or flood events).

Self-Verification Eligible

Maintenance activities that meet all of the following terms:

1. In non-tidal waters, the combined permanent and temporary impacts extending beyond the original footprint are ≤5,000 SF[2] and not located in vegetated shallows or riffle and pool complexes.

2. In tidal waters, the combined permanent and temporary impacts extending beyond the original footprint are ≤5,000 SF, ≤1,000 SF in mudflats and/or natural rocky habitat, and not located in saltmarsh and tidal vegetated shallows.

3. Minor deviations in the repair, rehabilitation, or replacement of previously authorized, currently serviceable structures or fills.

4. Bulkhead replacement in tidal and non-tidal waters via installation of new bulkhead within 18 inches of the existing bulkhead and associated backfill.

5. Drawdown of an impoundment for dam/levee repair provided it does not exceed 18 months and one growing season (April through September).

Pre-Construction Notification Required

1. Discharges associated with removal of accumulated sediments and debris in the vicinity of existing structures, including intake and outfall structures and associated canals.

2. The removal of sediment outside the immediate vicinity of existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.) that is ≥200 linear feet. This activity is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions existing when the structure was built.

3. Dam and flood control or levee repair, rehabilitation, or replacement involves:
   a. A change in the flood elevation or permanent water surface elevation of the impoundment; or
   b. Drawdown of impoundment for construction exceeding one growing season (see SV eligible #5);
   c. Any modification that changes the character, scope, or size of the original fill design; or
   d. Does not meet SV eligible 1-7.

4. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present.

[1] Some maintenance activities may not be subject to regulation under Section 404 of the CWA in accordance with 33 CFR 323.4(a)(2). Per 33 CFR 330.3, Vested dates are: a) Work performed and structures installed before December 18, 1968 (Section 10); and b) Fill placed before July 25, 1975 (Section 404).
[2] This excludes dam projects that may require a temporary drawdown with impacts >5,000 SF in non-tidal waters. Instead, the drawdown shall comply with SV #5 to be eligible under Self-Verification.

6. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project or within the boundaries of the structure or fill. 7. Work to previously approved tide gates not affecting upstream tidal resource areas.	5. Activities located in the Connecticut River or Merrimack River, unless they are completed in the dry or when the tide is waterward of the work area. 6. Activities on USACE properties & USACE-controlled easements. 7. Activities that do not require an IP. Activities that do not require a PCN or an IP may be SV eligible.
Notes: 1. This authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the CWA §404(f) exemption for maintenance. See 33 CFR 323.4(a)(2). Prior USACE permits may have included authorization to maintain the activity, in which case authorization under this GP is not necessary. 2. See GC 22 for information on temporary construction mats.	

GP 3. MOORINGS (Authority: §10)

New moorings and mooring fields; the relocation of previously authorized moorings; expansions, boundary reconfigurations or modifications of previously authorized mooring fields; and maintenance and replacement of moorings.

Not authorized under GP 3 (IP required): (a) Moorings or mooring fields converted to or associated with a new boating facility[1]; or (b) Moorings in a USACE Federal Navigation Anchorage or USACE Federal Navigation Channel, except municipal-operated mooring fields.

Self-Verification Eligible	Pre-Construction Notification Required
1. New or relocated moorings that meet all the following terms: a. Authorized by a local harbormaster/ municipality under MGL Chapter 91 §10A; and b. No interference with navigation; and c. Single boat, single-point and non-commercial; and d. Not associated with a boating facility, and e. Neither placed within nor impact tidal vegetated shallows (e.g., eelgrass); and f. Not located within a USACE Federal navigation project (FNP) or the FNP buffer zone. 2. Existing, authorized moorings are converted from traditional moorings to low impact mooring technology (see note below) and/or helical anchors. 3. Maintenance and replacement of moorings authorized by the USACE.	1. New mooring fields; or expansions, boundary reconfigurations or modifications of existing, authorized mooring fields. 2. Moorings located such that they, and/or vessels docked or moored at them, are within the buffer zone of the horizontal limits of a Federal Anchorage. The buffer zone is equal to 3 times the authorized depth of that channel (see GC 15). 3. New individual moorings located in saltmarsh, mudflats, natural rocky habitat, and tidal vegetated shallows. Locating moorings these areas should be avoided to the maximum extent practicable. If these areas cannot be avoided, plans should show conservation mooring or low-impact mooring systems that prevent mooring chains from resting or dragging on the bottom substrate at all tides, where practicable. USACE may require a survey in areas previously mapped as containing eelgrass or within 100 ft. of existing eelgrass beds to document presence or absence of eelgrass and to determine the appropriate type and amount of compensatory mitigation for impacts to eelgrass. 4. Replacement moorings located in tidal vegetated shallows. 5. Moorings that are not SV eligible and do not require an IP.

Notes:

1. Low impact mooring systems, including conservation moorings, are encouraged to minimize impacts of chain scouring from conventional moorings during the tidal cycle.
2. An SVN submittal to USACE is not required for work authorized under SV #2-3 above.

[1] Boating facilities are marinas, yacht clubs, boat clubs, boat yards, dockominiums, town facilities, land/homeowner's associations, etc. that provide for a fee, rent or sell mooring or docking space. Not classified as boating facilities are municipal moorings or municipal mooring fields that charge an equitable user fee based only on the actual costs incurred.

GP 4. STRUCTURES IN NAVIGABLE WATERS OF THE U.S. (Authority: §10 & §404)

New, expansions, reconfigurations or modifications of structures for navigational access in waters of the U.S. including but not limited to temporary/seasonal or permanent pile and pole-supported piers, floats, stairs, shore outhauls, and boat and float lifts.

Not authorized under GP 4 (IP required): (a) Structures associated with a new boating facility; (b) Structures in a USACE Federal anchorage or channel; or (c) Artificial reefs.

Self-Verification Eligible

1. Private, non-commercial piers, floats and lifts that meet all the following terms:

a. Piers and floats in: (i) Tidal waters total ≤600 SF combined; and (ii) Non-tidal navigable waters of the U.S. total ≤600 SF combined; and

b. Piers are ≤4 feet wide and ≥6 feet above the marsh substrate (the height is measured from the marsh substrate to the bottom of the lowest longitudinal support); and

c. Floats and lifts in tidal waters and non-tidal navigable waters of the U.S. are ≥24 inches above the substrate during all tidal cycles. Float stops are preferred when site conditions warrant them (i.e., low tide exposes substrate), and skids can only be used in areas where piles are not feasible and on sandy or hard bottom substrates; and

d. Piers, floats and lifts: (i) Are ≥25 feet from previously mapped or existing vegetated shallows, or riparian property line extensions; (ii) Extend ≤25% of the waterway width in non-tidal navigable waters of the U.S. or MHW in tidal navigable waters of the U.S.

e. Installation of ≤12-inch diameter timber piles. Installation of ≥12-inch diameter piles of any material type when installed in the dry.

2. Fenders and similar structures.

Pre-Construction Notification Required

1. Shore outhauls.
2. Expansions, modifications, or new reconfiguration zones at any authorized boating facility.
3. New, expansions, reconfigurations, reconfiguration zones, or modifications of structures that provide public, community or government recreational uses such as boating, fishing, swimming, access, etc.
4. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present.
5. Located within the buffer zone of the horizontal limits of an FNP (GC 15).
6. Miscellaneous structures.
7. Impacts in tidal vegetated shallows.
8. Structures that are not SV eligible and do not require an IP.

Notes:

1. See GC 19 regarding pile driving and pile removal in navigable waters and
2. See GC 20 regarding time of year restrictions in tidal waters.
3. Boating facilities are facilities that provide for a fee, rent, or sell mooring space, such as marinas, yacht clubs, boat clubs, boat yards, town facilities, dockominiums, etc. Pile supported structures with no discharges of dredged or fill material are not regulated by USACE in non-navigable waters.
4. A SVN submittal to USACE is not required for SV #2 above.

GP 5. BOAT RAMPS AND MARINE RAILWAYS (Authorities: §10 and §404)

Activities required for the construction of boat ramps and marine railways, including excavation and fill.

Not authorized under GP 5 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters of the U.S., >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows[1]; or (c) dredging in navigable waters of the U.S. (see GP 7).

Self-Verification Eligible	Pre-Construction Notification Required
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. Boat ramps are located within 25 feet of property line extensions unless the properties are owned by the same owner. The USACE may require a letter of no objection from the abutter(s).
2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, and (c), not located in saltmarsh and tidal vegetated shallows.	2. Activities that are not eligible for SV and do not require an IP.

GP 6. UTILITY LINES, OIL OR NATURAL GAS PIPELINES, OUTFALL OR INTAKE STRUCTURES, AND APPURTENANT FEATURES (Authorities: §10 & §404)

Activities required for: (a) The construction, maintenance, repair or removal of utility lines, oil or natural gas pipelines[1], outfall or intake structures[2], and appurtenant features including the associated excavation, backfill, or bedding for these structures. (b) The construction, maintenance, or expansion of substations and other appurtenant facilities associated with a utility line, oil or natural gas pipeline, and outfall or intake structure in non-tidal waters of the U.S.; and (c) The construction and maintenance of foundations for overhead utility line towers, poles, and anchors in tidal and non-tidal waters of the U.S., provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible. This GP authorizes the construction of access roads to facilitate construction of the above activities provided the activity, in combination with all other activities included in one single and complete project, does not exceed the thresholds identified below (IP required). Access roads used solely for construction of the utility line must be removed upon completion of the work. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above.[3]

Not authorized under GP 6 (IP required): (a) Permanent impacts for any single and complete project that are >1 acre in non-tidal waters of the U.S.; >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Stormwater treatment or detention systems, or subsurface sewage disposal systems in waters of the U.S.; or (d) New tide gates that do not meet SV criteria below.

Self-Verification Eligible	Pre-Construction Notification Required
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. New outfall and/or intake structures.
2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, and (c), not located in saltmarsh and tidal vegetated shallows.	2. Unconfined work or silt producing activities in streams with diadromous fish.
3. Intake structures that are dry hydrants used exclusively for firefighting activities with no stream impoundments.	3. Submarine cables, conduits, or pipelines that occur in, over or under navigable waters of the U.S.
4. New tide gates on outfall structures for pipes conveying stormwater and/or industrial NPDES-permitted discharges from waters that are not waters of the U.S.	4. Stream channelization, relocation, impoundment, or loss of streambed occurs.
	5. The activity is placed within and runs parallel to or along a streambed within waters of the U.S.
	6. There is a permanent change in preconstruction contours in waters of the U.S.
	7. Installation of utility lines or gas/oil pipelines using trench excavation where material is temporarily sidecast into waters of the U.S. for >3 months. Applicants must demonstrate how the material would not be dispersed by currents or other forces.
	8. Activities that are not SV eligible and do not require an IP.

[1] See the definitions of a “utility line” and “oil or natural gas pipeline” in Section VII.

[2] Outfall structures must be in compliance with regulations issued under the National Pollutant Discharge Elimination System Program (Section 402 of the Clean Water Act).

[3] Temporary impacts shall comply with all GCs, including GC 32 Utility Line Installation and Removal.

GP 7. DREDGING (Authority: §10), DISPOSAL OF DREDGED MATERIAL (Authorities: §10, §404), BEACH NOURISHMENT (Authorities: §10 & §404), ROCK REMOVAL (Authority: §10) AND ROCK RELOCATION (Authorities: §10 & §404)

New, improvement and maintenance dredging (see notes below) including: (a) Disposal of dredged material at a confined aquatic disposal cell, beach nourishment location, near shore site, or ocean disposal site selected under Section 404 of the Clean Water Act pursuant to the 404(b)(1) Guidelines, provided the dredged material meets the requirements for such disposal; (b) Beach nourishment not associated with dredging; and (c) Rock removal and relocation for navigation.

Not authorized under GP 7 (IP required): (a) Dredging where ocean disposal is required for the disposal of dredged material (Section 103); New dredging >½ acre; ≥10,000 CY; >1000 SF permanent impacts to intertidal areas, saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF permanent impacts to tidal vegetated shallows; (b) Maintenance or improvement dredging and/or disposal with >1 acre of impacts to intertidal areas, saltmarsh, mudflats, riffle and pool complexes, or non-tidal vegetated shallows; (c) New dredging where the primary purpose is sand mining for beach nourishment; (d) Beach scraping; (e) Boulder removal and relocation for navigation >½ acre; or (f) Blasting.

Self-Verification Eligible

1. Maintenance dredging of previously dredged areas, with upland disposal, that meet all of the following terms:
   a. Dredged area ≤1/2 acre; and
   b. Activities comply with GC 20, TOY Restrictions. The time-of-year restriction(s) stated in Appendix B of the MA Division of Marine Fisheries (DMF) Technical Report TR-47[1] can apply instead if the general TOY restriction if a TOY is provided for a specific waterbody and is less restrictive. This is to protect endangered species, EFH, and other species; and
   c. The dredge footprint is located >25' from salt marsh or >100' from vegetated shallows; and
   d. Combined permanent and temporary impacts that are (i) ≤1,000 SF in mudflats or natural rocky habitat, or (ii) ≤5,000 SF within intertidal habitat and areas containing shellfish (an area contains shellfish unless: it is verified that minimal shellfish are present per the local shellfish constable or a shellfish survey; or it is not mapped as a MassGIS shellfish suitability area).
   e. No return water from upland disposal areas.

2. Boulder relocation with ≤1,000 SF of impacts, relocated to a similar depth and substrate.

Pre-Construction Notification Required

1. Maintenance dredging where the primary purpose is sand mining for beach nourishment.

2. New dredging and associated disposal ≤1/2 acre or <10,000 cubic yards.

3. Improvement dredging.

4. Beach nourishment in waters of the U.S. not associated with dredging.

5. Activities that are located in saltmarsh and tidal vegetated shallows.

6. Dredging in a Federal Navigation Project or within the buffer zone (see GC 15).

7. Activities that are not eligible for SV and do not require an IP.

Notes:

1. See Section VII for definitions of improvement and maintenance dredging.
2. For PCN activities, the USACE may waive or adjust the time of year requirement on a case-by-case basis after consultation with resource agencies.
3. Disposal site of any dredged material must be identified prior to obtaining USACE authorization.
4. Contact the USACE if a ten-year authorization to maintain an area is desired.

[1] The MA DMF Technical Report TR-47: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/

GP 8. U.S. COAST GUARD APPROVED BRIDGES (Authorities: §404)

Discharges of dredged or fill material incidental to the construction and modification of bridges across navigable waters of the U.S., including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills provided that the USCG authorizes the construction of the bridge structure under Section 9 of the Rivers and Harbors Act of 1899 or other applicable laws. A USCG Authorization Act Exemption or a Surface Transportation and Uniform Relocation Assistance Act (STURRA) (144h) exemption do not constitute USCG authorization.

Not authorized under GP 8 (IP Required): Causeways and approach fills (see GP 23).

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Discharges of dredged or fill material that are incidental to the construction of bridges across navigable waters and meet all of the following: a. Combined permanent and temporary impacts that are ≤5,000 SF. b. Combined permanent and temporary impacts that are ≤1,000 SF in mudflats and natural rocky habitat. c. Not located in saltmarsh and tidal vegetated shallows.	1. Activities on USACE properties & USACE controlled easements.2. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present. 3. Activities that are not eligible for SV and do not require an IP.

Notes:

1. GP 8 is not applicable to bridges over inland waters or wetlands that are not tidally influenced or regulated as navigable under Section 10.
2. See eligibility criteria for GPs 2 & 23 for projects that are not subject to USCG regulations.

GP 9. BANK AND SHORELINE STABILIZATION (Authorities: §10 & §404)

Bank stabilization activities necessary for erosion protection along the banks of lakes, ponds, streams, estuarine and ocean waters, and any other open waters. Includes bulkheads, seawalls, riprap, revetments, living seawalls, or slope protection & similar structures, specifically for the purpose of shoreline protection. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above.

Activities must meet the following criteria: (a) No material is placed in excess of the minimum needed for erosion protection; (b) No material is of a type, or is placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the U.S.; (c) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas); (d) Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization; (e) The activity is not a stream channelization activity; and (f) The activity must be properly maintained, which may require repairing it after severe storms or erosion events. This GP authorizes those maintenance and repair activities if they require authorization. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the bank stabilization activity. See GP 20 for living shoreline stabilization structures or fills.

Not authorized under GP 9 (IP required): (a) New bank stabilization >500 feet in total length (>1,000 linear feet in total length when necessary to protect transportation infrastructure) or permanent loss of saltmarsh >1,000 SF, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects (an exception is for bulkheads – the district engineer cannot issue a waiver for a new bulkhead that is >1,000 feet in length along the bank); (b) Stream channelization or relocation activities; or (c) Breakwaters, groins or jetties.

Self-Verification Eligible

1. Activities in tidal and non-tidal waters that are:
   a. <200 feet in length.
   b. <400 feet in length when necessary to protect transportation infrastructure.
   c. ≤1 cubic yard of fill per linear foot average along the bank waterward of the plane of OHW or HTL.
   d. Not located in non-tidal wetlands, saltmarsh, vegetated shallows.

Pre-Construction Notification Required

1. Activities in tidal and non-tidal waters that are:
   a. ≥200 feet to ≤500 feet in total length. Activities >500 feet in total length must have a written waiver from USACE.
   b. ≥400 feet to ≤1,000 feet in total length when necessary to protect transportation infrastructure. Activities >1,000 feet in total length must have a written waiver from USACE.
   c. >1 cubic yard of fill per linear foot average along the bank waterward of the plane of OHW or HTL.
   d. Located in non-tidal wetlands, saltmarsh, vegetated shallows.
2. Activities with permanent loss of tidal or non-tidal waters that is (a) ≥5,000 SF or (b) ≥1,000 SF in mudflats and natural rocky habitat.
3. Activities that are (a) located in the Connecticut River or Merrimack River and/or (b) require installation of steel piles/steel sheet piles that cannot be done in the dry where NOAA ESA-listed species are mapped as present.
4. Activities on USACE properties & USACE-controlled easements.
5. Activities that require grouted riprap and/or poured/unformed concrete.
6. Activities that are not eligible for SV and do not require an IP.

Note: The applicant shall comply with GC 24. This includes utilization of bioengineering techniques in lieu of hard armoring to the maximum extent practicable as site conditions allow.

GP 10. AQUATIC HABITAT RESTORATION, ENHANCEMENT, AND ESTABLISHMENT ACTIVITIES (Authorities: §10 and §404)

Activities for the restoration, enhancement and establishment of non-tidal and tidal wetlands and riparian areas, including invasive, non-native or nuisance species control; the restoration and enhancement of non-tidal streams and other non-tidal open waters; the relocation of non-tidal waters, including non-tidal streams & associated wetlands for reestablishment of a natural stream morphology and reconnection of the floodplain; the restoration and enhancement of shellfish, finfish and wildlife; and the rehabilitation or enhancement of tidal streams, tidal wetlands and tidal open waters; provided those activities result in net increases in aquatic resource functions and services. See GP 9 for bank and shoreline stabilization. See GP 20 for living shorelines.

Not authorized under GP 10 (IP required): Stream channelization activities and artificial reefs.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In tidal and non-tidal waters excluding tidal vegetated shallows, the combined permanent and temporary impacts are ≤5,000 SF. 2. Eelgrass (vegetated shallows) planting and transplanting ≤100 SF in tidal waters.	1. In tidal and non-tidal waters excluding tidal vegetated shallows, the combined permanent and temporary impacts are >5,000 SF. 2. Eelgrass (vegetated shallows) planting and transplanting >100 SF in tidal waters. 3. Permanent water impoundments, dam removal, fish ladders, or tide gates. 4. Stream relocation, impoundment, or loss of streambed occurs. 5. Runneling projects with the purpose of restoring saltmarsh by removing excess water that ponds on the saltmarsh surface. 6. The conversion of: (a) a stream or natural wetlands to another aquatic habitat type (e.g., stream to wetland or vice versa, wetland to pond, etc.) or uplands, (b) one wetland type to another (e.g., forested wetland to an emergent wetland). 7. Activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, or Merrimack River from the Essex Dam to the mouth, involving permanent or temporary impacts unless they are performed <5 feet waterward from OHW or HTL and in the dry. This is to protect endangered species. 8. Activities on USACE properties & USACE-controlled easements. 9. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Changes in wetland plant communities that occur when wetland hydrology is more fully restored during wetland rehabilitation activities are not considered a conversion to another aquatic habitat type.
2. See RGL 18-01 for guidance on removal of obsolete dams and other structures from rivers and streams. https://www.usace.army.mil/missions/civil-works/regulatory-program-and-permits/guidance-letters/
3. An ecological reference site may be used for a design basis of the restoration activity. The reference site should possess characteristics of an intact aquatic habitat or riparian area that exists in the region. The reference site shall represent the target habitat type of the proposed activity. A reference site may be required at the discretion of USACE.

GP 11. FISH AND WILDLIFE HARVESTING AND ATTRACTION DEVICES AND ACTIVITIES (Authorities: §10 and §404)

Fish and wildlife harvesting and attraction devices and activities in waters of the U.S. such as pound nets, crab traps, crab and shellfish dredging, eel pots, lobster traps, duck blinds, clam and oyster digging, fish aggregating devices, and small fish attraction devices such as open-water fish concentrators (sea kites, etc.).

Not authorized under GP 11 (IP required): Artificial reefs; or new, or expansions of, impoundments and semi-impoundments of waters of the U.S. for the culture or holding of motile species such as lobster with an impounded area >½ acre.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤1/2 acre, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. Fish and wildlife harvesting and attraction devices and activities that do not require a PCN or IP.	1. Pound nets, impoundments or semi-impoundments of waters of the U.S. for the culture or holding of motile species such as lobster with an impounded area ≤½ acre, fish aggregating devices, or small fish attraction devices. 2. Devices and activities that are located in tidal vegetated shallows, mud flats, or saltmarsh. 3. Devices and activities that do not require an IP.

Note: An SVN submittal to USACE is not required for work authorized under GP 11.

GP 12. RESPONSE OPERATIONS, OIL AND HAZARDOUS SUBSTANCES (Authorities: §10 & §404)

(a) Activities conducted in response to a discharge or release of oil and hazardous substances that are subject to the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) including containment, cleanup, and mitigation efforts, provided that the activities are done under either: (i) The Spill Prevention, Control and Countermeasure Plan required by 40 CFR 112.3; (ii) The direction or oversight of the Federal on-scene coordinator designated by 40 CFR 300; or (iii) Any approved existing State, regional or local contingency plan provided that the Regional Response Team concurs with the proposed response efforts or does not object to the response effort; (b) Activities required for the cleanup of oil releases in waters of the U.S. from electrical equipment that are governed by EPA's polychlorinated biphenyl (PCB) spill response regulations at 40 CFR 761; (c) Booms placed in navigable waters of the U.S. for oil and hazardous substance containment, absorption and prevention; and (d) The use of structures and fills for spill response training exercises. Wetlands, vegetated shallows, mudflats, and riffle and pool complexes should be restored in place at the same elevation.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities are conducted in accordance with (a) or (b) above that are not planned or scheduled, but an emergency response (see Note 1). 2. Booms placed in navigable waters of the U.S. for oil and hazardous substance containment, absorption and prevention. 3. Temporary impacts for spill response training exercises ≤5000 SF in non-tidal waters and ≤1000 SF in tidal waters with no impacts to wetlands, saltmarsh, mudflats, or vegetated shallows. 4. Temporary structures in tidal waters with no impacts to wetlands, saltmarsh, mudflats, vegetated shallows, or riffle and pool complexes and in place ≤30 days.	1. Activities (a) or (b) above are planned or scheduled, not an emergency response; or 2. Activities that are not eligible for SV and do not require an IP.

Notes:

1. For emergency response activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, Merrimack River from the Essex Dam to the mouth, and remaining tidal waters that are not rivers, the permittee must contact the USACE at (978) 318-8338 before or as soon as possible after the work authorized under GP 12(a) - (c) commences for the USACE to address effects under the Endangered Species Act.
2. An SVN submittal to USACE is not required for booms used for spill prevention, or properly contained and cleaned de minimus oil or hazardous substance discharges into navigable waters of the U.S.

GP 13. CLEANUP OF HAZARDOUS AND TOXIC WASTE (Authorities: §10 and §404)

Specific activities required to affect the containment, stabilization, or removal of hazardous or toxic waste materials, including court ordered remedial action plans or related settlements, which are performed, ordered or sponsored by a government agency with established legal or regulatory authority.

Not authorized under GP 13: (a) Establishment of new disposal sites; or (b) Expansion of existing sites used for the disposal of hazardous or toxic waste.

Self-Verification Eligible	Pre-Construction Notification Required
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in vegetated shallows and riffle and pool complexes.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, and (b) located in vegetated shallows and riffle and pool complexes. 2. Permanent and temporary impacts in tidal waters or navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, or loss of streambed occurs. 4. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Wetlands, vegetated shallows, mudflats, and riffle and pool complexes should be restored in place at the same elevation to the maximum extent practicable.
2. Activities undertaken entirely on a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by authority of CERCLA, are not required to obtain permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act.

GP 14. SCIENTIFIC MEASUREMENT DEVICES (Authorities: §10 and §404)

Scientific measurement devices for measuring and recording scientific data, such as staff gauges, tide and current gauges, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Also eligible are small weirs and flumes constructed primarily to record water elevation, flow and/or velocity. Upon completion of the use of the device to measure and record scientific data, the measuring device and any other structures or fills associated with that device (e.g., foundations, anchors, buoys, lines, etc.) must be removed to the maximum extent practicable and the site restored to preconstruction elevations.

Not authorized under GP 14 (IP required): (a) Permanent impacts that are >5,000 SF in tidal and non-tidal waters of the U.S.; >1000 SF in tidal saltmarsh, mud flats, riffle and pool complexes; or >100 SF in tidal vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows. 3. Temporary, non-biological sampling devices in waters that do not restrict or concentrate movement of aquatic organisms and will not adversely affect the course, condition, or capacity of a waterway for navigation. 4. Scientific measurement devices, and small weirs and flumes constructed primarily to record water quantity and velocity provided the discharge of fill is limited to 25 cubic yards. These cannot obstruct or restrict the waterway course, condition, capacity, and location. 5. Temporary measuring devices and associated structures (e.g., anchors, buoys, etc.) in tidal and non-tidal waters that do not require a PCN or IP.	1. Biological sampling devices, weirs or flumes, or the activity restricts or concentrates movement of aquatic organisms. 2. Permanent towers located in navigable waters that record and measure scientific data. 3. Devices that are not eligible for SV and do not require an IP.

Note: An SVN submittal to USACE is not required for temporary measuring devices with a footprint of <10 SF, with a profile of <3 feet high measured from the substrate and located in water deeper than -10 feet MLW.

GP 15. SURVEY ACTIVITIES (Authorities: §10 and §404)

Survey activities such as soil borings, core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, sample plots or transects for wetland delineations, and historic resources surveys.

Not authorized under GP 15 (IP required): (a) Permanent impacts that are >1 acre in tidal and non-tidal waters; >1000 SF in tidal saltmarsh, mud flats, or riffle and pool complexes; or >100 SF in tidal vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows.	1. Exploratory trenching (see Note 2) occurs in waterways (e.g., streams, tidal waters). 2. Activities associated with the recovery of historic resources, and the drilling and discharge of excavated material from test wells for oil and gas exploration. 3. Seismic exploratory operations occur in tidal waters, the Connecticut River from the Turners Falls Dam to the MA/CT border, or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species. 4. Activities that are not eligible for SV and do not require an IP.

Notes:

1. An SVN submittal is not required for wetland delineations, and core sampling conducted for preliminary evaluation of dredge project analysis.
2. For the purposes of GP 15, the term “exploratory trenching” means mechanical land or underwater clearing of the upper soil profile to expose bedrock or substrate for the purpose of mapping or sampling the exposed material.
3. The discharge of drilling mud and cuttings may require a permit under §402 of the CWA.

GP 16. LAND AND WATER-BASED RENEWABLE ENERGY GENERATION FACILITIES (Authorities: §10 and §404), AND HYDROPOWER PROJECTS (Authority: §10 and §404)

Structures and work in tidal waters and discharges of dredged or fill material into tidal and non-tidal waters for the construction, expansion, modification or removal of: (a) Land-based renewable energy production facilities (e.g., solar, wind, biomass, geothermal) and their attendant features; (b) Water-based wind or hydrokinetic renewable energy generation projects and their attendant features; and (c) Discharges of dredged or fill material associated with hydropower projects. Attendant features may include, but are not limited to, land-based collection and distribution facilities, control facilities, and parking lots. For each single and complete project in (b) above, no more than 10 generation units (e.g., wind turbines or hydrokinetic devices) are authorized in navigable waters of the U.S. Upon completion of the pilot project (see note 2), the generation units, transmission lines, and other structures or fills associated with the pilot project must be removed to the maximum extent practicable.

Not authorized under GP 16 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters, >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) >5000 SF, or (b) located in vegetated shallows or riffle and pool complexes. 2. Permanent and temporary impacts in tidal waters. 3. Water-based wind or hydrokinetic renewable energy generation projects, and hydropower projects. 4. For all activities eligible for authorization under GP 16: a. The activity occurs in tidal waters or in, over or under navigable waters. b. Stream channelization, relocation, impoundment, or loss of streambed occurs. 5. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Utility lines constructed to transfer the energy from the land-based renewable generation or collection facility to a distribution system, regional grid, or other facility may be authorized by GP 6.
2. For the purposes of this GP, the term “pilot project” means an experimental project where the renewable energy generation units will be monitored to collect information on their performance and environmental effects at the project site.

GP 17. RESIDENTIAL, COMMERCIAL AND INSTITUTIONAL DEVELOPMENTS AND RECREATIONAL FACILITIES (AUTHORITIES: §404)

Discharges of dredged or fill material into non-tidal waters for the construction or expansion of: (a) Residences and residential subdivisions; (b) Residential, commercial and institutional building foundations and building pads; and (c) Recreational facilities such as playgrounds, playing fields, bikeways, trails, etc. This GP also authorizes attendant features that include, but are not limited to, roads, parking lots, garages, yards, and utility lines, and stormwater management facilities. This GP authorizes attendant features if they are necessary for the use of the project purpose.

Not authorized under GP 17 (IP required): (a) Permanent impacts that result in loss of non-tidal waters >1/2 acre; >1000 SF in riffle and pool complexes or vegetated shallows; or (b) Subsurface sewerage disposal systems in non-tidal waters.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) <5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. Stream channelization or relocation resulting in loss of streambed that is <200 LF.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≥5,000 SF, or (b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. Stream and wetland crossings that require a PCN per GCs 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings. 3. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind. 4. Activities on USACE properties & USACE-controlled easements. 5. Activities that are not SV eligible and do not require an IP.

Notes:

1. Stream and wetland crossings (permanent and temporary), including those built with construction mats; and modifications (including sliplining), replacements or extensions to existing crossings.
2. See GC 22 for information on temporary construction mats.
3. Subdivisions: For residential subdivisions, the aggregate total loss of waters of United States authorized by this GP cannot exceed 1/2-acre. This includes any loss of waters of the United States associated with development of individual subdivision lots.

GP 18. AQUACULTURE (Authorities: §10 and §404)

(a) The installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures into navigable waters of the U.S.; (b) Discharges of dredged or fill material into tidal and non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities; and (c) Shellfish seeding or brushing the flats projects. Any fill material imported to the project from offsite (this is limited to mineral growth medium used in culture trays) shall be clean and of comparable grain size to the native substrate. Activities authorized under this GP must have (a) their MA DMF Aquaculture Certificate letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.

Not authorized under GP 18 (IP required): (a) New, or expansions of, impoundments and semi-impoundments of tidal and non-tidal waters for the culture or holding of motile species such as lobster with an impounded area >½ acre; (b) Cultivation of a nonindigenous species (see Note 1) unless that species has been previously cultivated in the waterbody; (c) Cultivation of an aquatic nuisance species (see Note 1); (d) Attendant features such as docks, piers, boat ramps (see GP 4); (e) stockpiles, staging areas, or the deposition of shell material back into tidal and non-tidal waters as waste.

Self-Verification Eligible

1. In tidal waters, a new lease site area is (a) ≤2-acre, (b) not located in salt marsh, natural rocky habitat, or tidal vegetated shallows.

2. In tidal waters, *expansions* of existing lease sites not to exceed 2 acres for the entire site (e.g. 1 acre lease site increasing to a 2 acre lease site may qualify as SV). A PCN is required for expansions in salt marsh, natural rocky habitat, and tidal vegetated shallows.

3. Cages, racks that are elevated ≥2 feet above the ocean floor with legs within a lease site with ≤4 buoys marking the corners.

4. Floating cage strings with a single connecting line, ≤2 anchors and ≤2 end marker buoys per string within a lease site with ≤4 buoys marking the corners.

5. No activities located within 25 feet of tidal vegetated shallows.

6. Culture only indigenous species.

7. Not located in FNP or within a distance of three times the authorized depth of an FNP (see GC 15).

8. Not located in or impinge upon the value of any National Lands or Federal Properties.

9. Floating upweller docks that total ≤600 SF in area.

Pre-Construction Notification Required

1. Discharges of fill material associated with aquaculture >5,000 SF.

2. Research, educational, commercial-viability or experimental aquaculture gear activities >1,000 SF.

3. Kelp or finfish aquaculture.

4. Land-based hatchery intakes >3 inches in diameter.

5. Activities in water depths >10 feet mean low lower water (MLLW).

6. Activities with in-water lines, ropes or chains that are not SV eligible (see #3-4).

7. Activities occur in the Connecticut River from the Turners Falls Dam to the MA/CT border or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species.

8. New, or expansions of, impoundments and semi-impoundments for the culture or holding of motile species such as lobster with an impounded area ≤1/2 acre.

9. Activities that do not require an IP. Activities that do not require a PCN or an IP may be SV eligible.

Note: The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 defines: (a) nonindigenous species as “any species or other viable biological material that enters an ecosystem beyond its historic range, including any such organism transferred from one country into another”; and (b) aquatic nuisance species as “a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.”

GP 19. MINING ACTIVITIES (Authorities: §10 and §404)

Discharges of dredged or fill material into non-tidal waters for mining activities, except for coal mining and metallic mineral mining activities.

Not authorized under GP 19 (IP required): (a) Permanent impacts >1 acre in non-tidal waters; or (b) Activities in tidal waters.

Self-Verification Eligible	Pre-Construction Notification Required
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes, non-tidal vegetated shallows, and streams.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes, non-tidal vegetated shallows, and streams. 2. The activity occurs in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or discharge of tailings into streams occurs. 4. Work on USACE properties & USACE-controlled easements. 5. Activities that are not eligible for SV and do not require an IP.

GP 20. LIVING SHORELINES[1] (Authorities: §10 and §404)

Construction and maintenance of living shorelines to stabilize banks and shores in tidal waters. In non-tidal waters that are not subject to the ebb and flow of the tide, nature-based bank stabilization techniques such as bioengineering and vegetative stabilization may be authorized by GP 9. This GP authorizes those maintenance and repair activities in-kind that are necessary to address changing environmental conditions.

The following terms must be met for both SVs and PCNs as applicable: (a) Coir logs, coir mats, stone, native oyster shell, native wood debris, and other structural materials must be adequately anchored, of sufficient weight, or installed in a manner that prevents relocation in most wave action or water flow conditions, except for extremely severe storms; (b) For living shorelines consisting of tidal fringe wetlands, native plants appropriate for current site conditions, including salinity and elevation, must be used if the site is planted by the permittee; (c) Discharges of dredged or fill material into waters of the U.S., and oyster or mussel reef structures in navigable waters, must be the minimum necessary for the establishment and maintenance of the living shoreline; (d) If sills or other structural materials per PCN #4 must be constructed to protect fringe wetlands for the living shoreline, those structures must be the minimum size necessary to protect those fringe wetlands; (e) The activity must be designed, constructed, and maintained so that it has no more than minimal adverse effects on water and sediment movement between the waterbody and the shore and the movement of aquatic organisms between the waterbody and the shore; and (f) The living shoreline must be properly maintained and monitored, which may require periodic repair of sills, bioengineered components, or replacing sand fills after severe storms or erosion events. Vegetation may be replanted to maintain the living shoreline.

Not authorized under GP 20 (IP required): (a) The activity is ≥1000 feet in length along the bank (≥2000 LF both banks) unless waived by the District Engineer; or (b) The activity is >30 feet channel ward of mean low water in tidal waters; or (c) Upland reclamation activities; or (d) Stream channelization or relocation activities; or (e) Breakwaters, groins, jetties, or artificial reefs; or (f) Permanent impacts >1,000 SF in existing saltmarsh; >100 SF in existing tidal vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Tidal and non-tidal living shorelines ≤100 LF for each bank (≤200 LF for both banks). 2. Combined permanent and temporary impacts ≤5,000 SF in tidal waters, excluding existing salt marsh, tidal vegetated shallows, natural rocky habitat, and mudflats.	1. Tidal and non-tidal living shorelines >100 LF to <1000 LF (>200 LF to <2000 LF for both banks). 2. Permanent and temporary impacts in existing salt marsh, tidal vegetated shallows, or mudflats. 3. Work on USACE properties & USACE-controlled easements. 4. Use of stone sills, native oyster shell, native wood debris, or other structural materials.

Notes:

1. PCNs require monitoring for a minimum of 5 years in accordance with an approved restoration plan, unless otherwise determined by the USACE. The first year of monitoring will be the first year that the site has been through a full growing period after completion of construction and planting.
2. Applicants are encouraged to obtain a MEPA certificate prior to submitting a USACE permit application.

[1] A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural "soft" elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes. Living shorelines must have a substantial biological component, either tidal or lacustrine fringe wetlands or oyster or mussel reef structures.

GP 21. AGRICULTURAL ACTIVITIES (Authority: §404)

Discharges of dredged or fill material in non-tidal waters for agricultural activities, including the construction of building pads for farm buildings. Authorized activities include: (a) installation, placement, or construction of drainage tiles, ditches, or levees; mechanized land clearing; land leveling; the relocation of existing serviceable drainage ditches; and similar activities; (b) construction of farm ponds, excluding perennial streams, provided the farm pond is used solely for agricultural purposes; and (c) discharges of dredged or fill material to relocate existing serviceable drainage ditches constructed in non-tidal streams.

Not authorized under GP 21 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters; or >1000 SF in riffle and pool complexes, or non-tidal vegetated shallows; (b) Work in tidal waters; or (c) Construction of farm ponds in perennial streams.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes and non-tidal vegetated shallows. 2. Activities occur in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or farm ponds in non-perennial streams occurs. 4. Activities that are not eligible for SV and do not require an IP.

Note: Some discharges for agricultural activities may qualify for an exemption under Section 404(f) of the CWA (see 33 CFR 323.4). This GP authorizes the construction of farm ponds that do not qualify for the CWA §404(f)(1)(C) exemption because of the recapture provision at §404(f)(2).

GP 22. RESHAPING EXISTING DRAINAGE DITCHES, CONSTRUCTION OF NEW DITCHES, AND MOSQUITO MANAGEMENT (Authorities: §10 and §404)

Discharges to modify the cross-sectional configuration of currently serviceable drainage ditches constructed in tidal and non-tidal waters, for the purpose of improving water quality by regrading the drainage ditch with gentler slopes, which can reduce erosion, increase growth of vegetation, and increase uptake of nutrients and other substances by vegetation. Also authorized are mosquito reduction activities.

Not authorized under GP 22 (IP required): Stream channelization, relocation, impoundments, or loss of streambed.

Self-Verification Eligible	**Pre-Construction Notification Required**
≤500 linear feet of drainage ditch will be reshaped provided excavated material is deposited in an upland area.	1. >500 linear feet of drainage ditch will be reshaped, excavated material is deposited in a water of the U.S., or the reshaping of the ditch increases the drainage capacity beyond the original as-built capacity or expands the area drained by the ditch as originally constructed (i.e., the capacity of the ditch is not the same as originally constructed or drains additional wetlands or other waters of the U.S.). 2. Permanent and temporary impacts in tidal vegetated shallows. 3. New ditches or relocation of drainage ditches constructed in waters of the U.S. (i.e., the location of the centerline of the reshaped drainage ditch is not approximately the same as the location of the centerline of the original drainage ditch). 4. Activities that are not eligible for SV and do not require an IP.

Note: Some ditch activities are exempt under Section 404(f) of the CWA (see 33 CFR 323.4).

GP 23. LINEAR TRANSPORTATION PROJECTS AND WETLAND/STREAM CROSSINGS (Authorities: §10 & §404)

Activities[1] required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., driveways, roads, highways, railways, trails, airport runways, and taxiways) and attendant features. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats (see Note 1), necessary to construct the linear transportation project.

Not authorized under GP 23 (IP required): (a) Permanent impacts for any single and complete project that are >1 acre in non-tidal waters; >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars (see GP 17); or (d) New tide gates.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows; and c) meet the Massachusetts River and Stream Crossing Standards 2. Existing crossings (e.g., culverts, elliptical or arch pipes, etc.) are not modified by (a) decreasing the diameter of the crossing or (b) changing the friction coefficient, such as through slip lining (retrofitting an existing culvert by inserting a smaller diameter pipe), culvert relining or invert lining. 3. Stream channelization or relocation resulting in loss of streambed that is <200 LF.	1. In non-tidal waters, the combined permanent and temporary impacts are a) >5,000 SF; b) located in vegetated shallows or riffle and pool complexes; or c) do not meet the Massachusetts River and Stream Crossing Standards (see note 4). 2. The activity occurs in tidal waters, salt marsh, or in, over or under navigable waters of the U.S. 3. Stream and wetland crossings that require a PCN per GC 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings. 4. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind. 5. Work on USACE properties & USACE-controlled easements. 6. Activities that are not eligible for SV and do not require an IP.

Notes:

1. See GC 22 for information on temporary construction mats.
2. Discharges of dredged or fill material incidental to the construction of bridges across navigable waters of the U.S. may be authorized under GP 8.
3. Loss of streambed does not require a PCN when bridge piers or similar supports are used.
4. In their PCN application submission to the USACE, applicants must explain why they are unable to meet the Massachusetts River and Stream Crossing Standards.
5. For tidal crossings, modeling is encouraged as a method to verify the proposed crossing would not be undersized and resilient to the effects of sea level rise.

[1] Stream crossings must conform with the MA Stream Crossing Guidelines when practicable and comply with all applicable GCs of this document (Section IV).

GP 24. TEMPORARY CONSTRUCTION, ACCESS, AND DEWATERING (Authorities: §10 and §404)

Temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites that are not authorized under another GP activity.

Not authorized under GP 24 (IP required): (a) Permanent structures or impacts; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Use of cofferdams to dewater wetlands or other aquatic areas to change their use; (d) Temporary stream crossings (see GPs 6, 17, 23); (e) Structures or fill left in place after construction is completed.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) ≤5,000 SF, b) ≤1,000 SF in mudflats and/or natural rocky habitat, and c) not located in saltmarsh and tidal vegetated shallows. 3. Structures in navigable waters of the U.S. provided impacts do not require a PCN and they are left in place ≤30 days.	1. In non-tidal waters, temporary impacts are a) >5,000 SF; b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) >5,000 SF; b) >1,000 SF in mudflats and/or natural rocky habitat, or (c) located in saltmarsh and tidal vegetated shallows. 3. Activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, or Merrimack River from the Essex Dam to the mouth, involving temporary impacts unless they are performed <5 feet waterward from OHW or HTL and in the dry. This is to protect endangered species; or 4. Activities not eligible for SV and do not require an IP.

Notes:

1. Turbidity or sediment resuspension is generally not considered to occur when properly using management techniques to work in dry conditions. See GC 25.
2. Total impact areas under SV Eligible 1-2 exclude use of temporary construction mats. See GC 22 for information on temporary construction mats.
3. An SVN submittal to USACE is not required for SV #3 above.

GP 25. EMERGENCY SITUATIONS (Authorities: §10 and §404)

Structures or work in or affecting navigable waters of the U.S. and the discharge of dredged or fill material into waters of the U.S., including wetlands, necessary for repair or protection measures associated with an emergency situation[1], MassDEP Emergency Declaration/Certification, or FEMA Declared Disaster. The activity shall be the minimum necessary to alleviate the immediate emergency unless that additional work would result in no more than minimal effects to aquatic environment and is necessary to reduce the potential for future failure or loss of the structure or site. Typical activities authorized under this GP include, but are not limited to, restoration of damaged areas; bank stabilization; temporary fills for staging, access, and dewatering; and, repair, replacement, or rehabilitation of existing structures and/or fills (i.e., roads, bridges, utility pipelines and flood control structures, including attendant features, and other existing structures located in waters of the U.S.).

For the restoration of areas damaged by storms floods, or other discrete events: (a) The restored area must not extend waterward of the ordinary high-water mark or high tide line that existed prior to the damage. (b) The slope of the restored area below the ordinary high-water mark or high tide line must not exceed the slope that existed prior to the damage. (c) The bottom elevation of the restored area must not exceed the bottom elevation that existed prior to the damage (i.e., the restored area must not result in a reduction in the depth of the waterbody that existed prior to the damage). (d) Except in cases of FEMA reimbursement, the activity must be initiated, under contract to commence, or funds shall be allocated for the activity within 30 days of authorization under GP 25.

Not authorized under GP 25 (IP required): (a) Permanent impacts for a single and complete project >1/2 acre in tidal waters, unless the district engineer waives this criterion by making a written determination concluding that the activity will result in no more than minimal adverse environmental effects; >1,000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >5,000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1,000 SF in vegetated shallows; (c) New structures or fills that did not previously exist before the storm event or other discrete event (see other GPs).

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities that qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) and/or receive an Emergency Certification pursuant to 310 CMR 10.06 and/or meet the requirements of 314 CMR 9.12(2) or (3); and 2. Activities eligible under a FEMA Declared Disaster that also comply with #1 above.	1. Activities that are eligible under a FEMA Declared Disaster and do not qualify under SV #1. 2. Minor deviations in the structure or fill area, including those to existing structures or fills are authorized due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to alleviate the emergency. 3. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Review the GCs (Section IV) to confirm if a PCN is not required elsewhere in this document.
2. If the activity is not a MassDEP Emergency Declaration/Certification, does not meet the requirements of 314 CMR 9.12(2) or (3), or is not a FEMA Declared Disaster, applicants must explain in writing why their activity qualifies as an emergency (see footnote) to be eligible under GP 25.
3. SV eligible activities qualify under the general 401 WQC MassDEP issued for the 2023 MA GPs (GC 9).

[1] An emergency, as determined by this office and 33 CFR 325.2(e)(4), is one which would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a Department of the Army permit is not undertaken within a time period less than the normal time to process the request under standard processing procedures.

SECTION IV. GENERAL CONDITIONS:

To qualify for GP authorization, the applicant must comply with the following general conditions, as applicable, in addition to authorization-specific conditions imposed by the division or district engineer.

1. Other Permits
2. Federal Jurisdictional Boundaries
3. Single and Complete Projects
4. Use of Multiple General Permits
5. Suitable Material
6. Tribal Rights & Burial Sites
7. Avoidance, Minimization, and Compensatory Mitigation
8. Water Quality & Stormwater Management
9. Coastal Zone Management
10. Federal Threatened and Endangered Species
11. Essential Fish Habitat
12. National Lands
13. Wild and Scenic Rivers
14. Historic Properties
15. USACE Property and Federal Projects (§408)
16. Navigation
17. Permit/Authorization Letter On-Site
18. Storage of Seasonal Structures
19. Pile Driving and Pile Removal in Navigable Waters
20. Time of Year Restrictions
21. Heavy Equipment in Wetlands
22. Temporary Fill & Construction Mats
23. Restoration of Wetland Areas
24. Bank Stabilization
25. Soil Erosion and Sediment Controls
26. Aquatic Life Movements and Management of Water Flows
27. Spawning, Breeding, and Migratory Areas
28. Vernal Pools
29. Invasive Species
30. Fills Within 100-Year Floodplains
31. Stream Work and Crossings & Wetland Crossings
32. Utility Line Installation and Removal
33. Water Supply Intakes
34. Coral Reefs
35. Blasting
36. Inspections
37. Maintenance
38. Property Rights
39. Transfer of GP Verifications
40. Modification, Suspension, and Revocation
41. Special Conditions
42. False or Incomplete Information
43. Abandonment
44. Enforcement Cases
45. Previously Authorized Activities
46. Duration of Authorization

1. Other Permits. Authorization under these GPs does not obviate the need for the permittee to obtain other Federal, State, or local permits, approvals, or authorizations required by law. Permittees are responsible for obtaining all required permits, approvals, or authorizations. Activities that are not regulated by the State, but subject to USACE jurisdiction, may still be eligible for these GPs.

2. Federal Jurisdictional Boundaries.
a. Applicability of these GPs shall be evaluated with reference to Federal jurisdictional boundaries. Activities shall be evaluated with reference to "waters of the U.S." under the CWA (33 CFR 328) and "navigable waters of the U.S." under §10 of the Rivers and Harbors Act of 1899 (33 CFR 329). Permittees are responsible for ensuring that the boundaries used satisfy the Federal criteria defined at 33 CFR 328-329. These sections prescribe the policy, practice, and procedures to be used in determining the extent of the USACE jurisdiction. Note: Waters of the U.S. includes all waters pursuant to 33 CFR 328.3(a), and adjacent wetlands as the term is defined in 33 CFR 328.3(c).
b. Wetlands shall be delineated in accordance with the USACE Wetlands Delineation Manual and the most recent Northcentral/Northeast Regional Supplement. Wetland delineation and jurisdiction information is located at: www.nae.usace.army.mil/missions/regulatory/jurisdiction-and-wetlands and maps are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
c. Vegetated shallows shall be delineated when present on the project site. Vegetated shallow survey guidance and maps are located at: www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
d. Natural rocky habitats shall be delineated when present on the project site. The definition of natural rocky habitats is in Section VII of the MA GP. Natural rocky habitat survey guidance and maps are located at: www.nae.usace.army.mil/ missions/regulatory/state-general-permits/massachusetts-general-permit.

3. Single and Complete Projects. The MA GP shall not be used for piecemeal work and shall be applied to single and complete projects. The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers.
a. For non-linear projects, a single and complete project must have independent utility. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed, even if the other phases were not built, can be considered as separate single and complete projects with independent utility.
b. Unless USACE determines the activity has independent utility, all components of a single project and/or all planned phases of a multi-phased project (e.g., subdivisions should include all work such as roads, utilities, and lot development) shall be evaluated as one single and complete project.
c. For linear projects such as power lines or pipelines with multiple crossings, a "single and complete project" is all crossings of a single water of the U.S. (i.e., single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately. If any crossing requires a PCN review or an individual permit review, then the entire linear project shall be reviewed as one project under PCN or the individual permit procedures.

4. Use of Multiple General Permits. The use of more than one GP for a single and complete project is prohibited, except when the acreage loss of waters of the U.S. authorized by the GPs does not exceed the acreage limit of the GPs with the highest specified acreage limit. For example, if a road crossing over waters is constructed under GP 23, with an associated utility line

crossing authorized by GP 6, if the maximum acreage loss of waters of the U.S. for the total project is ≥1 acre it shall be evaluated as an IP.

5. Suitable Material & Discharge of Pollutants. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). All activities involving any discharge into waters of the U.S. authorized under these GPs shall be consistent with applicable water quality standards, effluent limitations, standards of performance, prohibitions, and pretreatment standards and management practices established pursuant to the CWA (33 U.S.C. 1251), and applicable state and local laws. If applicable water quality standards, limitations, etc., are revised or modified during the term of this GP, the authorized work shall be modified to conform with these standards within six months from the effective date of such revision or modification, or within a longer period of time deemed reasonable by the District Engineer in consultation with the Regional Administrator of the EPA. Unless monitoring data indicates otherwise, applicants may presume that their activity complies with state water quality standards provided they are in compliance with the Section 401 WQC (Applicable only to the Section 404 activity).

6. Tribal Rights & Burial Sites

a. For all SV and PCN applications, prospective permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

c. Many tribal resources are not listed on the National Register of Historic Places (NRHP) and may require identification and evaluation in collaboration with the identifying tribe and by qualified professionals. The Tribal Historic Preservation Officer (THPO) and State Historic Preservation Officer (SHPO) may be able to assist with locating information on:

i. Previously identified tribal resources; and
ii. Areas with potential for the presence of tribal resources.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the appropriate the Federal, Tribal, and state coordination required to determine if the items or remains are eligible for listing in the NRHP and warrant a recovery effort or can be avoided.

e. Burial Sites: Burial sites, marked or unmarked, are subject to state law (Massachusetts Unmarked Burial Law). Native American burial sites on federal or tribal land are subject to the provisions of Native American Graves Protection and Repatriation Act (NAGPRA). Regulated activities may not result in disturbance or removal of human remains until disposition of the remains has been determined by the appropriate authority under these laws, and the work is authorized by the USACE. Regulated activities which result in an inadvertent discovery of human remains must stop immediately, and the USACE, as well as the appropriate state and tribal authority, must be notified. Regulated work at inadvertent discovery sites requires compliance with state law or NAGPRA, as appropriate, prior to re-starting work.

7. Avoidance, Minimization, and Compensatory Mitigation. To qualify under the MA GP, activities must comply with Section V Mitigation Standards and the following as applicable:

a. Avoid and Minimize: Activities must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the U.S. to the maximum extent practicable at the project site. Avoidance and minimization are required to the extent necessary to ensure that the adverse effects to the aquatic environment (both area and function) are no more than minimal.

b. Compensatory mitigation for unavoidable impacts to waters of the U.S., including direct, indirect, secondary, and temporal loss, will generally be required for permanent impacts that exceed the thresholds identified in Section V, and may be required for temporary impacts, to offset unavoidable impacts which remain after all appropriate and practicable avoidance and minimization has been achieved and to ensure that the adverse effects to the aquatic environment are no more than minimal. Proactive restoration projects or temporary impact work with no secondary effects may generally be excluded from this requirement.
c. Mitigation proposals shall follow the guidelines found in the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule April 10, 2008; 33 CFR 332. Prospective permittees may purchase mitigation credits in-lieu of permittee-responsible mitigation as compensation for unavoidable impacts to waters of the U.S. in the Commonwealth of Massachusetts.

8. Water Quality & Stormwater Management. The 401 WQC requirement applies to all activities listed under GPs 1-25, unless determined otherwise by MassDEP. Permittees shall also satisfy stormwater management requirements in Massachusetts.

a. General 401 WQC: MassDEP issued a WQC on April 21, 2023 which conditionally certifies all activities in GPs 1 – 24 eligible for SV and PCN so long as the activity is described in 314 CMR 9.03, and is not an activity described in 314 CMR 9.04, and so long as the activity meets all other requirements, terms and conditions of the WQC. The MassDEP WQC also conditionally certifies activities described in GP 25 so long as the activity meets all other conditions of the WQC. Emergency projects described in GP 25 must obtain an emergency certification or otherwise be authorized pursuant to 310 CMR 10.06, qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) issued by the MassDEP, or meet the requirements of 9.12(2) or (3) in order to be certified under the WQC. Prospective permittees may refer to the following link to determine if their activity is eligible: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/ Massachusetts-General-Permit/. The General 401 WQC is located here, and it provides detailed information regarding what activities are certified and the conditions for certification. Activities listed in 314 CMR 9.03 that are not exempt from the Wetland Protection Act must have a valid Final Order of Conditions (OOC) or Final Restoration Order of Conditions pursuant to 310 CMR 10.00 to be eligible under the General 401 WQC.
b. Individual 401 WQC: Prospective permittees shall contact MassDEP and apply for an individual 401 WQC if their activity does not qualify for a General 401 WQC as outlined above. MassDEP may issue, waive, or deny the individual 401 WQC on a case-by-case basis. All activities listed in 314 CMR 9.04 must obtain an individual 401 WQC from MassDEP to be eligible under these GPs. When an Individual 401 WQC is required for *PCN activities*, the prospective permittee shall submit their Individual 401 WQC application concurrently to MassDEP and USACE to comply with 40 CFR 121.
c. The prospective permittee is responsible for determining the appropriate 401 WQC requirement and submitting this information to the USACE at the time of their PCN application or when completing their SVN. Prospective permittees that are unsure of whether their activity has been certified should contact MassDEP for a determination.
d. As applicable, all activities shall be compliant with the Massachusetts Stormwater Handbook. The Stormwater Handbook can be accessed on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. No work requiring authorization under Section 404 of the CWA may be performed unless (1) the prospective permittee qualifies for coverage under the April 21, 2023 General 401 WQC, (2) the prospective permittee receives an individual Section 401 WQC from the MassDEP, or (3) the MassDEP waives individual Section 401 WQC.

9. Coastal Zone Management. The permittee must obtain CZM consistency concurrence when an activity is located in the coastal zone in order to be eligible under the MA GP. This requirement

shall be satisfied by acquiring one of the following from the Massachusetts Office of Coastal Zone Management (MA CZM):

a. General CZM Federal Consistency Concurrence (General Concurrence): MA CZM has granted General Concurrence for all SV and PCN activities for GPs 1-25. The prospective permittee must obtain all applicable permits and approvals before construction of the authorized activity begins (e.g., before work begins on site). For SVs, General Concurrence is automatically granted and no further action is required from the prospective permittee. For PCNs, the USACE will coordinate with MA CZM to acquire General Concurrence as part of the PCN application review.
b. Individual CZM Federal Consistency Concurrence (Individual Concurrence): In certain cases, MA CZM may elevate any GP activity 1-25 and require Individual Concurrence. The prospective permittee must contact MA CZM and follow the procedures to obtain Individual Concurrence as determined appropriate by MA CZM.
c. Permittees must obtain CZM consistency concurrence as outlined above before commencing work authorized under these GPs.

10. Federal Threatened and Endangered Species

a. No activity is authorized under any GP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any GP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."
b. Other Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If a PCN is required for the proposed activity, the Federal permittee must provide USACE with the appropriate documentation to demonstrate compliance with those requirements. The USACE will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.
c. USFWS ESA-Listed Species: Non-federal applicants shall use the USFWS website, Information for Planning and Consultation (IPAC), to determine if their activity is located within the ESA-listed species range. The IPAC website can be accessed on the NAE Regulatory website: https://www. nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Applicants shall ensure they have an updated, valid species list before construction begins. This may require applicants to update their species list in IPAC before the start of construction. Note: Applicants should refer to the NAE Regulatory Website at the link above to determine if they have been designated as a non-federal representative. Applicants shall complete Section 7 consultation according to the guidance document located on the NAE Regulatory Website. After completing the Rangewide Determination Key and reaching the outcome "may affect, not likely to adversely affect", you may be required to wait up to 15 days before that outcome is final and compliance under Section 7 of the ESA is fulfilled.

i. *Self-Verification Criteria*: The activity is SV-eligible if:
   1) The activity is not located within the ESA-listed species range;
   2) Another (lead) Federal agency has completed Section 7 consultation; or
   3) The activity is located within the ESA-listed species range ***and*** USACE has designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all

species within the project's action area. As the non-federal representative, the applicant shall complete consultation through IPAC and reach the outcome of "no effect" or "not likely to adversely affect".

ii. *Pre-Construction Notification Criteria*: The activity requires a PCN if:

1) The activity is located within the ESA-listed species range ***and*** USACE has NOT designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all species within the project's action area;

2) The activity is located in designated or proposed critical habitat; or

3) The activity is located within the ESA-listed species range and completion of the IPAC determination key has resulted in the outcome of "may affect" or "may affect, likely to adversely affect"; or

4) A PCN is required elsewhere in this document.

d. NOAA-Listed Species: Non-federal applicants shall refer to the Section 7 Mapper for federally listed species to determine if any species are mapped as present. When NOAA-listed species are present, the applicant shall generate a species report through the mapper and submit this document as part of their PCN or SVN submission. The NOAA Fisheries' Section 7 Mapper can be accessed here on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

e. Authorization of an activity by an GP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

11. Essential Fish Habitat (EFH).

a. SV eligible activities have been determined to result in no more than minimal adverse effects, provided the permittee complies with all terms and conditions of the MA GP as appliable to the activity. NMFS has granted General Concurrence [50 CFR 600.920(g)] for all SV eligible activities. These activities do not require project specific EFH consultation.

b. For PCN required activities, the applicant is required to describe and identify potential adverse effects to EFH and should refer to NOAA Fisheries' EFH Mapper (http://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper) and Omnibus Essential Fish Habitat Amendment 2 Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts (https://www.habitat.noaa.gov/application/efhmapper/oa2_efh_hapc.pdf). If an activity is located within EFH, the PCN application must contain:

1. A description of the action located in EFH.
2. An analysis of the potential adverse effects of the action on EFH and the managed Species.
3. Conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable (refer to the mitigation thresholds located in Section V).

c. Federal agencies shall follow their own procedures for complying with the EFH requirements of the Magnuson-Stevens Fishery Conservation and Management Act. For activities requiring a PCN, the applicant is responsible for furnishing documentation that demonstrates consultation for EFH has been completed.

d. For PCN activities, no work may commence until EFH consultation as required by the Magnuson-Stevens Act has been completed.

12. National Lands. Activities that impinge upon the value of any National Wildlife Refuge, National Forest, National Marine Sanctuary, National Historic Landmarks or any other area administered by the National Park Service, U. S. Fish and Wildlife Service (USFWS) or U.S. Forest Service (USFS) require a PCN or Individual Permit. Federal land managers seeking authorization for activities located in the above listed National Lands may proceed under SV, unless a PCN is required elsewhere in this document.

13. Wild and Scenic Rivers. The following activities in designated river or study river segments in the National Wild and Scenic River (WSR) System require a PCN unless the Federal agency with direct management responsibility for such river, in Massachusetts this is generally the National Park Service, has determined in writing to the proponent that the proposed work will not adversely affect the WSR designation or study status:

a. Activities that occur in WSR segments, in and 0.25 miles up or downstream of WSR segments, or in tributaries within 0.25 miles of WSR segments;
b. Activities that occur in wetlands within 0.25 miles of WSR segments;
c. Activities that have the potential to alter free-flowing characteristics in WSR segments.

No GP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

As of May 10, 2023, affected rivers in Massachusetts include: the Taunton River (40 miles), Sudbury River (16.6 miles), Assabet River (4.4 miles), Concord River (8 miles), Nashua River (27 miles), Squannacook River (16.3 miles), Nissitissit River (4.7 miles), and the Westfield River, including West Branch, Middle Branch, Gendale Brook, East Branch, Drowned Land Brook, Center Brook, Windsor Jambs Brook, Shaker Mill Brook, Depot Brook, Savery Brook, Watson Brook, Center Pond Brook (78.1 miles). The most up to date list of designated and study rivers and their descriptions may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

14. Historic Properties

a. For all SV and PCN applications, permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No undertaking authorized by these GPs shall cause effects[1] (defined in 36 CFR Part 800 and 33 CFR Part 325, Appendix C, and its Interim Guidance) on properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places (NRHP)[2], including previously unknown historic properties within the permit area, unless the USACE or another Federal action agency has satisfied the consultation requirements of Section 106 of the National Historic Preservation Act (Section 106). If another Federal agency is determined the lead federal agency for compliance with Section 106, applicant must obtain the appropriate documentation and provide this information to the USACE to demonstrate compliance with Section 106. The applicant shall not begin the activity until the USACE notifies them in writing that the documentation provided satisfies Section 106 requirements.

[1] Effect means the alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register of Historic Properties.
[2] See the NAE Regulatory website, National Register of Historic Places link here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

c. Many historic properties are not listed on the NRHP and may require identification and evaluation by qualified historic preservation and/or archaeological consultants. The State Historic Preservation Officer (SHPO), Massachusetts Board of Underwater Archaeological Resources (BUAR), local historical societies, certified local governments, general public, and NRHP may also be able to assist with locating information on:

i. Previously identified historic properties; and
ii. Areas with potential for the presence of historic properties.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the Federal, State and tribal coordination required to determine if the items or remains warrant a recovery effort and/or if the site is eligible for listing in the National Register of Historic Places.

e. Section 110k: Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. § 306113) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106, has intentionally significantly adversely effected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the USACE is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties effected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or effects historic properties on tribal lands or effects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

f. Underwater Archaeological Resources: Under Massachusetts General Law Ch. 6, s.'s 179-180, and Ch. 91, s. 63, the BUAR has statutory jurisdiction within state waters and is the sole trustee of the Commonwealth's underwater heritage, charged with the responsibility of encouraging the discovery and reporting, as well as the preservation and protection, of underwater archaeological resources. Underwater archaeological resources located within the waters of the Commonwealth of Massachusetts are property of the Commonwealth, which holds title to these resources and retains regulatory authority over their use. Under Massachusetts General Law, no person, organization or corporation may "remove, displace, damage, or destroy" any underwater archaeological resources located within the Commonwealth's submerged lands except through consultation with the BUAR and in conformity with the permits it issues. https://www.mass.gov/orgs/board-of-underwater-archaeological-resources.

15. USACE Property and Federal Projects. (33 USC §408)

a. USACE projects and property can be found at: https://www.nae.usace.army.mil/Missions/Civil-Works/.

b. In addition to any authorization under these GPs, prospective permittee shall contact the USACE Real Estate Division (https://www.nae.usace.army.mil/Missions/Real-Estate-Division/) at (978) 318-8585 for work occurring on or potentially affecting USACE properties and/or USACE-controlled easements. Work may not commence on USACE properties and/or USACE-controlled easements until they have received any required USACE real estate documents evidencing site-specific permission to work.

c. Any proposed temporary or permanent occupation or alteration of a Federal project (including, but not limited to, a levee, dike, floodwall, channel, anchorage, breakwater, seawall, bulkhead, jetty, wharf, pier, or other work built or maintained but not necessarily owned by the United States),

is not eligible for SV and requires a PCN. This includes all proposed structures and work in, over, or under a USACE federal navigation project (FNP) or in the FNP's buffer zone. The buffer zone is an area that extends from the horizontal limits of the FNP to a distance of three times the FNP's authorized depth. The activity also requires review and approval by the USACE pursuant to 33 USC 408 (Section 408 Permission). The prospective permittee may reach out to the POCs located here: https://www.nae.usace.army.mil/ Missions/Section-408/.
d. Any structure or work constructed in a FNP or its buffer zone shall be subject to removal at the owner's expense prior to any future USACE dredging or the performance of periodic hydrographic surveys.
e. Where a Section 408 permission is required, written verification for the PCN will not be issued prior to the decision on the Section 408 permission request.

16. Navigation
a. No activity may cause more than a minimal adverse effect on navigation.
b. Any safety lights and signals prescribed by the U.S. Coast Guard, must be installed, and maintained at the permittee's expense on authorized facilities in navigable waters of the U.S.
c. There shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein, and no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized herein.
d. The permittee understands and agrees that if future U.S. operations require the removal, relocation, or other alteration of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from USACE, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

17. Permit/Authorization Letter On-Site. For PCNs, the permittee shall ensure that a copy of these GPs and the accompanying authorization letter are at the work site (and the project office) whenever work is being performed, and that all personnel with operational control of the site ensure that all appropriate personnel performing work are fully aware of its terms and conditions. The entire permit authorization shall be made a part of any and all contracts and sub-contracts for work that affects areas of USACE jurisdiction at the site of the work authorized by these GPs. This shall be achieved by including the entire permit authorization in the specifications for work. The term "entire permit authorization" means these GPs, including GCs and the authorization letter (including its drawings, plans, appendices, special conditions, and other attachments), and any permit modifications. If the authorization letter is issued after the construction specifications, but before receipt of bids or quotes, the entire permit authorization shall be included as an addendum to the specifications. If the authorization letter is issued after receipt of bids or quotes, the entire permit authorization shall be included in the contract or sub-contract as a change order. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions contained within the entire authorization letter, and no contract or sub-contract shall require or allow unauthorized work in areas of USACE jurisdiction. For SVs, the permittee shall ensure that a complete and signed copy of the SVN is present on site during construction and is made available for review at any time by USACE and other Federal, State, & Local regulatory agencies. A complete and signed copy of the SVN must be submitted to USACE Regulatory within 30 days of initiating construction of the authorized activity, unless stated otherwise in the applicable GP.

18. Storage of Seasonal Structures. Coastal structures such as pier sections, floats, etc., that

are removed from the waterway for a portion of the year (often referred to as seasonal structures) shall be stored in an upland location, located above MHW and not in tidal wetlands. These seasonal structures may be stored on the fixed, pile-supported portion of the structure that is seaward of MHW. This is intended to prevent structures from being stored on the marsh substrate and the substrate seaward of MHW.

19. Pile Driving and Pile Removal in Navigable Waters.
a. Derelict, degraded or abandoned piles and sheet piles in navigable waters of the U.S., except for those inside existing work footprints for piers, must be completely removed, cut and/or driven to 3 feet below the substrate to prevent interference with navigation, and existing creosote piles that are affected by project activities shall be completely removed if practicable. In areas of fine-grained substrates, piles must be removed by the direct, vibratory or clamshell pull method[1] to minimize sedimentation and turbidity impacts and prevent interference with navigation from cut piles. Removed piles shall be disposed of in an upland location landward of MHW or OHW and not in wetlands, tidal wetlands or mudflats.
b. A PCN is required for the installation or removal of structures with jetting techniques.
c. A PCN is required for the installation of >12 inch-diameter piles of any material type or steel piles of any size in tidal waters, unless they are installed in the dry. If piles are not installed in the dry:
i. Impact pile driving shall commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one minute waiting periods, before initiating continuous impact driving.
ii. Vibratory pile driving shall be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period shall be repeated two more times, followed immediately by pile-driving at full rate and energy.
iii. In addition to using a soft start at the beginning of the workday for pile driving as described in 19c(i-ii), a soft start must also be used at any time following a cessation of pile driving for a period of 30 minutes or longer.
d. Bubble curtains may be used to reduce sound pressure levels during vibratory or impact hammer pile driving.

20. Time-of-Year (TOY) Restrictions. Activities that include in-water work must comply with the TOY Restrictions below to be SV eligible, otherwise a PCN is required. PCN submittals shall contain written justification for deviation from the TOY Restrictions. The term “in-water work” does not include conditions where the work site is “in-the-dry” (e.g., intertidal areas exposed at low tide). The term “in-the-dry” includes work contained within a cofferdam so long as the cofferdam is installed and subsequently removed outside the TOY Restriction. The TOY restrictions stated in Appendix B of the MA DMF Technical Report TR-47[2] can apply instead for activities in tidal waters if (1) TOYs are provided for a specific waterbody where the activity is proposed and (2) the TOYs are less restrictive than below. The activity must also not require a PCN elsewhere in this document to be SV eligible.

[1] Direct Pull: Each piling is wrapped with a choker cable or chain that is attached at the top to a crane. The crane then pulls the piling directly upward, removing the piling from the sediment. Vibratory Pull: The vibratory hammer is a large mechanical device (5-16 tons) that is suspended from a crane by a cable. The vibrating hammer loosens the piling while the crane pulls up. Clamshell Pull: This can remove intact, broken or damaged pilings. The clamshell bucket is a hinged steel apparatus that operates like a set of steel jaws. The bucket is lowered from a crane and the jaws grasp the piling stub as the crane pulls up. The size of the clamshell bucket is minimized to reduce turbidity during piling removal.
[2] The MA DMF Technical Report TR-47: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/

	TOY Restriction (No work)
Non-tidal Waters	Defer to TR-47
Tidal Waters	January 15 – November 15

Alternate work windows proposed under a PCN will generally be coordinated with the USFWS and NMFS. Resulting written verifications may include species-specific work allowed windows.

21. Heavy Equipment in Wetlands. Operating heavy equipment (drill rigs, fixed cranes, etc.) within wetlands shall be minimized, and such equipment shall not be stored, maintained, or repaired in wetlands, to the maximum extent practicable. Where construction requires heavy equipment operation in wetlands, the equipment shall:

i. Have low ground pressure (typically ≤3 psi);

ii. Be placed on swamp/construction/timber mats (herein referred to as "construction mats" or "mats") that are adequate to support the equipment in such a way as to minimize disturbance of wetland soil and vegetation. See GC 22 for information on the placement of construction mats; or

iii. Be operated on adequately dry or frozen wetlands such that shear pressure does not cause subsidence of the wetlands immediately beneath the equipment and upheaval of adjacent wetlands. Construction mats are to be placed in the wetland from the upland or from equipment positioned on mats if working within a wetland. Dragging construction mats into position is prohibited. Other support structures that are capable of safely supporting equipment may be used with written USACE authorization.

22. Temporary Fill, Work & Construction Mats.

a. *Construction mats in non-tidal waters*: Temporary construction mats shall be in place ≤1 year *and* for one growing season or less to be SV eligible. A PCN is required if construction mats are in place >1 year *or* for more than one growing season. Construction mats can be placed in an area of any size in non-tidal waters. The activity may occur in segments to ensure the requirements for SV above are met, otherwise a PCN is required.

b. *Construction mats in tidal waters*: Temporary construction mats placed in an area <5,000 SF in tidal waters are SV eligible, provided those mats are in place ≤6 months. Temporary construction mats placed in an area ≥5,000 SF or in place >6 months in tidal waters require a PCN.

c. *Management of construction mats:* At a minimum, construction mats shall be managed in accordance with the following construction mat best management practices (BMPs):

1. Mats shall be in good condition to ensure proper installation, use, and removal.
2. As feasible, mats shall be placed in a location that will minimize the amount of mats needed for the wetland crossing(s).
3. Inspect mats prior to their re-use and remove any plant debris. Mats are to be thoroughly cleaned before re-use to prevent the spread of invasive plant species.
4. Impacts to wetland areas shall be minimized during installation, use, and removal of the mats.
5. Adequate erosion & sediment controls shall be installed at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto, the mats.
6. In most cases, mats should be placed along the travel area so that the individual boards are resting perpendicular to the direction of traffic. No gaps should exist between mats. Place mats far enough on either side of the resource area to rest on firm ground.

d. A PCN is required for temporary fills in place >2 years. All temporary fills and disturbed soils shall be stabilized to prevent the material from eroding into waters of the U.S. where it is not authorized. Work shall include phased or staged development to ensure only areas under active development are exposed and to allow for stabilization practices as soon as practicable. Temporary fill must be placed in a manner that will prevent it from being eroded by expected high flows.

e. Activities that require unconfined temporary fill and are authorized for discharge into waters of the U.S. shall consist of material that minimizes effects to water quality.
f. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Materials shall be placed in a location and manner that does not adversely impact surface or subsurface water flow into or out of the wetland. Temporary fill authorized for discharge into wetlands shall be placed on geotextile fabric or other appropriate material laid on the pre-construction wetland grade where practicable to minimize impacts and to facilitate restoration to the original grade. Construction mats are excluded from this requirement.
g. Construction debris and deteriorated materials shall not be located in waters of the U.S.
h. Temporary fills, construction mats, and corduroy roads shall be entirely removed as soon as they are no longer needed to construct the authorized activity and the disturbed areas be restored to pre-construction contours and conditions.
i. Construction equipment, such as temporary barges in tidal waters, shall provide clearance above the substrate to avoid grounding onto the substrate during all tides.

23. Restoration of Wetland Areas.
a. Upon completion of construction, all disturbed wetland areas shall be stabilized with a wetland seed mix or plant plugs containing only plant species native to New England, and be appropriate for site conditions, including salinity and frequency of inundation, and shall not contain any species listed in the “Invasive and Other Unacceptable Plant Species” Appendix K of the New England District “Compensatory Mitigation Standard Operating Procedures” found at https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
b. The introduction or spread of invasive plant species in disturbed areas shall be prevented and controlled. Equipment shall be thoroughly cleaned before and after project construction to prevent the spread of invasive species. This includes, but is not limited to, tire treads and construction mats.
c. In areas of authorized temporary disturbance, if trees are cut in USACE jurisdiction, they shall be cut at or above ground level and not uprooted in order to prevent disruption of any kind to the wetland soil structure and to allow stump sprouts to revegetate the work area, unless otherwise authorized.
d. Wetland areas where permanent disturbance is not authorized shall be restored to their original condition and elevation, which under no circumstances shall be higher than the pre-construction elevation. Original condition means careful protection and/or removal of existing soil and vegetation, and replacement back to the original location such that the original soil layering and vegetation schemes are approximately the same, unless otherwise authorized.

24. Bank Stabilization.
a. Projects involving construction or reconstruction/maintenance of bank stabilization within USACE jurisdiction shall be designed to minimize environmental effects, effects to neighboring properties, scour, conversion of natural shoreline to hard armoring, etc. to the maximum extent practicable.
b. Projects involving the construction of new bank stabilization within USACE jurisdiction shall use bioengineering techniques and natural materials in the project design to the maximum extent practicable. Use of hard structures shall be eliminated or minimized unless the prospective permittee can demonstrate that use of bioengineering techniques is not practicable due to site conditions.
c. Where possible, bank stabilization projects shall optimize the natural function of the shoreline, including self-sustaining stability to attenuate flood flows, fishery, wildlife habitat and water quality protection, while protecting upland infrastructure from storm events that can cause erosion as well as impacts to public and private property.
d. No material shall be placed in excess of the minimum needed for erosion protection.
e. No material shall be placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas).

f. Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization.
g. The activity must be properly maintained, which may require repairing it after severe storms or erosion events.

25. Soil Erosion and Sediment Controls.
a. Appropriate soil erosion and sediment controls[1] (hereinafter referred to as "controls") must installed prior to earth disturbance and maintained in effective operating condition during construction. Biodegradable wildlife friendly erosion controls should be used whenever practicable to minimize effects to water quality.
b. Activities in streams (rivers, streams, brooks, etc.) and tidal waters that are capable of producing sedimentation or turbidity should be done during periods of low-flow or no-flow, when the stream or tide is waterward of the work area. Controls may also be used to obtain dry work conditions (e.g., coffer dam, turbidity curtain). The prospective permittee must demonstrate in the project plans where the controls are proposed and how these controls would avoid and/or minimize turbidity or sedimentation.
c. A PCN is required for controls that encroach: i) >25% of the stream width measured from OHW in non-tidal diadromous streams from March 15 to June 30; or ii) >25% of the waterway width measured from MHW in tidal waters from Feb. 1 to June 30, or >50% of the waterway width measured from MHW in tidal waters from July 1 to Jan. 14. This is to protect upstream fish passage. Proponents must also maintain downstream fish passage throughout the project.
d. No dewatering shall occur with direct discharge to waters or wetlands. Excess water in isolated work areas shall be pumped or directed to a sedimentation basin, tank or other dewatering structures in an upland area adequately separated from waters or wetlands. Suspended solids shall be removed prior to discharge back into waters or wetlands from these dewatering structures. All discharge points back into waters and wetlands shall use appropriate energy dissipaters and erosion and sedimentation control BMPs.
e. Temporary controls shall be removed upon completion of work, but not until all exposed soil and other fills, as well as any work waterward of OHW or the HTL, are permanently stabilized at the earliest practicable date. Sediment and debris collected by these devices shall be removed and placed at an upland location in a manner that will prevent its later erosion into a waterway or wetland. Controls may be left in place if they are biodegradable and flows and aquatic life movements are not disrupted.

26. Aquatic Life Movements and Management of Water Flows.
a. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies and wetlands shall be:
   i. Suitably spanned, bridged, culverted, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species; and
   ii. Properly aligned and constructed to prevent bank erosion or streambed scour both adjacent to and inside the crossing.

[1] Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

b. To avoid adverse impacts on aquatic organisms, the low flow channel/thalweg shall remain unobstructed during periods of low flow, except when necessary to perform the authorized work.
c. For work in tidal waters, in-stream controls (e.g., cofferdams) should be installed in such a way as to not obstruct fish passage.
d. Riprap and other stream bed materials shall be installed in a manner that avoids organism entrapment in rock voids or water displaced to subterranean flow with crushed stone and riprap.
e. To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity shall not restrict or impede the passage of normal or high flows unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

27. Spawning, Breeding, and Migratory Areas.
a. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized under these GPs.
b. Activities in waters of the U.S. that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.
c. The applicant is responsible for obtaining any "take" permits required under the USFWS's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The applicant should contact the appropriate local office of the USFWS to determine if such "take" permits are required for a particular activity.
d. Information on spawning habitat for species managed under the Magnuson-Stevens Fishery Conservation and Management Act (i.e., EFH for spawning adults) can be obtained from NAE Regulatory website, Essential Fish Habitat section, at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. Information regarding diadromous fish habitat can be obtained from the following DMF website at: https://www.mass.gov/info-details/massgis-data-diadromous-fish.

28. Vernal Pools.
a. A PCN is required if a discharge of dredged or fill material is proposed within a vernal pool depression that is also a water of the U.S.
b. Vernal pools must be identified on the plans that show aquatic resource delineations.
c. Adverse impacts to vernal pools shall be avoided & minimized to the maximum extent practicable.

29. Invasive Species.
a. The introduction, spread or the increased risk of invasion of invasive plant or animal species on the project site, into new or disturbed areas, or areas adjacent to the project site caused by the site work shall be avoided. Construction mats shall be thoroughly cleaned before reuse to avoid spread of invasive species.
b. Unless otherwise directed by USACE, all applications for PCN non-tidal projects proposing fill in USACE jurisdiction shall include an Invasive Species Control Plan. Additional information can be found at: https://www.nae.usace.army.mil/Missions/Regulatory/Invasive-Species/, https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/.

30. Fills Within 100-Year Floodplains. The activity shall comply with applicable Federal Emergency Management Agency (FEMA) approved, Massachusetts Emergency Management

Agency (MEMA) approved and/or local floodplain management requirements. Applicants should contact FEMA and/or MEMA regarding floodplain management requirements.

31. Stream Work and Crossings & Wetland Crossings.
a. When feasible, all temporary and permanent crossings of waterbodies and wetlands (hereinafter referred to as "crossings") shall conform to the "Massachusetts River and Stream Crossing Standards" located at: https://www.mass.gov/doc/massachusetts-river-and-stream-crossing-standards/download or https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Projects that do not conform to these guidelines shall be reviewed under PCN or IP procedures.
b. Crossings shall be suitably culverted, bridged, or otherwise designed to withstand and to prevent the restriction of high flows, to maintain existing low flows, maintain water quality, and not obstruct the movement of aquatic life indigenous to the waterbody beyond the duration of construction.
c. Crossings shall be installed in such a manner as to preserve hydraulic capacity and flow, sediment transport, and organism passage at its present level, between the wetlands on either side of the road. The applicant shall take necessary measures to correct any wetland damage resulting from deficiencies in hydraulic capacity, sediment transport and organism passage.
d. Stream crossings shall utilize a natural mixed grain-size streambed material composition that matches upstream and downstream substrates to create a stable streambed. Substrate should function appropriately during normal and high flows without washing out. If natural streambed material is not utilized, a PCN is required.
e. Activities involving open trench excavation in flowing waters require a PCN. Work should not occur in flowing waters (requires using management techniques such as temporary flume pipes, culverts, cofferdams, etc.). Normal flows should be maintained within the stream boundary's confines when practicable. Projects utilizing these management techniques must meet all applicable terms and conditions of the GP, including the GCs in Section IV.

32. Utility Line Installation and Removal
a. Subsurface utility lines must be installed at a sufficient depth to avoid damage from anchors, dredging, etc., and to prevent exposure from erosion and stream adjustment.
b. When utility lines are installed via horizontal directional drilling, a frac-out contingency plan shall be present on site for the duration of construction. As necessary, the applicant shall immediately contain, control, recover, and remove drilling fluids released into the environment.
c. Abandoned or inactive utility lines must be removed and faulty lines (e.g., leaking hazardous substances, petroleum products, etc.) must be removed or repaired. A written verification from the USACE is required if they are to remain in place, e.g., to protect sensitive areas or ensure safety.
d. Utility lines shall not adversely alter existing hydrology, and trenches cannot be constructed or backfilled in such a manner as to drain waters of the U.S. (e.g., backfilling with extensive gravel layers, creating a French drain effect). In wetland areas, structures such as ditch plugs, cut-off walls, clay blocks, bentonite, or other suitable material shall be used within utility trenches to ensure that the trench through which the utility line is installed does not drain waters of the U.S. including wetlands.
e. Stockpiling of tree debris, to the extent where it has the effect of fill material, shall not occur in waters of the U.S. Tree debris shall be removed from waters of the U.S. and placed in uplands without causing additional disturbance to aquatic resources. Failure to meet this condition could change the bottom elevation of the wetland and be considered a discharge of fill material, and depending on the area of alteration, may require a PCN or IP.

33. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

34. Coral Reefs. Impacts to coral reefs are not authorized under these GPs. Coral reefs consist of the skeletal deposit, usually of calcareous or silicaceous materials, produced by the vital activities of anthozoan polyps or other invertebrate organisms present in growing portions of the reef.

35. Blasting. Blasting in waters of the U.S. associated with work such as dredging, trenching, pile installation, etc. is not authorized under these GPs.

36. Inspections. The permittee shall allow USACE to make periodic inspections at any time deemed necessary to ensure that the work is being or has been performed in accordance with the terms and conditions of this permit. To facilitate these inspections, for activities requiring a PCN, the permittee shall complete and return the Certificate of Compliance when it is provided with a PCN verification letter. For SV-eligible activities, the permittee shall complete and submit the SVN to USACE within 30 days of initiating project construction, at which point, USACE may opt to inspect the activity to verify compliance with the terms and conditions of the GP. Post-construction engineering drawings may be required by USACE for completed work. This includes post-dredging survey drawings for any dredging work.

37. Maintenance. The permittee shall maintain the activity authorized by these GPs in good condition and in conformance with the terms and conditions of this permit. Some maintenance activities may not be subject to federal regulation under Section 404 in accordance with 33 CFR 323.4(a)(2). This condition is not applicable to maintenance of dredging projects. Prospective permittees should contact USACE to inquire about maintenance of dredging projects, and its eligibility under these GPs. Maintenance dredging is subject to the review thresholds in GP #7 as well as any conditions included in a written USACE authorization. Maintenance dredging includes only those areas and depths previously authorized and dredged.

38. Property Rights. Per 33 CFR 320.4(g)(6), these GPs do not convey any property rights, either in real estate or material, or any exclusive privileges, nor do they authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations.

39. Transfer of GP Verifications. When the work authorized by these GPs is still in existence at the time the property is transferred, the terms and conditions of these GPs, including any special conditions, will continue to be binding on the entity or individual who received the GP authorizations, as well as the new owner(s) of the property. If the permittee sells the property associated with a GP authorization, the applicant may transfer the GP authorization to the new owner by submitting a letter to USACE to validate the transfer. A copy of the GP authorization letter must be attached to the letter, and the letter must include the following statement: “The terms and conditions of these general permits, including any special conditions, will continue to be binding on the new owner(s) of the property.” This letter shall be signed by both the seller and new property owner(s).

40. Modification, Suspension, and Revocation. These GPs and any individual authorization issued thereof may be either modified, suspended, or revoked in whole or in part pursuant to the policies and procedures of 33 CFR 325.7; and any such action shall not be the basis for any claim for damages against the U.S.

41. Special Conditions. The USACE may impose other special conditions on a project authorized pursuant to these GPs that are determined necessary to minimize adverse navigational and/or environmental effects or based on any other factor of the public interest. Failure to comply with all conditions of the authorization, including special conditions, constitutes a permit violation and may subject the applicant to criminal, civil, or administrative penalties or restoration.

42. False or Incomplete Information. If USACE makes a determination regarding the eligibility of a project under these GPs, and subsequently discovers that it has relied on false, incomplete, or inaccurate information provided by the applicant, the authorization will not be valid, and the U.S. Government may institute appropriate legal proceedings.

43. Abandonment. If the permittee decides to abandon the activity authorized under these GPs, unless such abandonment is merely the transfer of property to a third party, he/she/they may be required to restore the area to the satisfaction of USACE.

44. Enforcement cases. These GPs do not apply to any existing or proposed activity in USACE jurisdiction associated with an on-going USACE or EPA enforcement action, until such time as the enforcement action is resolved or USACE or EPA determines that the activity may proceed independently without compromising the enforcement action.

45. Previously Authorized Activities.

a. Completed projects that received prior authorization from USACE (SV or PCN), shall remain authorized in accordance with the original terms and conditions of those authorizations, including their terms, GCs, and any special conditions provided in a written verification.

b. Activities authorized pursuant to 33 CFR 330.3 (activities occurring before certain dates) are not affected by these GPs.

46. Duration of Authorization.

These GPs expire on June 1, 2028. Activities authorized under these GPs will remain authorized until the GPs expire, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization in accordance with 33 CFR 325.2(e)(2). Activities authorized under GPs 1-25 that have either commenced (i.e., are under construction) or are under contract to commence in reliance upon this authorization will have until June 1, 2029 to complete the work. If requested by USACE, the permittee shall furnish documentation that demonstrates the project was under construction or under contract to commence by June 1, 2028. If work is not completed before June 1, 2029, the permittee must contact USACE. The USACE may issue a new authorization provided the project meets the terms and conditions of the MA GPs in effect at the time. Activities completed under the SV or PCN authorizations of these GPs will continue to be authorized after their expiration date.

SECTION V: MITIGATION STANDARDS

1. Mitigation Types

For all activities, applicants must (a) demonstrate how the project has been designed to avoid or minimize impacts to aquatic resources; and (b) describe measures taken to avoid or minimize impacts to aquatic resources through construction techniques and/or site access. Please see https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/ for assistance with preparing mitigation in accordance with the 2008 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 CFR 332.3), hereafter referred to as "2008 Mitigation Rule."

Avoidance - Avoidance of impacts (direct and indirect) to aquatic resources means that project activities would not result in the placement of fill material or installation of a structure that could impact the resource area. Avoidance can include, but is not limited to, designing the project to avoid impacts to all or a portion of the aquatic resource areas.

Minimization - Minimization of impacts (direct and indirect) to aquatic resources means that measures are taken to ensure the amount and duration of impacts are limited to the maximum extent practicable. There are many minimization measures that could be implemented, prior to, during, or after the proposed activity, to ensure impacts are minimized. Examples include, but are not limited to:

- Permanent preservation of avoided aquatic features and buffer zone, in perpetuity. In these cases, the preserved area would be under a conservation easement and managed by conservation oriented third-party manager.
- Utilization of best management practices (BMPs) to ensure impacts are limited, and do not result in adverse impacts to the integrity and long-term functions of preserved/avoided features.

Compensatory Mitigation - Compensatory mitigation is generally required for PCN activities in which the impacts to the aquatic resources have been avoided and minimized to the maximum extent practicable but would still result in unavoidable adverse effects to the environment that are considered more than minimal or are contrary to the public interest. *Whatever the case may be, compensatory mitigation is no substitute for avoidance and minimization.*

2. Thresholds for Compensatory Mitigation

The basic objective of compensatory mitigation in the USACE Regulatory Program is to offset environmental losses resulting from unavoidable impacts to waters of the U.S. authorized by Department of the Army permits. **The following compensatory mitigation thresholds apply to all PCN activities that result in loss[1] of the resource area types listed below. Activities[2] in waters of the U.S. associated with the restoration, enhancement, and establishment of tidal and non-tidal aquatic resources are not considered loss and are not subject to the thresholds below.** Thresholds for different resource areas may not be combined to exceed 5,000 SF of total loss of all waters. The USACE will continue to evaluate projects on a case-by-case basis, and may in some cases require compensatory mitigation below these thresholds (e.g. minor impacts that add to a cumulative loss).

[1] See definition of loss in Section VII.
[2] These activities must result in net increases in aquatic resource functions and services to be exempted from the thresholds above.

Compensatory Mitigation Thresholds in Massachusetts		
Resource Area	**Non-Tidal Threshold**	**Tidal Threshold**
Stream	200 LF	200 LF
Bank Stabilization	500 LF	500 LF
Open Water	Project Dependent	Project Dependent
Wetland	5,000 SF	500 SF
Vernal Pool	All	N/A
SAV	Project dependent	25 SF
Mudflat	N/A	1,000 SF
Intertidal	N/A	1,000 SF

These thresholds can be utilized to determine at what point compensatory mitigation is required but are not used to determine how much mitigation may be needed to offset impacts to resources. Per the 2008 Mitigation Rule (33 CFR 332.3(f)(1)) "the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions. In cases where appropriate functional or condition assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required. If a functional or condition assessment or other suitable metric is not used, a minimum one-to-one acreage or linear foot compensation ratios must be used."

3. Compensatory Mitigation Hierarchy

Compensatory mitigation should follow the hierarchy as outlined in 33 CFR 332.3(b)(2-6) or current regulation. This hierarchy in order of preference includes: (1) Mitigation Bank credits, (2) In-Lieu Fee program credits, (3) permittee-responsible mitigation under a watershed approach, (4) permittee-responsible mitigation through on-site and in-kind mitigation, and (5) permittee-responsible mitigation through off-site and/or out-of-kind mitigation. If the proposed mitigation deviates from this mitigation hierarchy, the applicant **must** justify in writing why the proposed mitigation is environmentally preferable to the preferred method of compensatory mitigation (See 2008 Mitigation Rule). **In order for your application to be considered complete, you must provide a statement that discusses how your project will compensate for the loss or impact to aquatic resources.** If you are proposing permittee responsible mitigation, the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14) must be addressed for your application to be considered complete. Prospective applicants are encouraged to contact USACE with questions at any time. Addressing the 12 components of a mitigation plan is commensurate with the amount of compensatory mitigation required, and USACE can assist prospective applicants with the level of information needed to satisfy each component.

For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee.

4. In-Lieu Fee (ILF)

The purchase of credits from the Massachusetts In-Lieu Fee Program (MA ILFP) is the ***preferred*** method of compensatory mitigation in Massachusetts since, as of the issuance date of this GP, there are no mitigation banks available in Massachusetts. The applicant shall develop a mitigation plan that addresses the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

The MA ILFP is administered by the Massachusetts Department of Fish & Game (DFG) in accordance with the 2008 Mitigation Rule at 33 CFR 332. The Mitigation Rule governs in-lieu fee compensatory mitigation associated with USACE permits under §404 of the Clean Water Act and/or §9 or §10 of the Rivers and Harbors Act of 1899.

MA ILFP Website: https://www.mass.gov/in-lieu-fee-program

Acceptance of an ILF payment into the ILFP established by the 2014 MA ILFP Instrument (link below) is an acknowledgement by DFG that it assumes all legal responsibility for satisfying the mitigation requirements of the USACE (i.e., the implementation, performance, and long-term management and monitoring of the compensatory mitigation project(s) approved under this Instrument and subsequent Compensatory Mitigation Plans). This transfer of legal responsibility is established by: 1) the approval of this In-Lieu Fee Instrument; 2) receipt by the district engineer of a Notice of Credit Sale and Transfer of Legal Responsibility to DFG that is signed by the DFG and the permittee and dated; and 3) the transfer of fees from the permittee to DFG.

MA ILFP Fact Sheet: https://www.mass.gov/files/documents/2017/01/sj/ilfp-fact-sheet-ma-ilfp-fees.pdf

MA ILFP Instrument: https://www.mass.gov/files/documents/2016/08/nd/ilfp-final-instrument-dfg.pdf

5. Permittee-Responsible

The USACE may determine that the proposed permittee-responsible compensatory mitigation is appropriate on a case-by-case basis. As described in the Compensatory Mitigation Hierarchy section above, applicants must justify in writing why the proposed mitigation is environmentally preferable to the purchase of ILF credits. Applicants are encouraged to contact the USACE prior to submission of a permit application to seek further guidance regarding USACE mitigation requirements.

Applicants will demonstrate their proposed compensatory mitigation in writing by addressing the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14). *Please note that all elements must be addressed, or the permit application will be deemed incomplete.* In certain circumstances, the district engineer may determine that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). Guidance on how to address these components can be found on the New England District Mitigation webpage: https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/

Performance standards will be used to measure the successfulness of the mitigation project. A successful mitigation project is one that is self-sustaining. For a mitigation project that will restore, enhance, or create wetlands, proper performance standards must address hydrology, hydric soils, and hydrophytic vegetation. The mitigation proposal must include an explanation of quantitative methods used to measure the success of performance standards (i.e., percent cover may be measured using vegetation plots, hydrology may be measured using data loggers, soil cores may be taken and evaluated for hydric soil indicators).

Monitoring methods should include quantitative sampling methods following established, scientific protocols. Sampling documentation, as part of monitoring reports, should include maps and coordinates (also shapefiles, if available) showing locations of sampling points, transects, quadrats, etc. In addition, permanent photo stations should be established coincident with sampling locations.

SECTION VI: FEDERAL & STATE AGENCY CONTACT INFORMATION & ORGANIZATIONAL WEBSITES

Federal Agencies

U.S. Army Corps of Engineers
Regulatory Division
696 Virginia Road
Concord, Massachusetts 01742-2751
(978) 318-8338 (phone); (978) 318-8303 (fax)
www.nae.usace.army.mil/missions/regulatory

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930
(978) 281-9300 (phone)
(*Federal endangered species & EFH)*

National Park Service
15 State Street
Boston, Massachusetts 02109
(617) 223-5191 (phone)
(*Wild and Scenic Rivers*)

Chief, Risk Analysis Branch
FEMA Region 1
99 High Street, 6th Floor
U.S. Department of Homeland Security
Boston, Massachusetts 02110
(617) 956-7576 (phone)

U.S. Environmental Protection Agency
5 Post Office Square
Suite 100 (OEP06–3)
Boston, Massachusetts 02109-3912
(617) 918-1692 (phone)

U.S. Army Corps of Engineers
Navigation Division – Section 408
696 Virginia Road
Concord, Massachusetts 01742-2751
See link below for contact information:
https://www.nae.usace.army.mil/Missions/Section-408/

U.S. Fish & Wildlife Service
70 Commercial Street, Suite 300
Concord, New Hampshire 03301
(603) 223-2541 (phone)
(Federal endangered species)

Bureau of Ocean and Energy Management
1849 C Street, NW
Washington D.C. 20240
202-208-6474 (phone)
(*Offshore Wind Facilities)*

Commander (dpb)
First Coast Guard District
Battery Building
One South Street
New York, New York 10004-1466
(212) 514-4331 (phone); (212) 514-4337 (fax)
(*Bridge permits*)

State Agencies in Massachusetts

Massachusetts Department of Environmental Protection (MassDEP)	
DEP Division of Wetlands & Waterways	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 292-5695
Northeast Region	150 Presidential Way, Suite 300 Woburn, Massachusetts 01801 (978) 694-3200
Southeast Region	20 Riverside Drive, Route 105 Lakeville, Massachusetts 02347 (508) 946-2800
Central Region	8 New Bond Street Worcester, Massachusetts 01606 (508) 792-7650
Western Region	436 Dwight Street Springfield, Massachusetts 01103 (413) 784-1100

Massachusetts Office of Coastal Zone Management (CZM) Emails may be sent to: czm@mass.gov	
MA Office of Coastal Zone Management	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1200
North Shore Region	2 State Fish Pier Gloucester, Massachusetts 01930 (978) 281-3972
South Shore Region	175 Edward Foster Road Scituate, Massachusetts 02066
Cape Cod and Islands Region	3195 Main Street, P.O. Box 220 Barnstable, MA 02630
South Coastal Region	81-B County Road, Suite E Mattapoisett, MA 02739

Massachusetts Historical Commission (MHC)	
Office Location:	220 Morrisey Boulevard Boston, Massachusetts 02125 (617) 727-8470

Massachusetts Board of Underwater Archaeological Resources (BUAR) Emails may be sent to: david.s.robinson@mass.gov	
Office Location:	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1014

SECTION VII: Definitions & Acronyms

Artificial or Living Reef: A structure which is constructed or placed in waters for the purpose of enhancing fishery resources and commercial and recreational fishing opportunities.
Attendant Features: Occurring with or as a result of; accompanying.
Biodegradable: A material that decomposes into elements found in nature within a reasonably short period of time and will not leave a residue of plastic or a petroleum derivative in the environment after degradation. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Examples of biodegradable materials include jute, sisal, cotton, straw, burlap, coconut husk fiber (coir) or excelsior. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Photodegradable, UV degradable or Oxo-(bio)degradable plastics are not considered biodegradable under this GP.
Boating facilities: These provide, rent or sell mooring space, such as marinas, yacht clubs, boat yards, dockominiums, municipal facilities, land/home owners, etc. Not classified as boating facilities are piers shared between two abutting properties or municipal mooring fields that charge an equitable user fee based on the actual costs incurred.
Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. Must comply with the applicable provisions of 33 CFR 332. See also the New England District Compensatory Mitigation Guidance at http://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
Construction mats: Constructions, swamp and timber mats (herein referred to as “construction mats”) are generic terms used to describe structures that distribute equipment weight to prevent wetland damage while facilitating passage and providing work platforms for workers and equipment. They are comprised of sheets or mats made from a variety of materials in various sizes. A timber mat consists of large timbers bolted or cabled together. Corduroy roads, which are not considered to be construction mats, are cut trees and/or saplings with the crowns and branches removed, and the trunks lined up next to one another. Corduroy roads are typically installed as permanent structures. Like construction mats, they are considered as fill whether they are installed temporarily or permanently.
Cumulative Impacts: The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.1). Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. See 40 CFR 230.11(g).
Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.
Dredging:
Improvement Dredging: For the purposes of these GPs, this is dredging deeper than previously authorized by the USACE and dredged under that authorization.
Maintenance Dredging: For the purposes of these GPs, this is dredging from an area previously authorized by the USACE and dredged under that authorization. The USACE may require proof of authorization and dredging. Maintenance dredging typically refers to the routine removal of accumulated sediment to maintain the design depths of serviceable navigation channels, harbors, marinas, boat launches and port facilities. Maintenance dredging is conducted for navigational purposes and does not include any expansion of the previously dredged area. The USACE may

review a maintenance dredging activity as new dredging if sufficient time has elapsed to allow for the colonization of SAS, shellfish, etc.

New Dredging: For the purposes of these GPs, this is a) first time the USACE authorizes dredging of a particular location or b) dredging has not occurred for an extended period of time, and this has allowed for aquatic resources (i.e., eelgrass, shellfish, etc.) to redevelop in the area.

Dredged material & discharge of dredged material: These are defined at 33 CFR 323.2(c) and (d). The term dredged material means material that is excavated or dredged from waters of the U.S.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s) but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: A stream with flowing water only during, and for a short duration, after precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Erosion Controls: Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area (33 CFR 332.2).

Expansions: Work that increases the footprint of fill, structures, depth of basin or drainage features, or floats, or slip capacity.

Essential Fish Habitat (EFH): The Federal Magnuson-Stevens Fishery Management and Conservation Act broadly defines EFH to include those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. See www.greateratlantic.fisheries.noaa.gov/habitat for more information.

Fill material & discharge of fill material: Material placed in waters of the U.S. where the material has the effect of either replacing any portion of a water of the U.S. with dry land or changing the bottom elevation of any portion of a water of the U.S. Fill material does not include any pollutant discharged into the water primarily to dispose of waste. These are defined at 33 CFR 323.2 (e) & (f).

Federal navigation projects (FNPs): These areas are maintained by the USACE; authorized, constructed and maintained on the premise that they will be accessible and available to all on equal terms; and comprised of USACE Federal anchorages, Federal channels and Federal turning basins. The buffer zone is equal to three times the authorized depth of a FNP. The following are FNPs in MA and more information, including the limits, is provided at www.nae.usace.army.mil/missions/navigation >> Navigation Projects:

- Andrews River, Harwich, MA
- Aunt Lydia's Cove
- Beverly Harbor
- Boston Harbor
- Buttermilk Bay Channel
- Canapitsit Channel
- Cape Cod Canal
- Chatham Harbor
- Cohasset Harbor
- Cross Rip Shoals, Nantucket Sound
- Cuttyhunk Harbor
- Dorchester Bay and Neponset River
- Duxbury Harbor
- Edgartown Harbor
- Essex River
- Fall River Harbor
- Falmouth Harbor
- Gloucester Harbor and Annisquam River
- Green Harbor
- Hingham Harbor
- Hyannis Harbor
- Ipswich River
- Island End River (Chelsea, MA)
- Kingston Harbor
- Lagoon Pond
- Little Harbor Woods Hole

Lynn Harbor
Malden River
Menemsha Creek
Merrimack River
Mystic River
Nantucket Harbor of Refuge
New Bedford and Fairhaven Harbor
Newburyport Harbor
Oak Bluffs Harbor
Pigeon Cove Harbor
Plymouth Harbor
Pollock Rip Shoals, Nantucket Sound
Provincetown Harbor
Red Brook Harbor
Rockport Harbor
Salem Harbor
Sandy Bay Harbor of Refuge
Saugus River
Scituate Harbor
Sesuit Harbor
Taunton River
Vineyard Haven Harbor
Wareham Harbor
Wellfleet Harbor
Westport River and Harbor
Weymouth Back River
Weymouth Fore and Town Rivers
Winthrop Harbor
Woods Hole Channel

Flume: An open artificial water channel, in the form of a gravity chute, which leads water from a diversion dam or weir alongside a natural flow. A flume can be used to measure the rate of flow.
FNP buffer zone: The buffer zone of a USACE Federal Navigation Project (FNP) is equal to three times the authorized depth of the FNP.
Frac out: During horizontal directional drilling (HDD) operations, drilling fluid travels up the borehole into a pit. When the borehole becomes obstructed or the pressure becomes too great inside the borehole, the ground fractures and fluid escapes to the surface and may affect surface waters.
Ground disturbance: Any activity that compacts, relocates, overturns, removes, mixes, or otherwise disturbs the ground, including under water. Ground disturbance can be caused by the use of hand tools (shovels, pick axe, posthole digger, etc.), heavy equipment (excavators, backhoes, bulldozers, dredgers, trenching and earthmoving equipment, etc.), and heavy trucks (large four wheel drive trucks, dump trucks and tractor trailers, etc.). Trenching, bulldozing, dredging, excavating, scraping, and plowing are typical examples of ground disturbance activities.
Height:width ratio: The height of structures shall at all points be equal to or exceed the width of the deck. For the purpose of this definition, height shall be measured from the marsh substrate to the bottom of the longitudinal support beam.
High Tide Line (HTL): The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides 58 that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds. (33 CFR 328). Refer to the highest predicted tide for the current year at the nearest NOAA tide gage. https://tidesandcurrents.noaa.gov/map/index.html
Historic Property: Any prehistoric or historic site (including archaeological sites), district, building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).
Impacts:
Direct Impacts: Effects that are caused by the activity and occur at the same time and place (40 CFR 1508.7).
Indirect impacts: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.
Secondary impacts: Effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.

Information about secondary effects on aquatic ecosystems shall be considered prior to the time final section 404 action is taken by permitting authorities. Some examples of secondary effects on an aquatic ecosystem are: aquatic areas drained, flooded, fragmented; fluctuating water levels in an impoundment and downstream associated with the operation of a dam; septic tank leaching and surface runoff from residential or commercial developments on fill; and leachate and runoff from a sanitary landfill located in waters of the U.S. See 40 CFR 230.11(h).

Incidental Fallback: Incidental fallback is the redeposit of small volumes of dredged material that is incidental to excavation activity in waters of the U.S. when such material falls back to substantially the same place as the initial removal (33 CFR 323.2(d)(2)(iii)).

In the dry: Work that is done under dry conditions, e.g., work behind cofferdams or when the stream or tide is waterward of the work.

Independent utility: A test to determine what constitutes a single and complete non-linear project in the USACE Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Individual permit: A Department of the Army authorization that is issued following a case-by-case evaluation of a specific structure or work in accordance with the procedures of 33 CFR 322, or a specific project involving the proposed discharge(s) in accordance with the procedures of 33 CFR 323, and in accordance with the procedures of 33 CFR 325 and a determination that the proposed discharge is in the public interest pursuant to 33 CFR 320.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Intertidal: The area in between mean low water and the high tide line.

Living reef: See the definition of “artificial or living reef.”

Living shoreline: A term used to describe a low-impact approach with a substantial biological component to shoreline protection and restoration along coastal shores, riparian zones, lacustrine fringe wetlands, or oyster or mussel reef structures. This approach integrates natural features to restore, enhance, maintain, or create habitat, functions, and processes while also functioning to mitigate flooding or shoreline erosion. Living shorelines may stabilize banks and shores with small fetch and gentle slopes that are subject to low-to mid-energy waves. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes.

Loss of waters of the United States: Waters of the U.S. that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the U.S. is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for a GP; it is not a net threshold that is calculated after considering compensatory mitigation that maybe used to offset losses of aquatic functions and services. Waters of the U.S. temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the U.S. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the U.S.

Maintenance: The repair, rehabilitation, or in-kind replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 – "Activities occurring before certain dates," provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Maintenance includes minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make repair, rehabilitation, or replacement are authorized. Currently serviceable means useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Maintenance Exemption: In accordance with 33 CFR 323.4(a)(2), any discharge of dredged or fill material that may result from any of the following activities is not prohibited by or otherwise subject to regulation under Section 404 of the CWA: "Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design."

Mean high water: Line on the shore reached by the plane of the average high water. Where precise determination of the actual location of the line becomes necessary, it must be established by survey with reference to the available tidal datum, preferably averaged over a period of 18.6 years. Less precise methods, such as observation of the "apparent shoreline" which is determined by reference to physical markings, lines of vegetation, or changes in type of vegetation, may be used only where an estimate is needed of the line reached by the mean high water.

Mechanized land clearing: Land clearing activities using mechanized equipment such as backhoes or bulldozers with sheer blades, rakes or discs constitute point source discharges and are subject to section 404 jurisdiction when they take place in wetlands or waters of the U.S (Regulatory Guidance Letter 90-05).

Metallic mineral: Any ore or material to be excavated from the natural deposits on or in the earth for its metallic mineral content to be used for commercial or industrial purposes. "Metallic mineral" does not include thorium or uranium.

Minor deviations: Deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards, which are necessary to make repair, rehabilitation, or replacement are permitted, provided the adverse environmental effects resulting from such repair, rehabilitation, or replacement are minimal.

Natural Rocky Habitats: Intertidal and subtidal substrates of pebble-gravel, cobble, boulder, or rock ledge and outcrops. Manufactured stone (e.g., cur or engineered riprap) is not considered a natural rocky habitat. Natural rocky habitats are either found as pavement (consolidated pebble-gravel, cobble, or boulder areas) or as a mixture with fines (i.e., clay and sand) and other substrates. Rocky habitats as EFH are defined as follows: (1) All pebble-gravel, cobble, or boulder pavements; (2) Pebble-gravel mixed with fines: mixed substrate of pebble-gravel and fines where pebble-gravel is an evident component of the substrate (either through visual observation or within sediment samples). Sediment samples with a content of 10% or more of pebble-gravel in the top layer (6-12 inches) should be delineated; (3) Scattered cobble, scattered boulder, scattered cobble/boulder: mixed substate of cobble and/or boulder and other substrates. The aerial extent of cobbles and/or boulders should be delineated; and (4) All rock ledge outcrops: area should be delineated along the edge of the ledge/outcrop (as defined by NMFS Habitat and Ecosystems Services Branch, Gloucester, MA).

Navigable waters or Navigable waters of the U.S.: These waters are subject to section 10 of the Rivers and Harbors Act of 1899 and are defined as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce (33 CFR Part 329). Work or structures in navigable

waters require permits pursuant to §9 and §10 of the Rivers and Harbors Act of 1899. Also see the definition of "waters of the U.S." below.
Note: Currently the following non-tidal waters have been determined to be navigable waters of the U.S. subject to permit jurisdiction in Massachusetts: Merrimack River, Connecticut River, and Charles River to the Watertown Dam.
Nearshore disposal: This is defined in the USACE Coastal Engineering Manual as "(1) In beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone. (2) The zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20m." A nearshore berm is an artificial berm built in shallow water using dredged material. Often, the berm is intended to renourish the adjacent and downdrift shore over time under the influence of waves and currents.
Non-regulated activity: Only structures or fills that were previously authorized and are in compliance with the terms and condition of the original authorization can be maintained as a non-regulated activity under 33 CFR 323.4(a)(2). Minor deviations from the previously authorized footprint do not qualify as a non-regulated activity and require new authorization from the USACE. The state's maintenance provisions may differ from the USACE and a project may require reporting and written authorization from the state.
Non-tidal wetlands: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the HTL (*i.e.,* spring HTL). Also see the definition of "Waters of the U.S." below.
Oil or natural gas pipeline: Any pipe or pipeline for the transportation of any form of oil or natural gas, including products derived from oil or natural gas, such as gasoline, jet fuel, diesel fuel. heating oil, petrochemical feedstocks, waxes, lubricating oils, and asphalt.
Ordinary High Water Mark (OHWM): A line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas. See 33 CFR 328.3(e).
Overall project: The overall project, for purposes of these GPs, includes all regulated activities that are reasonably related and necessary to accomplish the project purpose. Also see the definition of "single and complete linear project."
Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.
Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.
Permanent impacts: Permanent impacts means waters of the U.S. that are permanently affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent impacts include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody.
Preconstruction notification (PCN): A request submitted by the applicant to the USACE for confirmation that a particular activity is authorized by these GPs. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Preconstruction notification may be required by the terms and conditions of these GPs. A PCN may be voluntarily submitted in cases where PCN is not required and the applicant wants confirmation that the activity is authorized under these GPs.
Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions (33 CFR 332.2).
Real estate subdivision: Includes circumstances where a landowner or developer divides a tract of land into smaller parcels for the purpose of selling, conveying, transferring, leasing, or

developing said parcels. This would include the entire area of a residential, commercial or other real estate subdivision, including all parcels and parts thereof

Reconfiguration zone: A USACE authorized area in which permittees may rearrange pile-supported structures and floats without additional authorizations. A reconfiguration zone does not grant exclusive privileges to an area or an increase in structure or float area.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/ historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in again in aquatic resource area and functions (33 CFR 332.2).

Reference Site: Reference sites - Compensatory restoration, rehabilitation, and creation mitigation projects should seek to duplicate the features of reference aquatic resources or enhance connectivity with adjacent natural upland and aquatic resource landscape elements. Performance standards related to reference sites are encouraged. Mitigation project sites must be selected based on their ability to be, and continue to be, resistant to disturbance from the surrounding landscape, by locating them adjacent to refuges, buffers, green spaces, and other preserved natural elements of the landscape. In general, aquatic resource mitigation projects must be designed to be self-sustaining, natural systems within the landscape and climate in which they are located, with little or no ongoing maintenance and/or hydrologic manipulation.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area (33 CFR 332.2).

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation (33 CFR 332.2).

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Sedimentation: Sedimentation is defined as the process of deposition of a solid material from a state of suspension. Deposited sediments may accumulate and have temporal impacts to aquatic resource areas. See secondary effects definition above. For the purposes of this document, “greater than minimal sedimentation” is generally not considered to occur when using proper erosion controls (GC 25) or when sedimentation is considered “de minimis” 33 CFR 323.2(d)(5).

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term “single and complete project” is defined as that portion of the total linear project proposed or accomplished by one owner/ developer or partnership or other association of owners/developers that includes all crossings of a single water of the U.S. (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for the purposes of these GPs. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term “single and complete project” is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete

non-linear project must have independent utility (see the definition of “independent utility”). Single and complete non-linear projects may not be “piecemealed” to avoid the limits in a GP authorization.

Special aquatic sites (SAS): These include inland and saltmarsh wetlands, mud flats, vegetated shallows, sanctuaries and refuges, coral reefs, and riffle and pool complexes. These are defined at 40 CFR 230.3 and listed in 40 CFR 230 Subpart E.

Streambed: The stream substrate between the OHW marks on each side. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the streambed, but outside of the OHW marks, are not considered part of the streambed.

Stream channelization: The manipulation of a stream’s course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the U.S.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Temporal loss: The time lag between the loss of aquatic resource functions caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site(s) (33 CFR 332.2).

Temporary impacts: Temporary impacts include, but are not limited to, jurisdictional waters that are temporarily filled, flooded, excavated, or drained because of the regulated activity. Impacts are considered temporary when they are removed immediately upon completion of the activity. Note: An impact is considered temporary when the aquatic resource is restored to pre-project conditions, but effects to archaeological and/or cultural resources may be permanent in duration.

Tidal wetlands: A wetland that is subject to the ebb and flow of the tide. See the definition of “Waters of the U.S.” below.

Tide gates: Structures such as duckbills, flap gates, manual and self-regulating tide gates, etc. that regulate or prevent upstream tidal flows.

Turbidity: A measure of the level of particles such as sediment, plankton, or organic by-products, in a body of water. As the turbidity of water increases, it becomes denser and less clear due to a higher concentration of these light-blocking particles. Suspended solids are more likely to carry toxic chemicals, and can also negatively affect aquatic organisms, water temperature, and dissolved oxygen levels.

Utility line: Any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose that is not oil, natural gas, or petrochemicals. A utility line also includes any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. The term ‘utility line’ does not include activities that drain a water of the U.S., such as drainage tile or French drains, but it does apply to pipes conveying drainage from another area.

Vegetated shallows: Permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as eelgrass *(Zostera marina)* and widgeon grass (*Rupia maritima*) in marine systems (does not include salt marsh) as well as a number of freshwater species in rivers and lakes. These are a type of SAS defined at 40 CFR 230.43. Vegetated shallows are commonly referred to as submerged aquatic vegetation or SAV. Vegetated shallow survey guidance is located at www.nae.usace.army.mil/missions/regulatory /jurisdiction-and-wetlands. Maps of vegetated shallows in Massachusetts are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.

Vernal pools: For the purposes of these GPs, vernal pools are depressional wetland basins that typically dry up in most years and may contain inlets or outlets, typically of intermittent flow. Vernal pools range in both size and depth depending upon landscape position and parent material(s). In

most years, vernal pools support one or more of the following obligate indicator species: wood frog, spotted salamander, blue-spotted salamander, marbled salamander, Jefferson's salamander and fairy shrimp. However, they should preclude sustainable populations of predatory fish.

Water diversions: Water diversions are activities such as bypass pumping (e.g., "dam and pump") or water withdrawals. Temporary flume pipes, culverts or cofferdams where normal flows are maintained within the stream boundary's confines aren't water diversions. "Normal flows" are defined as no change in flow from pre-project conditions.

Waters of the United States (U.S.) These waterbodies are the waters where permits are required for the discharge of dredged or fill material pursuant to §404 of the CWA. These waters include but are not limited to navigable waters of the U.S. and tidal wetlands and include many non-tidal wetlands and other waterbodies. See definitions for navigable waters of the U.S., tidal wetlands, waterbody, and non-tidal wetlands. (33 CFR 328)

Waterbody: Examples of "waterbodies" include oceans, coastal waters, rivers, streams, ditches, lakes, ponds, and wetlands. If a wetland is adjacent to a waterbody determined to be a water of the U.S., that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

Weir: A barrier across a river designed to alter the flow characteristics. In most cases, weirs take the form of a barrier, smaller than most conventional dams, across a river that causes water to pool behind the structure and allows water to flow over the top. Weirs are commonly used to alter the flow regime of a river, prevent flooding, measure discharge and help render a river navigable.

Wetland: Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. The Corps of Engineers Wetlands Delineation Manual in conjunction with the associated regional supplement should be used to determine if a wetland is present and delineate wetland boundaries.

Acronyms

BMPs	Best Management Practices
BUAR	Massachusetts Board of Underwater Archaeological Resources
CWA	Clean Water Act
CZM	Coastal Zone Management
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EFH	Essential Fish Habitat
FNP	Federal Navigation Project
GC	General Condition
GP	General Permit
HTL	High Tide Line
IP	Individual Permit
LID	Low impact development
MassDEP	Massachusetts Department of Environmental Protection
MA DMF	Massachusetts Division of Marine Fisheries
MHC	Massachusetts Historical Commission
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
OHW	Ordinary High Water Mark
PCN	Preconstruction Notification
SAS	Special Aquatic Sites
SF	Square Feet
SV	Self-Verification
SHPO	State Historic Preservation Officer
THPO	Tribal Historic Preservation Officer
USFWS	U.S. Fish and Wildlife Service
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USGS	U.S. Geological Service
WQC	Water Quality Certification

Appendix A: Guidance for NHPA Section 106 Compliance in Massachusetts

1. Purpose & Applicability

Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (54 U.S.C § 306108), requires Federal agencies to take into account the effects of their undertakings on Historic Properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Therefore, in order for an activity to be eligible for authorization under the 2023 Massachusetts General Permit, the USACE must consider the effect the activity may have on historic properties. Historic properties may include, but are not limited to, historic districts, archaeological districts, sites, buildings, structures, objects, sacred sites, traditional cultural places, and traditional cultural landscapes that are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

This guidance applies to projects that require authorization under Section 404 of the Clean Water Act (33 U.S.C. § 1344) and/or Section 10 of the Rivers and Harbors Act (33 U.S.C. §403) and will assist applicants when evaluating and documenting the presence of historic properties within or near their project site(s). The prospective applicant will evaluate their proposed project using the criteria below to determine if their project has the potential to affect historic properties and if so, whether or not historic properties are present or are likely to be present. All activities authorized under these GPs shall follow the terms outlined in General Condition 14: Historic Properties and General Condition 6: Tribal Rights & Burial Sites. Prospective applicants shall complete their due diligence according to the procedures below for their application to be deemed complete.

2. No Potential to Affect Historic Properties

Certain activities do not have the potential to cause effects on historic properties, assuming such historic properties were present, based on the nature of the activity and site-specific conditions. Therefore, these activities **do not** require historic property identification efforts or notification of the SHPO, THPOs, and/or BUAR under Section 106. The USACE has determined the following activities within the stated parameters have no potential to affect historic properties:

General Permit	Activity Parameters
1	Temporary buoys, markers and similar structures that are placed during winter events on ice and removed before spring thaw.
2	Repair or rehabilitation of structures that are less than 45 years in age. Any temporary structures or fills or work necessary to complete repairs or rehabilitation must not result in any ground disturbance.
3	Maintenance and replacement of moorings that are less than 45 years in age.
6	Maintenance, repair, replacement, or removal of utility lines, oil or natural gas pipelines, outfall or intake structures, and/or appurtenant features that are less than 45 years in age when all access, staging, and ground disturbance is strictly limited to previously disturbed areas (including any previous ground disturbance). Replacement must be in kind or smaller in size. Installation of tide gates on outfall structures that are less than 45 years in age.
7	Maintenance dredging of previously dredged areas where dredging does not extend beyond the original bottom elevations.

	Disposal of dredged material at an existing established and USACE-approved confined aquatic disposal cell. Beach nourishment in ongoing existing nourishment areas.
11	Fish and wildlife harvesting and attraction devices and activities.
13	Cleanup of hazardous and toxic waste materials, including contaminated sediments, that are less than 45 years in age.
16	Removal of land-based and water-based renewable energy generation facilities and hydropower projects that are less than 45 years in age.
18	Installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures for previously authorized by the USACE and ongoing aquaculture activities. Discharges of dredged or fill material into tidal or non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities for previously authorized and ongoing aquaculture activities.
20	Maintenance activities for existing living shorelines excluding maintenance activities that require new ground disturbance such as excavation or re-sloping of the bank/shoreline.
22	Reshaping or maintenance of existing drainage ditches less than 45 years in age excluding ditch enlargement.
23	Placement of temporary and removable linear transportation and wetland/stream crossings that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
24	Placement of temporary and removable crossings and cofferdams that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
25	Emergency repair of existing structures and/or fills less than 45 years in age.

3. Historic Property Identification

If the activity does not fit under the criteria above, the following historic property identification efforts must be completed to demonstrate compliance with Section 106 of the NHPA. This includes documenting previously identified and unidentified historic properties in the project area.

a. Previously Identified Historic Properties: The prospective applicant shall document if previously identified historic properties are present on or adjacent to the project site by notifying the Massachusetts Historical Commission (MHC) and the Massachusetts Board of Underwater Archaeological Resources (BUAR), as appropriate, of the proposed project. The MHC and BUAR will check their records for the presence of any previously identified historic properties. The following outlines how prospective applicants should notify the MHC and BUAR.

i. The prospective applicant will notify the SHPO and BUAR to identify any previously recorded cultural resources. Applicants shall mail a completed Project Notification Form[18], project narrative, location (coordinates), plans, soil maps, and information on known cultural resources to the MHC. The MHC does not accept submissions via email. Applicants shall email or mail this information to the BUAR when the activity is located in lakes, ponds, rivers, and/or navigable waters in MA. Emailed file attachments should be <10MB. Any files >10MB shall be delivered via a file exchange system or the hard copy documents shall be mailed. Preferred contact information is listed below.

ii. **When sending this information, applicants must also document proof of receipt OR proof the information was delivered.** Proof of receipt constitutes a certified mail receipt, read email receipt, or other mail/email/online tracking services that document the information has reached the intended recipient(s). Proof the information was delivered constitutes a certificate of mailing, email delivery receipt, or other mail/email/online services that document the information was sent at a particular time. When using proof of delivery such (e.g., certificate of mailing), applicants should add 5 days to the 30-day notification period so the mail has time to reach its intended recipient. When using proof of receipt, the applicant may begin the 30-day notification period from the date received by the intended recipient.

iii. When mailing or emailing the application materials, applicants should include the following statement: "Please send responses to this notification directly to the USACE via email: cenae-r-ma@usace.army.mil or address regular mail responses to: Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, Massachusetts 01742-2751." Email responses to the USACE are strongly preferred. The SHPO and BUAR will contact the USACE and cc the applicant(s) within 30 days of receiving the notification if their records indicate that historic properties are located in the project vicinity, and if additional review and/or surveys are recommended to ensure NHPA compliance. If the SHPO and/or BUAR do not respond within 30 days of receiving the notification, is it presumed that no known historic properties are present.

b. Previously Unidentified Historic Properties: The prospective applicant shall evaluate the project site and determine the sensitivity for the presence of historic properties if the project site has not been previously surveyed for cultural resources within the last 10 years. If the sensitivity is determined to be moderate to high, an intensive archaeological and/or architectural survey is required to investigate the potential presence of historic properties. The individual conducting this survey must meet the Secretary of the Interior's Standards for Professional Qualifications (48 FR 44738-44739) in the discipline relevant to a particular resource type. For example, archeologists should not document and evaluate buildings or structures and architectural historians should not document and evaluate archaeological sites. The identification and qualifications for those participating in any survey and evaluation of resources should be included with the survey results. The criteria listed below are indicators of low sensitivity for the presence of historic properties for consideration when determining if an archaeological or architectural survey is needed.

Low sensitivity indicators:

- Previous archaeological and/or architectural survey within the last 10 years with negative results.
- In a location created in modern times (i.e., built on fill placed within the last 45 years or within an area excavated within the last 45 years).
- USACE has reviewed the project description and determined that a survey is not warranted based on the proposed activity and its location.

State survey guidance and standards are provided in the September 1995 Historic Properties Survey Manual Guidelines for the Identification of Historical and Archaeological Resources in Massachusetts available. State survey guidance and standards for underwater surveys are provided

[18] https://www.sec.state.ma.us/mhc/mhcform/formidx.htm

in the Board of Underwater Archaeological Resources' 2022 Policy Guidance on Archaeological Investigations and Related Survey Standards for the Discovery of Underwater Archaeological Resources. This guidance is available on the NAE Regulatory website: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

Please note, a negative result from MHC and/or BUAR does not necessarily mean no historic properties are present. Often proposed project sites have not been previously subject to a survey, so historic properties which may be present have not been previously recorded.

4. Tribal Coordination

Prospective applicants shall mail the Project Notification Form, project narrative, location (coordinates), plans with locus map, soil maps, and information on cultural resources to the Wampanoag Tribe of Gay Head (Aquinnah), Mashpee Wampanoag Tribe, Narragansett Indian Tribe, and/or Stockbridge-Munsee Community Band of Mohican Indians with interests in the project location. Preferred tribal contact information, including their respective areas of interest, can be found below. Applicants shall follow the same procedures as identified in Section 3(a)i-iii above when notifying Tribes of the proposed activity. Applicants shall provide the USACE with any responses received from the tribe(s) with their PCN application. If a tribe does not respond within 30 days of receiving the notification, the applicant shall provide USACE with all documentation of tribal outreach with their SV or PCN submission (e.g., emails, letters, phone call log, etc.). If the tribe indicates the presence of a previously unrecorded cultural resource, including a traditional cultural property (TCP) or traditional cultural landscape (TCL), a PCN is required.

5. Effect Determination

The project may have the potential to affect historic properties and/or tribal resources if 1) notification recipients respond within 30 calendar days of notification with concerns, 2) historic properties eligible for listing, or potentially eligible for listing in the NRHP, are present or 3) tribal resources are known to be present. The USACE may need to further review the project to confirm potential effects to historic properties and/or tribal resources. A PCN is required for any activity that may affect a historic property.

The USACE may determine the project will have 'no effect' on historic properties (i.e., no historic properties affected) when procedures outlined in Section 3 above are followed and no cultural resources are identified. Similarly, if historic properties are identified and will be completely avoided, the USACE may determine 'no effect.'

6. Contact Information:

Massachusetts Historical Commission

The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

No email. Applicants or their representatives must send project information via certified mail and submit the certified mail receipt to the USACE or send via regular mail and submit proof of delivery.

Area of concern: All of Massachusetts.

Massachusetts Board of Underwater Archaeological Resources (BUAR)

100 Cambridge Street, Suite 900
Boston, Massachusetts 02114
Email: david.s.robinson@mass.gov

Applicants or their representatives must send project information via email (***strongly preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All waterbodies in Massachusetts.

Wampanoag Tribe of Gay Head (Aquinnah)

Bettina Washington
Tribal Historic Preservation Officer (THPO)
20 Black Brook Road
Aquinnah, Massachusetts 02535
Email: thpo@wampanoagtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Mashpee Wampanoag Tribe

ATTN: David Weeden
Tribal Historic Preservation Officer (THPO)
483 Great Neck Road South
Mashpee, Massachusetts 02649
Email: 106review@mwtribe-nsn.gov
Cc: David.weeden@mwtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Narragansett Indian Tribe

ATTN: John Brown
Tribal Historic Preservation Officer (THPO)
Narragansett Indian Longhouse
4425 South County Trail
Charlestown, Rhode Island 02813
Email: tashtesook@aol.com

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: Massachusetts east of the Connecticut River.

Stockbridge-Munsee Community Band of Mohican Indians

ATTN: Jeff Bendremer
Tribal Historic Preservation Manager
Stockbridge-Munsee Community
Tribal Historic Preservation Extension office
86 Spring Street
Williamstown, Massachusetts 01267
Email: thpo@mohican-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: West of the Connecticut River and Northfield, Montague, Miller's Falls, Turner's Falls, Sunderland, Amherst, Hadley, South Hadley, Chicopee, Springfield and Longmeadow.

APPENDIX B PRE-CONSTRUCTION NOTIFICATION

U.S. Army Corps of Engineers (USACE), New England District (NAE)

PRE-CONSTRUCTION NOTIFICATION (PCN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose The information provided will be used in evaluating activities under Pre-Construction Notification procedures within New England.

Routine Uses This information may be shared with other federal, state, and local government agencies during the application review process. Submission

Disclosure of requested information is voluntary. However, if information is not provided the PCN application cannot be fully evaluated nor can USACE render a permit decision.

Instructions The applicant must complete ALL required sections of this document before their submission to USACE. The PCN submission to USACE shall include one set of drawings which show the location and character of the proposed activity, statements that address each required field below, and documentation that supports each field (e.g., emails, letters, description/narrative, phone calls, surveys, reports, etc.). Electronic submissions to the following address are strongly preferred: cenae-r-ma@usace.army.mil. The email subject line shall contain the following: General Permit #, PCN, City/Town, and date submitted. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
6. APPLICANT'S ADDRESS:	9. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
7. APPLICANT'S PHONE NOs. with AREA CODE	10. AGENT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile	a. Residence b. Business c. Fax d. Mobile

STATEMENT OF AUTHORIZATION

11. I hereby authorize, _____ to act on my behalf as my agent in the processing of this general permit PCN application and to furnish, upon request, supplemental information in support of this general permit PCN application.

_____ _____

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)	14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)	City: State: Zip:
Latitude: °N Longitude: °W	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: Municipality:

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by Proposed General Permit Activity (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration	Purpose

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other GP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project on any related activity (*see instructions*)

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

25. Is Any Portion of the General Permit Activity Already Complete? ☐ Yes ☐ No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

27. List any historic properties that have the potential to be affected by the proposed GP activity or include a vicinity map indicating the location of the historic property or properties. Attach relevant project information, along with any responses received from project notifications to this submittal. (*see instructions*)

28. For a proposed GP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

29. If the proposed GP activity also requires permission from the USACE pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the USACE district having jurisdiction over that project? ☐ Yes ☐ No

If "yes", please provide the date your request was submitted to the USACE District:

30. Does the activity require a 401 Water Quality Certification (WQC)? If so, specify the type of 401 WQC that is required (general or individual). In cases where an individual 401 WQC is required, provide the date the 401 WQC certification request was submitted to the certifying authority and their contact information.

31. If the terms of the GP(s) you want to use require additional information to be included in the PCN (i.e. sampling and analysis plan), please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

32. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The Pre-Construction Notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a

Department of the Army

General Permit (GP) Pre-Construction Notification (PCN)

Blocks 1 through 4. To be completed by the U.S. Army Corps of Engineers.

Block 5. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the PCN, please attach a sheet of paper with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the PCN. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by the applicant, if an agent is to be employed.

Block 12. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 13. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Activity Street Address. If the proposed GP activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. Location of Proposed Activity. Enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area requiring evaluation. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality where the site is located.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide a description of the location of the proposed GP activity, such as lot numbers, tract numbers, or you may choose to locate the proposed GP activity site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed GP activity site if known. If there are multiple locations, please indicate directions to each location on a separate sheet of paper and mark as Block 17.

Block 18. Identify the Specific General Permit(s) You Propose to Use. List the number(s) of the General Permit(s) you want to use to authorize the proposed activity (e.g., GP 4).

Block 19. Description of the Proposed General Permit Activity. Describe the proposed GP activity, including the direct and indirect adverse environmental effects of the proposed activity. The description of the proposed activity should be sufficiently detailed for USACE to determine that the adverse environmental effects of the activity will be no more than minimal. Identify the materials to be used in construction, as well as the methods by which the work is to be done.

Provide drawings to show that the proposed GP activity complies with the terms of the applicable GP(s). Drawings should contain sufficient detail to provide an illustrative description of the proposed GP activity, but do not need to be detailed engineering plans. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 19.

Block 20: Description of Proposed Mitigation Measures. Describe any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed GP activity. The description of any proposed mitigation measures should be sufficiently detailed for USACE to determine how the measures would avoid and minimize adverse environmental effects. If adverse effects exceed the New England District compensatory mitigation thresholds, you must document how compensatory mitigation would be satisfied in Block 24.

Block 21. Purpose of General Permit Activity. Describe the purpose and need for the proposed GP activity. What will it be used for and why? Also include a brief description of any related activities associated with the proposed project. Provide the approximate dates you plan to begin and complete all work.

Block 22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by the Proposed General Permit Activity. For discharges of dredged or fill material into Waters of the U.S., provide the amount of wetlands, streams, or other types of waters filled, flooded, excavated, or drained by the proposed GP activity. For structures or work in Navigable Waters of the U.S. subject to Section 10 of the Rivers and Harbors Act of 1899, provide the amount of navigable waters filled, dredged, occupied by one or more structures (e.g., aids to navigation, mooring buoys) by the proposed GP activity. The area of impact includes the structures or fills with direct or indirect effects to waters of the U.S. The length of impact includes the length of a stream, including is banks, that are directly affected by the structures or fills. The duration of impact should be identified as temporary (xx days) or permanent. The impact purpose should briefly describe what structure or fill is responsible for the impact.

Block 23. Identify Any Other General Permit(s), Regional General Permit(s), or Individual Permit(s) Used to Authorize Any Part of Proposed Activity or Any Related Activity. List any other GP(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. For linear projects, list other separate and distant crossings of waters and wetlands authorized by these GPs that do not require PCNs. If more space is needed, attach an extra sheet of paper marked Block 23.

Block 24. Compensatory Mitigation Statement for Losses Greater Than the New England District Compensatory Mitigation Thresholds. New England District requires compensatory mitigation at a minimum one for one replacement ratio or greater for all aquatic resource losses that require a PCN and exceed the New England District Compensatory Mitigation Thresholds, unless USACE determines in writing that either some other form of mitigation is more environmentally appropriate or the adverse environmental effects of the proposed GP activity are no more than minimal without compensatory mitigation, and provides an activity specific waiver of this requirement. Describe the proposed compensatory mitigation for wetland losses greater than the New England District Compensatory Mitigation Thresholds or provide an explanation of why USACE should not require wetland compensatory mitigation for the proposed GP activity. If more space is needed, attach an extra sheet of paper marked Block 24.

Block 25. Is Any Portion of the General Permit Activity Already Complete? Describe any work that has already been completed for the GP activity.

Block 26. List the Name(s) of Any Species Listed As Endangered or Threatened under the Endangered Species Act that Might be Affected by the General Permit Activity. If you are not a federal agency, and if any listed species or designated critical habitat might be affected or is in the vicinity of the proposed GP activity, or if the proposed GP activity is located in designated critical habitat, list the name(s) of those endangered or threatened species that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 7 of the Endangered Species Act.

Block 27. List Any Historic Properties that Have the Potential to be Affected by the General Permit Activity. If you are not a federal agency, and if any historic properties have the potential to be affected by the proposed GP activity, list the name(s) of those historic properties that have the potential to be affected by the proposed GP activity. Provide all relevant documentation about these historic properties in the PCN submittal. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

Block 28. List the Wild and Scenic River or Congressionally Designated Study River if the General Permit Activity Would Occur in such a River. If the proposed GP activity will occur in a river in the National Wild and Scenic River System or in a river officially designated by Congress as a “study river” under the Wild and Scenic Rivers Act, provide the name of the river. For a list of Wild and Scenic Rivers and study rivers, please visit http://www.rivers.gov/

Block 29. General Permit Activities that also Require Permission from the USACE Under 33 U.S.C. 408. If the proposed GP activity also requires permission from the USACE under 33 U.S.C. 408 because it will temporarily or permanently alter, occupy, or use a USACE federal authorized civil works project, indicate whether you have submitted a written request for section 408 permission from the USACE district having jurisdiction over that project.

Block 30. 401 Water Quality Certification. As described above, specify if the activity requires a 401 WQC from the certifying authority.

Block 31. Other Information Required For General Permit Pre Construction Notifications. The terms of some of the General Permits include additional information requirements for preconstruction notifications:

* Maintenance – information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals.
* Temporary Construction, Access, and Dewatering – a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions.
* Repair of Uplands Damaged by Discrete Events – documentation, such as a recent topographic survey or photographs, to justify the extent of the proposed restoration.
* Commercial Shellfish Aquaculture Activities – (1) a map showing the boundaries of the project area, with latitude and longitude coordinates for each corner of the project area; (2) the name(s) of the species that will be cultivated during the period this GP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area (a detailed survey is not required).Dredging – (1) a proposed sampling and analysis plan shall be provided to USACE for approval prior to its execution. Pre-application meetings are encouraged.
* Beach Nourishment – sediment grain size should be determined for the length of the beach where nourishment is proposed. The frequency and locations of sediment sampling shall be sufficient to identify the sediment composition of the beach profile. This data shall be consolidated to generate a sediment gradation curve for each sampled transect. Each sampled transect should also be identified on the project plans (drawings).

If more space is needed, attach an extra sheet of paper marked Box 31.

Block 32. Signature of Applicant or Agent. The PCN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the PCN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the PCN possesses the requisite property rights to undertake the GP activity (including compliance with special conditions, mitigation, etc.).

DELINEATION OF WETLANDS, OTHER SPECIAL AQUATIC SITES, AND OTHER WATERS

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by the USACE. The permittee may ask the USACE to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the USACE does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. The 60-day PCN review period will not start until a delineation has been completed.

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross Section Map. Identify each illustration with a figure or attachment number. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings should also be included. Please submit one copy of all drawings on 8½ x 11 inch plain white paper (electronic submissions preferred). Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

ADDITIONAL INFORMATION AND REQUIREMENTS

For proposed GP activities that involve discharges into waters of the United States, water quality certification from the State, Tribe, or EPA must be obtained or waived. Some States, Tribes, or EPA have issued water quality certification for one or more GPs. Please check the New England District website to see if water quality certification has already been issued for the GP(s) you wish to use. For proposed GP activities in coastal states, state Coastal Zone Management Act consistency concurrence must be obtained, or a presumption of concurrence must occur. Some States have issued Coastal Zone Management Act consistency concurrences for one or more GPs. Please check the New England District website to see if Coastal Zone Management Act consistency concurrence has already been issued for the GP(s) you wish to use.

APPENDIX C SELF-VERIFICATION NOTIFICATION

U.S. Army Corps of Engineers (USACE)

SELF-VERIFICATION NOTIFICATION (SVN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose This information will be used in evaluating activities under Self-Verification procedures within Massachusetts.

Routine Uses Routine uses will include: (1) Documenting compliance with the terms and conditions of the General Permit (GP) for activities that may require authorization pursuant to one or more of USACE's Regulatory authorities. (2) Records may be referred to other Federal, State, and local agencies for evaluation and enforcement purposes.

Disclosure Failure to fully comply and abide by the GP terms and conditions prior to commencing work and after completion project may result in formal enforcement action, up to and including monetary penalties and/or legal action, pursuant to 33 CFR Part 326.

Instructions The permittee must complete ALL required sections of this document before commencing USACE-regulated activities. A copy of this completed SVN must be kept on site during construction and be made available for review by USACE and other Federal, State, & Local regulatory authorities at any time. Within 30 days of initiating project construction, the permittee shall submit the completed SVN to USACE. The SVN shall be submitted to USACE as **ONE signed document** that includes project plans and documentation that supports each field (e.g., emails, letters, description, phone calls, surveys). Electronic submissions to the following address are strongly preferred: cenae-r-ma-sv@usace.army.mil. The email subject line shall contain the following: GP #, SVN, City/Town, and date submitted.

(ITEMS 1 THRU 3 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED

APPLICANT AND AGENT INFORMATION

4. APPLICANT'S NAME	7. AGENT'S ADDRESS:
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
5. APPLICANT'S ADDRESS:	8. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
6. APPLICANT'S PHONE NOs. w/AREA CODE	9. AGENTS PHONE NOs. w/AREA CODE
a. Residence b. Business c. Fax	a. Residence b. Business c. Fax

NAME, LOCATION, AND DESCRIPTION OF PROJECT SITE

10. PROJECT NAME OR TITLE

11. FILE NUMBER(S) OF PREVIOUS USACE ACTIONS ON THE SITE (if applicable)	12. NAME OF WATERBODY
13. PROJECT COORDINATES (in decimal degrees)	14. PROJECT STREET ADDRESS (if applicable)
Latitude: ◦N Longitude: ◦W	Address
	City - State - Zip -

ACTIVITY TYPE, PROJECT IMPACTS, AVOIDANCE & MINIMIZATION

15. GENERAL PERMIT ACTIVITIES (CHECK ALL THAT APPLY)

1 ☐	6 ☐	11 ☐	16 ☐	21 ☐
2 ☐	7 ☐	12 ☐	17 ☐	22 ☐
3 ☐	8 ☐	13 ☐	18 ☐	23 ☐
4 ☐	9 ☐	14 ☐	19 ☐	24 ☐
5 ☐	10 ☐	15 ☐	20 ☐	25 ☐

16. SUMMARY OF PROJECT IMPACTS (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration

17. PROJECT PLANS (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE ITEMS ARE COMPLETE) (*see instructions*)

- ☐ a. Plans shall at least contain the following: Vicinity Map, Plan View, and Typical Cross Section View of the proposed activity.
- ☐ b. All direct, indirect and secondary impacts from USACE regulated activities are shown on the project plans.
- ☐ c. The size of the impact area for each activity (acre, square feet, linear feet) are shown on the project plans.
- ☐ d. For discharges of fill material (§404), the volume of fill material is identified on the project plans.
- ☐ e. The duration of each impact, permanent or temporary (X days), is identified on the project plans.
- ☐ f. Do activities with permanent impacts result in the loss of waters? If so, this is identified on the project plans.
- ☐ g. All aquatic resources in the vicinity of the USACE regulated activities are delineated on the project plans.

18. AVOIDANCE & MINIMIZATION (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE CRITERIA ARE MET) (*see instructions*)

- ☐ a. The project has been designed to avoid and minimize impacts to aquatic resources.
- ☐ b. The footprint of activities in waters of the U.S. has been reduced to only what is necessary to achieve the overall project purpose.
- ☐ c. All practicable measures have been taken to avoid and minimize impacts to aquatic resources through construction techniques and site access (e.g., Best Management Practices, Time of Year Restrictions).
- ☐ d. All temporary impacts from USACE regulated activities will be restored upon completion of construction and the project area will be returned to pre-construction contours and conditions.

COMPLIANCE WITH FEDERAL REGULATIONS & SUPPLEMENTAL INFORMATION

19. DUE DILIGENCE (*see instructions*)

Complete the entries below to document compliance with the following Federal requirements. Construction may NOT begin if a PCN is/may be required, and you must contact USACE to determine permitting requirements. Documentation that demonstrates how the activity complies with each field below shall be submitted to the USACE as noted in the instructions block. See each General Condition (GC) in the GP for how to comply with each requirement.

a. State Historic Preservation Officer	Select Option
b. Massachusetts BUAR	Select Option
c. Tribal Historic Preservation Officers	Select Option
d. Endangered Species Act - NOAA	Select Option
e. Endangered Species Act - USFWS	Select Option
f. Northern Long Eared Bat (ESA)	Select Option
g. Essential Fish Habitat	Select Option
h. Wild & Scenic Rivers	Select Option
i. 401 Water Quality Certification 401	Select Option
	401 WQC/OOC File Number: OOC issued: 401 issued:
j. Section 408 Permission	Select Option
k. Coastal Zone	Select Option
l. Construction Mats	Select Option
m.Time of Year Restrictions	Select Option
n. Vernal Pools	Select Option
o. Sediment & Erosion Controls	Select Option
p. Stream/Wetland Crossings	Select Option

20. AQUACULTURE ACTIVITIES - GP 18 (*see instructions*)

- ☐ a. If required, an Aquaculture Certification from the Massachusetts Division of Marine Fisheries was obtained prior to commencing work.
- ☐ b. Coordination with the U.S. Coast Guard pursuant to Private Aids to Navigation has occurred prior to commencing work.
- ☐ c. If required, a MEPA Certificate was obtained from the Massachusetts Environmental Protection Agency prior to commencing work. Select Option
- ☐ d. The prospective permittee contacted local authorities (e.g. harbormaster, select board, shellfish constable) for authorization of their facility prior to commencing work.

21. ADDITIONAL INFORMATION/ATTACHMENTS (*see instructions*)

- ☐ a. The project plans are enclosed in this SVN submittal (see block 17).
- ☐ b. The activity Select Option funded through the Bipartisan Infrastructure Bill (also known as the Infrastructure Investment and Jobs Act).
- ☐ c. All required state, local and federal approvals were acquired prior to starting construction in USACE jurisdiction.
- ☐ d. After construction of the activity is completed, a complete Certificate of Compliance will be submitted to USACE.

22. IS THERE ANOTHER LEAD FEDERAL AGENCY:

☐ YES ☐ NO

23. STATEMENT OF AUTHORIZATION *(see instructions)*

I certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

24. SIGNATURES *(see instructions)*

I hereby certify that the information in this Self-Verification Notification is complete and accurate. As the applicant or their duly authorized agent, I certify the activity was completed in accordance with the terms and conditions of the GP. This includes all applicable terms, general conditions, and activity-specific GP criteria. I agree to allow the duly authorized representatives of the Corps of Engineers Regulatory Program and other regulatory or advisory agencies to enter upon the premises of the project site at reasonable times to evaluate inspect and photograph site conditions. This consent to enter the property is superior to, takes precedence over, and waives any communication to the contrary. For example, if the property is posted as “no trespassing” this consent specifically supersedes and waives that prohibition and grants permission to enter the property despite such posting.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a
Department of the Army
General Permit (GP) Self-Verification

Blocks 1 through 3. To be completed by the Corps of Engineers.

Block 4. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the self-verification, please attach a sheet of paper with the necessary information marked Block 4.

Block 5. Address of Applicant. Please provide the full address of the party or parties responsible for the self-verification. If more space is needed, attach an extra sheet of paper marked Block 5.

Block 6. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 7 through 9. To be completed, if you choose to have an agent.

Block 7. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 8 and 9. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 10. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 11. File Number(s) of Previous USACE Actions on the Site Please provide any known USACE file number. If the activity does not have a known USACE file number, you may state N/A.

Block 12. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 13. Proposed Activity Coordinates. Please enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 13.

Block 14. Proposed Activity Street Address. If the proposed activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. General Permit Activity Type. Please select all GP activity types that apply to the proposed activity. A list of GP activity types can be found in Section III of the GP.

Block 16. Summary of Project Impacts. Please provide ALL proposed impacts, both temporary and permanent in duration, that are located in Waters of the United States. The area of impact shall be provided in square feet (SF). When applicable, impacts that result in conversion of stream bank or shoreline must also be identified in linear feet (LF). Dredging or the discharge of dredged or fill material shall also include the volume, cubic yards (CY), of material removed from or placed into Waters of the U.S. If more entries are required, please attach a table matching the desired format in Block 16.

Block 17. Project Plans. Please verify that items a-g are included in the project plans. Three types of illustrations are necessary to properly depict the proposed work. These illustrations or drawings are identified as a Vicinity Map, a Plan View (Aerial view) and a Cross Section Map. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings (longitudinal profile) should also be included. Plans must accurately depict the existing conditions and all aspects of the proposed activity located in waters of the U.S. Please submit one copy of all drawings formatted to print on 8½ x 11 inch or 11 x 17 inch plain white paper. Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be certified engineering sheets; they should be clear, accurate, contain all necessary information, and depict all proposed work. Each submission must also include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by USACE.

Block 18. Avoidance & Minimization. Please verify that items a-d have been implemented for the proposed activity.

Block 19. Due Diligence. Please complete all the fields and submit documentation to USACE to demonstrate compliance with the above requirements. This Documentation may include emails, letters, meeting notes, phone call log, project narrative, project plans, a species list from the NOAA Section 7 Mapper, a completed copy of the IPAC determination keys, etc. Documentation should be limited to what is necessary to demonstrate how the proposed activity meets each requirement. Refer to the MA GP, Appendix A, for specific guidance on the identification of previously identified historic properties and previously unidentified historic properties. Endangered Species: *The applicant must be designated as the non-federal representative for the purposes of Section 7 consultation to select the Rangewide D-Key options. Otherwise, the applicant shall select the following option when IPAC indicates the NLEB is present: "The activity IS located within the NLEB Species Range (PCN Required)."

Block 20. Aquaculture Activities. Please verify that items a-d have been obtained or completed prior to commencing work in waters of the U.S.

Block 21. Additional Information/Attachments. Please verify that items a-d have been completed prior to commencing work in waters of the U.S.

Block 22. Lead Federal Agency. Please identify if there is another lead federal agency involved with the proposed activity. Enter the lead federal agency name (e.g., the Federal Emergency Management Agency, FEMA) and the agency's designated person of contact for the activity.

Block 23. Statement of Authorization. The applicant shall sign this section for all activities. If an agent is to be employed, the agent shall sign this section.

Block 24. Signatures. The SVN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the SVN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the SVN possesses the requisite property rights to undertake the GP activity.

US Army Corps of Engineers®
New England District

APPENDIX D: PCN APPLICATION CHECKLIST

The following information shall be submitted for all PCNs for USACE to properly evaluate your application. Some applications may require more information and this checklist is offered as a tool to assist applicants with submitting a complete application.

SECTION 1: GENERAL APPLICATION INFORMATION

1. ☐ Complete the Pre-Construction Notification document (Appendix B).
2. ☐ Specify which local/state/federal authorizations are required for the project and if any have been obtained or applied for at the time of USACE application submittal.
3. ☐ Identify all funding sources the project will receive or has received to date. Provide any relevant information in the application submission.
4. ☐ Is this part of a larger project that is being implemented in phases? If so, describe the project schedule and how each phase will be implemented.
5. ☐ Describe the existing conditions on the site and the general land use in the vicinity of the project at the time application submittal.
6. ☐ Provide any historic information available that you may have of project area, e.g., existing USACE permit numbers, the names under which the permits were obtained if the permit numbers are unknown, construction dates and proof of prior existence (aerials, photos, town hall records, affidavits, state or local permits, etc.) to verify that the project predates regulation and is "vested".[19]
7. ☐ The anticipated start and end dates for construction.

SECTION 2: WETLAND DELINEATION

8. ☐ Data used to support aquatic resource boundary determinations (delineation forms, delineation map(s) that show the locations of each aquatic resource in the project area, aerial and ground photographs, LIDAR imagery, national wetland inventory maps, soil maps, national hydrography dataset maps, floodplain maps, historical imagery, etc.).
9. ☐ Photographs of the wetland(s) and/or waterway(s) where impacts are proposed. Photos at low tide are preferred for work in tidal waters.
10. ☐ Indicate the relationship of the project area to waters of the U.S., i.e., adjacent wetlands, tidal influence or hydraulic connectivity through culverts, or other conveyances, etc.
11. ☐ At minimum the delineation map/figure should include the following:
    a. Contour lines showing topography.
    b. North arrow.
    c. Bar and text scale.
    d. Legend.
    e. Drawn project boundary.
    f. High tide line, mean high water, mean low water, ordinary high water mark, and/or wetland boundaries.
    g. Captions with a unique name for each aquatic resource and the area or length of the aquatic resource within the project area.

[19] Vested is exempt (someone or something) from a new law or regulation.

h. Appropriate landmarks and features (e.g., culverts, special aquatic sites, etc.).
i. Points showing the paired upland and wetland delineation locations for tidal and non-tidal wetlands only.

SECTION 3: AVOIDANCE & MINIMIZATION

12. ☐ Describe specific measures taken to avoid impacts to aquatic resources or describe why aquatic resources could not be avoided while achieving the project purpose and need.
13. ☐ For impacts to aquatic resources that could not be avoided, describe specific considerations/ measures taken to minimize the area of proposed impacts to aquatic resources in designing the project.
14. ☐ Describe specific measures taken to avoid and minimize the proposed direct, indirect, and secondary impacts to aquatic resources and their functions through construction techniques and timing.
15. ☐ If applicable, provide a restoration plan that describes how all temporary fills and structures will be removed and the area restored to pre-impact conditions (see GC 22).
16. ☐ If applicable, provide an Invasive Species Control Plan (see GC 29). For sample control plans, see www.nae.usace.army.mil/missions/regulatory/invasive-species.
17. ☐ If applicable, describe how the proposed wetland/waterbody crossing is compliant with GC 31, Stream Work and Crossings, and Wetland Crossings.

SECTION 4A: PROJECT IMPACTS

18. ☐ Describe the overall project and the activities located in Waters of the U.S. (WOTUS) that you are seeking authorization for.
19. ☐ Identify the following for project impacts in WOTUS:
    a. ☐ Direct, indirect, secondary impacts[20] within WOTUS.
    b. ☐ The size of each impact (square feet or acres, or linear feet).
    c. ☐ For discharges of fill material (§404), specify the volume of fill material to be discharged (cubic yards).
    d. ☐ The impact duration from each activity, permanent or temporary (X days).

SECTION 4B: PROJECT PLANS

20. ☐ Submit project plans that depict all impacts in WOTUS. On the project plans, applicants shall provide:

General Information

    a. ☐ Plan view and typical cross-section view sheets that show the existing and proposed conditions. These illustrations should each be identified with a figure number, date of the map, the project title, the name of the applicant and the type of illustration (vicinity map, plan view, or cross section).
    b. ☐ Drawings, sketches, or plans that are legible, reproducible (color is encouraged, but features must be distinguishable in black and white), drawn to scale, and no larger than 11”x17” and 10 MB when submitted in digital format. Numeric and graphic/bar scales must agree, and plan details must be measurable using a standard engineer’s scale on printed plans. Reduced plans are not acceptable.
    c. ☐ The north arrow and remove miscellaneous non-wetland or water project related features such as conduits, utility poles, guardrails, etc.

[20] See definitions section for the definitions of direct, indirect, secondary impacts.

d. ☐ Clearly draw the overall limits of work, staging areas, disposal sites, access routes, and any permittee responsible mitigation sites. These areas may include both aquatic resources and upland areas.
e. ☐ Names or numbers of all roads in the site's vicinity and ownership and numbers of abutting parcels.
f. ☐ Datum in plan and elevation views. The horizontal datum shall be in the NAD 83 Massachusetts State Plane Coordinate System (INSERT) in U.S. survey feet. The vertical data in coastal projects shall be referenced to either MLLW or the North American Vertical Datum of 1988 (NAVD 88). Both the distance and depth units shall be U.S. survey feet and specified on the project plans.

Aquatic Resources & Project Impacts

g. ☐ Delineation of all aquatic resource types on site including salt marsh; other special aquatic sites (vegetated shallows, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges); other waters, such as lakes, ponds, vernal pools, natural rocky habitat (tidal only), and perennial, intermittent, and ephemeral streams.
h. ☐ Identify the substrate type (cobble/gravel, organic detritus, sand/shell, silt, mud) and the approximate percentage of each substrate type on site. Grain sizes shall be based on Wentworth grain size classification scale for granules, pebbles, cobbles, and boulders. Sediment samples with a content of 10% or more of pebble-gravel-cobble and/or boulder in the top layer (6-12 inches) should be delineated and material with epifauna/macroalgae should be differentiated from bare pebble-gravel-cobble and boulder.
i. ☐ The direction of ebb and flood in tidal waters and direction of flow in non-tidal waters.
j. ☐ In tidal waters, the project boundary distance from special aquatic sites identified in 20g above if within 25 feet from that resource.
k. ☐ USACE jurisdictional boundaries including ordinary high-water mark (OHWM), high tide line (HTL), mean high water (MHW). Other boundaries include mean low water (MLW), mean lower low water (MLLW), as applicable.
   - Non-tidal: OHWM and/or wetland boundaries.
   - Tidal (structures/work only): MHW, MLW.
   - Tidal (Fill and Structures/work): HTL, MHW, MLW.
   - Tidal (Dredging/Beach Nourishment): HTL, MHW, MLW, MLLW.
l. ☐ Identification of each aquatic resource with a unique name (ex. Wetland 1, Wetland 2, Tributary 1, Beaver Brook, Atlantic Ocean) and the size of each aquatic resource within the project area (square feet or acres).
m. ☐ Impacts to each aquatic resource with captions denoting the size of each impact (square feet, acres, or linear feet) and the duration of the impact (ex. Permanent, Temporary (X days).

SECTION 4C: PROJECT PLANS - SPECIFIC PROJECT INFORMATION

21. ☐ For projects involving Navigation, Structures, Dredging, and/or Beach Nourishment, the applicant shall also address the following:

Navigation

a. ☐ Identify the locations of adjacent Federal navigation project (FNP) and/or state/local navigation projects on the project plans.
b. ☐ Specify the distance between the FNP and proposed project boundary, the authorized depths of the FNP, and state plane coordinates of seaward end(s) of project structures near an FNP.

Structures

a. ☐ Identification of the piling type (steel, timber, concrete) and diameter to be removed and/or installed.
b. ☐ Specify the minimal height of the structures' frame over saltmarsh. To meet the SV threshold, piers must be ≤4 feet in width and this minimal height must achieve a 1.5:1 ratio (i.e., a 4-foot-wide pier is 6 feet above a saltmarsh).
c. ☐ For floats, the methods of securing them (piles, bottom anchors) and for keeping them off substrate (skids, stops) at low water. To meet the SV threshold, a minimum depth of 18-inches of water should be maintained below a floating dock/structure at lower tide levels.

Dredging

a. ☐ The area (SF, acre) and volume (CY) of material to be dredged waterward of MHW for each dredge location.
b. ☐ Dredge boundaries.
c. ☐ Bathymetry for existing, proposed, and historical (include dates and USACE permits) dredge depths.
d. ☐ The likely final angle of repose of the side cuts based on the physical characterization of the material to be dredged and based upon the high/ medium/low, wave or current energy of the location.
e. ☐ Label area whether the dredging is new, maintenance, improvement, or a combination.
f. ☐ Location of the disposal site (include location sheet). NOTE: For projects proposing open water, nearshore disposal, or beach nourishment, contact USACE as early as possible for sampling and testing protocols. Sediment testing, including physical (e.g., grain-size analysis), chemical and biological testing may be required. Sampling/testing of sediments without such contact should not occur and if done, will be at the applicant's risk.
g. ☐ The methods and areas used to retain or prevent dredged material from running back into the wetland or waterway. Provide the capacity of the storage area and points of runback, including the overflow route, into the aquatic system.
h. ☐ For open-water disposal, explain why inland or beneficial reuse sites are not practicable.
i. ☐ Show the finished top elevation of the disposal site.

Beach Nourishment

a. ☐ For beach nourishment, identify the disposal footprint, existing and proposed nourishment profiles (multiple profiles are appropriate if the site is more than 150 feet long or non-contiguous), total fill area (SF) and volume (CY), fill area and volume waterward of the HTL, and delineation of dunes, banks, existing beach vegetation, and contours.
b. ☐ For beach nourishment identify the substrate type (fine sand, sand, cobble, boulder) and/or grain-size of existing material.

SECTION 5: STRUCTURES

22. ☐ For projects with the removal of existing pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be removed and the methodology for removal (cut off at mud line, pulling, vibratory, etc.).
23. ☐ For projects with the installation of new pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be installed and the methodology for installation (vibratory hammer, impact hammer etc.).
24. ☐ Identify any existing structures and moorings in waters adjacent to the proposed activity, their dimensions, and the distance to the limits and coordinates of any proposed mooring field or reconfiguration zone. For reconfiguration zone and mooring fields, provide the coordinates for all

corners based on the Massachusetts State Plane Coordinate System. Specify the maximum number of slips and/or moorings within proposed reconfiguration zones or anchorage areas.

25. ☐ The dimensions of the structure or work and extent of encroachment waterward of MHW and from affixed point on the shoreline or upland.
26. ☐ Shoreline of adjacent properties and property boundary offset for structures. In narrow waterbodies, the distance to opposite shoreline, waterway width, and structures across from proposed work.
27. ☐ For new commercial boating facilities, anchorage areas or reconfiguration zones, provide a description of the type of vessels that would use the facility, and any plans for sewage pump-out facilities, fueling facilities and contingency plans for oil spills.
28. ☐ See Sections 4A-C above.

SECTION 6: AQUACULTURE

29. ☐ Identify the coordinates for lease area corners and gear configuration area on the project plans.
30. ☐ Identify the proposed aquaculture gear type (buoys, floats, racks, trays, nets, lines, tubes, cages, containers, and other structures). Provide the impacts for each aquaculture gear type (see Section 4A 19a-d).
31. ☐ For a GP 18 to be valid, applicants must have (a) their MA DMF Aquaculture Certification letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.
32. Provide information on site the operation, maintenance, and access. Will the site be accessed via boat, kayak, etc.? Will cages be removed in the winter? How often will gear be checked on? Is there an operations plan for the proposed aquaculture area?
33. ☐ See Sections 4A-C above.

SECTION 7: DREDGING

34. ☐ Sampling plan requests for new, improvement or maintenance dredging must submit completed **Dredged Material Evaluation checklist found at Dredged Material Evaluation Checklist, Sampling and Analysis Plan Requirements from Applicant (army.mil)** and identify the method of handling/transporting the dredged material.
35. ☐ Identify grain-size of material to be dredged (e.g., silty sand) and provide any existing sediment grain size and bulk sediment chemistry data from the proposed project or nearby projects. Include information on any recent spills of oil and/or other hazardous materials and/or nearby outfalls. Document the information source, e.g., EPA database, the harbormaster or fire chief. If there are none, state “none”.
36. ☐ See Section 4A, 4B and 4C, Dredging 21(a-i) above.

SECTION 8: WETLAND/WATERBODY CROSSINGS

37. ☐ For the stream crossing, identify the crossing methodology on the project plan (e.g., dam and pump, dry, wet, etc.). Submit a waterway crossing sequencing plan with the application.
38. ☐ If the project includes a permanent crossing of a tidal waterway, your project design should be modified to match the velocity, depth, cross-sectional area, and substrate of the existing waterbody adjacent to the crossing and provide documentation (hydraulic analysis including low lying property analysis) that the size of the crossing will not restrict tidal flow over the full natural tide range and will not adversely affect abutting infrastructure.

39. ☐ If the work includes a permanent crossing of a non-tidal stream, your project design should be modified to match the culvert gradient of the existing stream channel profile, provide clearance for ≥1.2 times bank full width and conveyance should be embedded ≥1-2 feet for box culverts and pipe arches or ≥1-2 feet and at least 25 percent for rounded pipes/culverts in accordance with the Massachusetts Stream Crossing Standards. Provide the basis for any variation to this requirement.
40. ☐ If the work includes a permanent crossing of a non-tidal stream, the structure should be designed to include a natural bottom substrate within the conveyance that matches the characteristics of the substrate in the natural stream channel and the character of the banks (mobility, slope, stability, confinement, grain and rock size). The conveyance should be designed with a minimum openness ratio ≥0.82-feet (0.25-meters). For how to calculate openness ratio and stream simulation ecological approach for road and stream crossings, see https://www.nae.usace.army.mil/Missions/Regulatory/Stream-and-River-Continuity/.

SECTION 9: COMPENSATORY MITIGATION

41. ☐ Does the project require Compensatory Mitigation[21] for impacts to Waters of the U.S.? (See Section V in the 2023 Massachusetts General Permit)
42. ☐ If the project requires mitigation, does the selected compensatory mitigation option (i.e., In-Lieu Fee, permittee-responsible mitigation) deviate from the order of the options presented in §332.3(b)(2)-(6)? If so, please explain why. https://www.ecfr.gov/current/title-33/chapter-II/part-332/section-332.3
43. ☐ For any compensatory mitigation that involves preservation, the applicant must use a site protection instrument to preserve the parcel in perpetuity. (Conservation Easement, Deed Restriction, etc.) https://www.mass.gov/service-details/conservation-restriction-review-program.

SECTION 10: HISTORIC PROPERTIES & NOTIFICATIONS TO SHPO, THPOs, BUAR

44. ☐ Notify the SHPO, Massachusetts Historical Commission, of the Project via Certified Mail and include proof of delivery or receipt in the application package (See Appendix A).
45. ☐ As applicable, notify the THPOs, Narragansett Indian Tribe, Wampanoag Tribe of Gay Head (Aquinnah), and Mashpee Wampanoag Tribe, of the Project via email OR mail and include proof of delivery or receipt in the application package (See Appendix A).
46. ☐ As applicable, notify the BUAR via email (*strongly preferred*) OR mail and include proof of delivery or receipt in the application package (See Appendix A).
47. ☐ Include responses to this notification in the permit application.
48. ☐ As applicable, information on historic properties (Tribal and Archaeological) within the project area should be provided in the permit application.

SECTION 11: ENDANGERED SPECIES & ESSENTIAL FISH HABITAT

49. ☐ Provide a USFWS Information for Planning and Consultation (IPaC) Official Species List from https://ecos.fws.gov/ipac and the email of the individual who generated the list (see GC 10 of the 2023 Massachusetts General Permit for more information).
50. ☐ Provide a species list from the NMFS Section 7 Endangered Species Act mapper at https://noaa.maps.arcgis.com/apps/webappviewer/index.html.
51. ☐ Provide a species list from the NMFS Essential Fish Habitat Mapper at https://www.habitat.noaa.gov/apps/efhmapper/?page=page_3.

[21] Your mitigation proposal must be consistent with the December 29, 2020 Compensatory Mitigation Standard Operating Procedures at https://www.nae.usace.army.mil/Portals/74/docs/regulatory/Mitigation/Compensatory-Mitigation-SOP-2020.pdf and 2008 Mitigation Rule.

52. ☐ If the project will generate turbidity, describe the extent of turbidity and if erosion controls will be used to contain turbidity. If turbidity controls are not operationally feasible, explain the basis for your conclusion and identify any other measures that you will implement to minimize resuspension of sediment.
53. ☐ Identify the substrate type and any aquatic resources that will be affected by the proposed action. (SAV, salt marsh, sand, silt/clay, rocky/hard bottom)
54. ☐ For projects which will include the installation of pilings/sheet-piles, identify the substrate at the project site (sand, cobble, silt/mud/clay), the installation method (vibratory hammer, impact hammer, combination) and indicate whether the following "soft start" procedures at beginning of the workday and after a 30-minute period of rest will be deployed:
    a. ☐ Vibratory Pile Installation: pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
    b. ☐ Impact Pile Installation: pile driving will commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one-minute waiting periods, before initiating continuous impact driving.
55. ☐ If the project involves dredging, describe any dredge history, number of dredge events to be covered by the permit, erosion/sediment controls, dredge type, intake structures (mesh screen size), dredged material disposal site.
56. ☐ For project activities associated with structures, identify the number, type (drill barge, work boat, tugboat, etc.), and size of any temporary vessels that will be used. Specify measures that will be implemented to ensure vessels are not berthed in shallow water or will "ground out" at low tide.
57. ☐ For aquaculture projects identify whether any component of the gear is seasonal (will be removed annually) or will be in place year-round. If gear will be present year-round and will be variably managed (e.g., floating in summer, bottom in winter) identify month/date for such configurations.
58. ☐ For aquaculture projects identify whether the project will involve use of an existing vessel or new vessel. Identify the length for all work vessels and identify the distance round trip from vessel berthing location and aquaculture area.
59. ☐ For project activities associated with docking structures (either commercial, industrial, or recreational) identify the number, type (motorized/non-motorized, jet-ski, sailboat, kayak, canoe, other that will be berthed there and the sizes of each.
60. ☐ Information required for Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act:
    a. Results of an eelgrass survey completed per the INSERT.
    b. Essential Fish Habitat Assessment to determine project-related impacts to essential fish habitat, using guidance developed by the National Marine Fisheries Service.
61. ☐ A document containing the following information (requirements of 50 CFR §600.920(e)(3)):
    a. Description of proposed action.
    b. Analysis of potential adverse effects on essential fish habitat.
    c. Conclusions regarding the effects of the action on essential fish habitat.
    d. If applicable, proposed mitigation.
    e. Analysis of alternatives to the proposed action.
    f. Other:

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DOCUMENT A00841

MASSACHUSETTS
Department of Environmental Protection

Water Quality Certificate

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Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
100 Cambridge Street Suite 900 Boston, MA 02114 • 617-292-5500

Maura T. Healey
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Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

March 21, 2025

Massachusetts Department of Transportation Highway Division
10 Park Plaza, Suite 7360
Boston, MA 02116
ATTN: Courtney Walker

RE: 401 WATER QUALITY CERTIFICATION
BRP WW 10, Major Fill Project
BRP WW 08, Minor Dredge Project
Bridge Replacement (H-01-005), Bay Road (Route 47) over Fort River
Hadley, Massachusetts

401 WQC Filing Number: 24-WW26-0055-APP
USACE Application No. NAE-2016-02256
MassDOT File Number: 608460

Dear Ms. Walker:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed your application for a Water Quality Certification (WQC), as referenced above. This application was deemed complete on March 5, 2025. In accordance with the provisions of MGL Ch. 21, §§26-53 and Section 401 of the Federal Clean Water Act as amended (33 U.S.C. §1251 et seq.), it has been determined there is reasonable assurance the proposed project will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law.

The proposed project consists of the replacement of the existing bridge (Bridge No. H-01-005) that carries Bay Road (Route 47) over the Fort River in Hadley (the Project). The Project also includes stormwater improvements, scour protection installation, full-depth reconstruction of the approaches, vegetation removal, and streambed and wetland restoration. The bridge is stated as needing replacement due to age and various structural deficiencies.

Existing Conditions

The existing bridge, constructed in 1936, is oriented in a northwest/southeast direction with the Fort River flowing northeast to southwest under the bridge. The bridge is approximately 124 feet long, 39 feet wide, and carries two travel lanes (one in each direction) and a single sidewalk. Two reinforced

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concrete abutments and seven timber piles comprise the substructure that supports the superstructure. Stormwater from the southeast portion of the Project area flows to an existing catch basin just east of the bridge that connects to an outfall and discharges into the Fort River via an intermittent stream south of the bridge. On the bridge, stormwater discharges directly into the river without pretreatment through bridge scuppers. Stormwater drainage for the remaining portion of the Project area is country drainage.

The Fort River is a tributary of the Connecticut River and is mapped as a Coldwater Fishery Critical Area. The bridge is within a mapped 1% annual chance of flood zone with a Base Flood Elevation (BFE) of 124-feet NAVD (Zone A). The intermittent stream runs parallel to Fort River and flows through a forested Bordering Vegetated Wetland (BVW). In addition, the Project is located within Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitat of Rare Species (PH 2084).

Project Description

The Project will demolish the existing concrete bridge, abutments, and timber piers and construct a new bridge in the same location. The replacement bridge will be comprised of three-spans with a total span length of 126 feet and width of 42.5 feet. The increased bridge width will accommodate two 12-foot-wide travel lanes with 5-foot-wide shoulders, a single 5.5-foot-wide sidewalk, and guard rails on either side. The existing timber piers will be cut 5 feet below the mudline. New integral concrete abutments and two pipe pile bents with concrete pile caps will support the new bridge. Each embankment will be comprised of a 12-inch-deep crushed stone layer topped with a 3-foot-deep layer of riprap. In addition, 5-foot-wide terrestrial wildlife passages consisting of level, natural streambed material will be created on each embankment above the ordinary high water mark (OHWM). The bridge will be raised 15 inches in profile to maintain the lowest elevation of the superstructure and the approaches will be raised slightly to meet the grade of the higher bridge. Full depth pavement reconstruction of the approaches will occur approximately 310 feet southeast and 315 feet northwest of the bridge. To facilitate the bridge replacement, two utility poles will be permanently relocated to the southwestern side of the bridge.

During construction, the roadway will be reduced to one lane to demolish and reconstruct the bridge substructure and superstructure one half at one time. Erosion and sedimentation controls will be installed prior to demolition and construction to prevent the migration of sediment to adjacent resource areas. Sandbag cofferdams will be installed within BVW and Land Under Water (LUW) associated with the Fort River and dewatered to create dry working conditions while maintaining flow. The cofferdams will also act as a sediment control by confining bridge debris. Vegetation will be cleared and grubbed to facilitate construction access and provide clearance to overhead utility lines. Following grading of the side slopes, a native seed mix and plantings will be applied.

LUW and BVW Impacts and Restoration

Installation of riprap scour protection around the abutments will account for 1,525 square feet (sf) of permanent fill and 378 cubic yards (cy) of dredging. In addition, there will be 21 sf of permanent impact to the intermittent stream due to grading, loaming, and seeding. A total of 8,790 sf of temporary impact to LUW is required for construction access, placement of sandbag cofferdams and streambed following construction. A portion of the native dredged material will be stockpiled and used to restore the streambed throughout the Fort River LUW restoration area. Once the new abutments and piers are

installed, the dredged area within LUW will be restored with the placement of geo-textile fabric, 3-feet of riprap over 12-inches of crushed stone, and topped with 12-inches of native streambed material. All LUW restoration will be conducted under the supervision of a qualified fluvial geomorphologist.

The Project will not result in permanent impact to BVW. Temporary impact of 895 sf will occur within BVW for placement of the sandbag cofferdams. Following removal of the cofferdams, the area will be restored by decompacting soil compressed by the sandbags, applying a wetland seed mix, and planting river birch (*Betula nigra*), elderberry (*Sambucus canadensis*), red osier dogwood (*Cornus sericea*), silky dogwood (*Cornus amomum*), and winterberry (*Ilex verticillata*).

Table 1. BVW and LUW Impacts

Wetlands/Waters	Permanent Impact	Temporary Impact	Restoration
LUW	1,546 sf	8,790 sf	8,790 sf
BVW	0 sf	895 sf	895 sf
Dredge	378 cy	N/A	N/A

Alternatives Analysis

An alternatives analysis was completed in accordance with 314 CMR 9.00. The existing bridge is structurally deficient and presents a risk to driver safety and downstream areas of the Fort River should the bridge fail; therefore, a no-build alternative is not practicable to meet project goals. A wider bridge to accommodate the ideal number and width of sidewalks and shoulders was considered, but rejected due to the increased cost, utility pole relocations, and impact on the surrounding environment and abutting properties. The selected alternative of a two-lane bridge with 5-foot-wide shoulders and a single sidewalk requires fewer utility pole relocations and minimizes the overall impact to adjacent resource areas.

Stormwater Management Standards

The Project meets the Stormwater Management Standards to the maximum extent practicable per 314 CMR 9.06(6). The proposed widening of Bay Road will increase impervious surfaces in the Project area by 2,900 sf. Through a complete evaluation, it was determined that structural Stormwater Control Measures (SCMs) were limited due to the narrow right-of-way, site topography, and bordering resource areas. However, stormwater drainage patterns in the southeast portion of the Project area will be improved through replacement of the existing catch basin east of the bridge with a new deep sump catch basin. The new catch basin will connect underneath Bay Road to a new drainage manhole. From there, stormwater will be carried through a 12-inch corrugated metal pipe (CMP) and outlet at a constructed drainage channel at the toe of slope in the northeast quadrant of the Project area. This proposed drainage pattern will redirect stormwater away from the intermittent stream southwest of the bridge. In addition, direct discharges of untreated stormwater to the river will be eliminated with removal of the bridge scuppers. Stormwater from the bridge will be conveyed to a new deep sump catch basin and piped to a stone splash pad west of the bridge.

Stormwater drainage patterns in the remaining portion of the Project area will be maintained, utilizing existing country drainage to avoid creating point source discharges. The new deep sump catch basins will provide 25% pre-treatment total suspended solids (TSS) removal, and installation of the drainage channel and stone splash pad, as well as intentional grading and planting within adjacent upland areas, will slow flow velocities and promote infiltration. Stormwater Management Standards 2, 3, and 4 will be met to the maximum extent practicable.

Stream Crossing Standards

The Project meets or exceeds all Stream Crossing Standards. At the bridge crossing, the bankfull width of the Fort River is approximately 75 feet, which equals a 1.2 times bankfull width of 90 feet. Given the proposed bridge span of 126 feet, Stream Crossing Standard 3 has been sufficiently met. Regarding Stream Crossing Standards 4 through 7, natural streambed materials will be reused throughout areas of LUW restoration. Water depth and velocity of the proposed channel will be comparable to the native channel as it will closely match existing conditions upstream and downstream of the bridge crossing. Based on the site plans, the height from the bottom of the stream channel to the bottom of the proposed superstructure will be greater than 15 feet, creating an openness ratio of 39.5 feet. In addition, dry wildlife passages with at least 10 feet of clearance will be created underneath the bridge on both sides of the stream. Banks at each corner of the bridge abutments will match the horizontal profile of the existing stream and banks.

Sediment Chemistry

Two soil borings were completed in accordance with 314 CMR 9.07(2)(b)4.; one boring southwest and downstream of the bridge and one boring east and upstream of the bridge. Sediment sample analytical results were compared to the Reportable Concentration (RC) S-1 criteria of the Massachusetts Contingency Plan (MCP). Results of the sediment samples analyzed indicated the presence of metals and Polycyclic Aromatic Hydrocarbons (PAHs) in concentrations below the RCS-1 criteria. As such, dredged sediment may be reused onsite.

Invasive Species

All invasive species within the project limits will be treated as part of the Project. Specifically, non-native invasive Asiatic bittersweet (*Celastrus orbiculatus*) will be treated east of the bridge. Treatment of invasives species will be managed in accordance with an Invasive Plant Management Strategy (IPMS) to be approved by MassDEP as conditioned herein.

Wetland and Rare Species

In an email dated January 29, 2025, the Division of Fisheries and Wildlife (DFW) stated no time of year (TOY) restrictions or other Best Management Practices are required for the Project. However, NHESP issued a Conditional No-Take Determination for the Project on October 30, 2024. The Project is required to incorporate a NHESP-approved construction-period Wood Turtle Protection Plan (TPP) to avoid a prohibited Take, as conditioned herein.

Based on a review of information provided by the applicant, MassDEP finds that this project complies with the standards described under 314 CMR 9.06 and 9.07. Public notice was provided in the Daily

Hampshire Gazette on October 10, 2024. No comment letters were received during the public comment period.

Therefore, based on information currently in the record, MassDEP grants a WQC for this project subject to the following conditions to maintain water quality, to minimize impact on waters and wetlands, and to ensure compliance with appropriate state law. The Department further certifies in accordance with 314 CMR 9.00 that there is reasonable assurance the project or activity will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law. Finally, the Department has determined that upon satisfying the conditions and mitigation requirements of this approval, the project provides a level of water quality necessary to protect existing uses and accordingly finds that the project to be implemented satisfies the Surface Water Quality Standards at 314 CMR 4.00.

Pursuant to 314 CMR 9.09(1)(d); 314 CMR 9.06(6)(a); 310 CMR 9.06(2); 314 CMR 9.07; 314 CMR 9.07(1); 314 CMR 9.09(7)(5)(c); 314 CMR 9.11; and 314 CMR 9.09(1)(e), the following Special Conditions are necessary to ensure that construction practices and stormwater controls are implemented in such a manner as to prevent degradation to wetlands and waters; ensure that practicable steps have been taken which will avoid and minimize impacts to wetlands and waters; minimize turbidity and sediment caused by construction activities; ensure that water quality is not degraded, and that biology of the waters are not negatively impacted by potential discharges; and/or maintain a record of the dredged material for reference and to ensure accountability in its transportation.

Those Special Conditions that require direct submittals to MassDEP for either review, or review and approval, are denoted by the following notation (Submittal) at the end of the condition and are summarized in Attachment A. In addition, those conditions with the (Submittal) designation shall be included in the Special Provisions and, as applicable, reviewed at the Pre-Construction Meeting.

1. All work shall be performed in accordance with the following documents and plans:

    - Application for Water Quality Certification. Prepared by Benesch on behalf of MassDOT, dated October 7, 2024, with cover letter and attachments. 401 WQC Filing Number: 24-WW26-0055-APP.
    - Plans entitled: “Bay Road (Route 47) over Fort River (Bridge No. H-01-005 (C1H))”. Sheets 1 through 77. Prepared by Benesch. Dated April 25, 2018, last revised August 9, 2021.
    - MassDEP Administrative Completeness and Technical Deficiency Review. 401 Water Quality Certification, Combined Fill and Dredge Project Certification. Bay Road (Route 47) over Fort River Bridge Replacement, Hadley, MA. Dated October 28, 2024.
    - MassDOT Responses to MassDEP Technical Deficiency Review, with attachments. Prepared by Benesch on behalf of MassDOT. 401 Water Quality Certification, Combined Fill and Dredge Project Certification. Bay Road (Route 47) over Fort River Bridge Replacement, Hadley, MA. Dated February 20, 2025.
    - MassDOT Supplemental Responses to MassDEP Technical Deficiency Review, with attachments. Prepared by Benesch on behalf of MassDOT. 401 Water Quality

Certification, Combined Fill and Dredge Project Certification. Bay Road (Route 47) over Fort River Bridge Replacement, Hadley, MA. Dated March 4, 2025.

- DFW Comments via email. RE: MassDOT 608460 Hadley Fort River. Dated January 29, 2025.
- NHESP Conditional No-Take Determination. NHESP File No. 23-6213. Dated October 30, 2024.
- NHESP Approval of the TPP via email. NHESP File No. 23-6213. Dated December 12, 2024.

Pre-Construction

2. A qualified **Wetland Scientist** (WS) with a minimum of five years of relevant professional experience with wetland and stream restoration projects shall be employed to oversee all BVW and LUW restoration activities as proposed in the application, including but not limited to soil decompaction, seeding, vegetation plantings, and placement of terrestrial wildlife passages. The name, contact information, and qualifications of the WS shall be provided to MassDEP for approval prior to the Pre-Construction Meeting required in Condition 5. The name and contact information of the approved WS shall be provided to the Hadley Conservation Commission prior to the start of work. **(Submittal)**

3. A qualified **Fluvial Geomorphologist** (FGM) with a minimum of five years of relevant professional experience in stream replacement and restoration projects shall be employed to oversee all LUW replacement and restoration activities as proposed in the application. The name, contact information, and qualifications of the FGM shall be provided to MassDEP for approval with a copy to the Hadley Conservation Commission prior to the Pre-Construction Meeting required in Condition 5. **(Submittal)**

4. Prior to the Pre-Construction Meeting required in Condition 5, the applicant shall provide MassDEP with the name and contact information of the Resident Engineer (RE) responsible for ensuring that all work complies with the conditions of this WQC. **(Submittal)**

5. A minimum of 21 days prior to the start of vegetation clearing, MassDOT shall contact MassDEP to schedule an onsite Pre-Construction Meeting to review the approved plans and terms and conditions of this WQC. The RE, the construction contractor, the WS, a representative from the MassDOT Environmental Section and/or the District Environmental Engineer shall attend the Pre-Construction Meeting. **No work shall commence prior to the Pre-Construction Meeting.**

6. MassDEP shall be copied on applicable submittals to the U.S. Army Corps of Engineers (USACE). These include but are not limited to: Self-Verification Notification Form (SVNF); Pre-Construction Notification (PCN); Work-Start Notification Form; Mitigation Work-Start Notification Form; and Compliance Certification Form. The Work-Start Notification Form shall be submitted at least 14 days before the anticipated start of work and the Compliance Certification Form shall be submitted within 30 days following the completion of the authorized work. **(Submittal)**

7. A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (CP/PP) shall be developed and implemented as required by 314 CMR 9.06(6)(a)8. A minimum of 14 days prior to the start of work, MassDOT shall submit the CP/PP for review and approval. If the Environmental Protection Agency (EPA) Construction General Permit (CGP) applies, the Stormwater Pollution Prevention Plan (SWPPP) may serve as the CP/PP, providing it includes the measures required to be in the CP/PP per these Special Conditions, in addition to the measures specifically required by the CGP. Any subsequent changes to the Final CP/PP (defined herein as including the construction period SWPPP if applicable) must be approved by MassDEP. **(Submittal)**

8. Training regarding erosion and sedimentation controls is required. The RE, CP/PP Inspector, and any other relevant personnel responsible for erosion and sedimentation controls shall complete the EPA CGP Inspector Training, or other training that meets the CGP requirements, as well as complete a comprehensive review of the Final CP/PP. Proof of completion of the training shall be submitted to MassDEP prior to the start of work. **(Submittal)**

9. The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to BVW and LUW, proposed dewatering methods and locations, proposed stockpile locations and their proximity to catch basins or other drainage conveyances that discharge to wetland resource areas, and the location of construction-period erosion and sedimentation controls. Stockpiles shall be located no less than 50 feet from BVWs, LUW, catch basins, or other drainage conveyances that discharge to BVWs or LUW.

10. A minimum of 14 days prior to the start of work, MassDOT shall submit a Control of Water Plan for review and approval. The Plan shall include a description of proposed methods to isolate and dewater work areas within streams while maintaining stream flow, including but not limited to the method of isolation (e.g., steel sheeting or sandbag cofferdam), dewatering methods and locations and specifications for stream bypass systems as applicable. The Control of Water Plan shall include a plan depicting BVW and LUW boundaries, and the location of all relevant methods and materials which shall be located within the BVW and LUW impact areas approved herein. The plan shall meet requirements of the CP/PP and be specific to the Project. Dewatering and stream bypasses shall be conducted under the supervision of the RE or other project staff with knowledge of these practices and comply with the applicable conditions identified herein. **(Submittal)**

11. Prior to the start of work, approved erosion and sedimentation control measures shall be installed per the approved CP/PP and as applicable, the manufacturer specifications. Erosion and sedimentation control measures may consist of, but are not limited to, silt fence, staked straw bales, silt/turbidity curtains, compost filter tubes, etc.

12. Prior to the Pre-Construction Meeting, the boundaries of BVW and LUW shall be re-flagged where they are within 50 feet of the limits of work. In the event BVW and LUW boundaries overlap, the outermost boundary (i.e., closest to the proposed work) shall be flagged. All boundary markers, once in place, shall remain in place throughout construction until all disturbed surfaces have been permanently stabilized. Boundary markers shall be fully evaluated annually and refreshed where needed. Implementation of and compliance with this

requirement shall be documented by the WS or RE. All construction personnel shall be made aware of these markers.

13. A Flood Contingency Plan shall be submitted to MassDEP for review and approval that addresses areas that fall within the 1% annual chance of flooding zone within project limits. The Plan shall address the potential need for temporary relocation of construction and auxiliary equipment during flood events to designated upland locations above the Base Flood Elevation. The Plan shall be approved by MassDEP prior to any work within the 1% annual chance of flooding zone, including mobilization or storage of equipment and materials. **(Submittal)**

14. The Contractor shall develop an Invasive Plant Management Strategy (IPMS) to be submitted to MassDEP for review and approval prior to the Pre-Construction Meeting. The IPMS shall be implemented as approved. **(Submittal)**

15. If needed, use of herbicides to control invasive species shall be implemented in accordance with the approved IPMS and with the following requirements:

    a. Herbicides can only be applied by a Licensed Applicator;

    b. Applicant must provide MassDEP Material Safety Data Sheets (MSDS) of the product being used and must also keep MSDS sheets on site;

    c. Product registration in MA with Massachusetts Pesticide Product Registration Number must be confirmed with Massachusetts Department of Agricultural Resources Pesticide Division;

    d. EPA Registration Number for the product must be identified;

    e. Product label restricted use provisions must be followed; and

    f. Applicant must contact MassDEP Wetlands Program, Dredge Unit to determine if a BRP WM 04 herbicide permit is required.

16. Final Construction Plans (the plans provided to the contractor) shall be submitted for review at least 30 days prior to the Pre-Construction Meeting. Sufficient supporting information, explanation, and documentation shall be provided to MassDEP and the Hadley Conservation Commission for any changes, and MassDEP may at its discretion require additional supporting documentation as a condition of review. Once MassDEP provides written approval, the updated set of plans shall become the "Final Plan of Record." The Plan shall be prepared and signed by a Professional Engineer in the Commonwealth of Massachusetts and shall incorporate all revisions and additions to the original plans that have been approved as discussed herein. Specifically, the plans should include the invert elevation of the pipe end that will connect the proposed deep sump catch basin west of the bridge to the 5-foot-long stone splash pad. **(Submittal)**

Construction Period

17. No more than **895 sf** of temporary impacts to BVW shall occur. No more than **1,546 sf** of permanent and **8,790 sf** of temporary impacts to LUW shall occur. No more than **378 cy** of dredging in LUW shall occur. All work shall avoid unapproved impacts to BVW and LUW.

18. The Project shall identify one individual with at least three years of experience with construction period erosion and sedimentation control to be responsible for erosion and sedimentation control inspections (CP/PP Inspector). Under the direction of the CP/PP Inspector, inspection and maintenance of erosion and sediment controls in active work areas may be performed by both the Contractor and RE or other MassDOT project staff. Maintenance is the responsibility of the Contractor; however, the permittee shall be ultimately responsible for erosion and sedimentation control failure. The RE and/or contractor shall immediately notify MassDEP and the Hadley Conservation Commission if any unauthorized discharges to BVW or LUW occur.

19. CP/PP inspections shall occur at least once every seven calendar days and within 24 hours of a storm event that produces 0.5 inches or more of rain within a 24-hour period, or at a more stringent frequency if the CP/PP requires.

20. Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

21. Disturbed areas shall be stabilized immediately after activities have permanently ceased or will be temporarily inactive for 14 or more calendar days. The installation of stabilization measures shall be implemented as soon as practicable, but no later than 14 calendar days after stabilization has been initiated.

22. Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Hadley Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the RE or other project staff with knowledge of these practices prior to use to ensure consistency with the approved Control of Water Plan, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to BVW or LUW. Any discharges shall be visibly free of sediment.

23. Additional erosion and sedimentation control materials shall be stored on-site at all times for emergency and routine replacement. Materials shall be kept covered, dry, and accessible at all times. The CP/PP Inspector shall be responsible for anticipating the need for and installation of additional erosion and sedimentation controls and shall have the authority to require additional erosion control measures to protect wetland resource areas beyond what is shown on the plans if field conditions or professional judgment dictate that additional protection is necessary.

24. The Contractor shall monitor the National Weather Service forecast for updates, and upon issuance of a flood watch for the 1% annual chance of flooding zone, shall implement the flood contingency plan referenced in Condition 13.

25. Any storm drains with potential to receive discharge from stockpiled materials or construction operations shall be managed to inhibit the inflow of sediment while not increasing the likelihood

of roadway flooding during periods of precipitation. The CP/PP shall specify measures to implement this. Filter fabric stretched under storm drain inlet grates are not acceptable for this purpose.

26. The contractor shall have designated washout areas for concrete equipment that will be comprised of impermeable material and sized to contain project concrete wastes and wash water. Concrete wash out areas shall be located no less than 50 feet from BVW, LUW, and catch basins or other drainage conveyances that discharge directly or indirectly to BVW or LUW.

27. Refueling, washing, and cleaning of vehicles and other construction equipment shall not take place within 50 feet of BVW or LUW and any wash water shall be contained such that it does not drain toward BVW or LUW. MassDEP shall explicitly approve in writing any deviation to this condition for oversized stationary vehicles.

28. The contractor shall have spill containment kits on site. In the event of a release of fuels and/or oils, the local fire department, MassDEP Emergency Response and MassDEP Wetlands Program Highway Unit shall be contacted, and in addition, the MassDEP Bureau of Waste Site Cleanup shall be notified per the requirements of the Massachusetts Contingency Plan, 310 CMR 40.0000.

29. The Turtle Protection Plan shall be implemented as approved by NHESP on December 12, 2024.

30. Construction vehicles and equipment shall not enter the BVW or LUW unless authorization is provided by way of this permit or amendment. The Contractor shall use equipment with boom reach capabilities and other measures to avoid inadvertent impacts to jurisdictional resource areas as a result of excavation, riprap placement, and/or bridge/pier demolition materials.

31. A temporary shielding or containment system shall be in place beneath the bridge structure prior to removal and concrete excavation to prevent debris from falling into the water below. In the event that any debris accidentally enters the Fort River, it shall be immediately retrieved. Notice shall be provided to MassDEP if debris enters the river and that it has been removed with photo-documentation (if practicable) submitted by email.

Dredging

32. MassDEP shall be notified one week prior to the start of dredging so that staff may inspect the work for compliance throughout the project.

33. No later than 21 days prior to commencement of dredging activity, a Dredged Material Dewatering Plan shall be submitted to MassDEP for review and approval. At a minimum, the Plan shall include but not be limited to the type of containment, method of dewatering (i.e. mechanical or by gravity), method of collecting the dewatered effluent and method of disposal. **(Submittal)**

34. Best Management Practices (BMPs) shall be employed by the contractor to protect resource areas located adjacent to the proposed staging/temporary dredged material stockpiling and dewatering areas. Sediment stockpiles shall be constructed in accordance with the MassDEP

approved project plans, stabilized, bottom-lined if not placed on paved surfaces and securely covered with wind tear resistance tarpaulin, polyethylene sheeting or similar impermeable material at all times, and properly labeled. Stockpile covers shall be securely weighed down. Stockpiles shall also be secured to restrict access by the public and shall be set back at least 10 feet from temporary construction access roads or other areas and activities which could disturb the stockpiles and associated erosion controls; if the 10-foot setback cannot be met, then a MassDEP-approved barrier shall be provided. Inspection of the sediment containment and dewatering location and associated erosion controls shall be conducted daily and within 24 hours of a storm that produces 0.5 inches or more of rain. Any observed deficiency shall be corrected or repaired in a timely manner.

35. In the event of a precipitation or storm event, the site shall be secured beforehand in such a way as to protect resource areas and waters on site and downstream of the site, including covering of stockpiles of dredged material. Sediment stockpile areas shall be inspected in line with the frequency of the CP/PP required in Condition 19. Any observed deficiency shall be corrected or repaired in a timely manner to prevent discharge from the stockpiled material. If stormwater runoff and erosion is observed from stockpiled dredged material, additional erosion and/or damage prevention controls measures shall be implemented.

36. Measures shall be in place to prevent turbid waters, due to dredging, demolition, or debris removal activities, from extending past the limits of work into the Fort River. These measures can be items such as turbidity curtains and/or sheet piles.

37. If visual turbidity escapes the controls in place, as described in Condition 34, work shall stop immediately and MassDEP shall be notified within 24 hours. Work shall not resume until the issue is corrected and to the satisfaction of MassDEP.

38. All turbidity controls shall be inspected daily by the RE or a designated MassDOT project staff. If any damage is observed the controls in place will be replaced or repaired immediately.

39. If excavated sediment is disposed of off-site, MassDEP shall be notified in writing of the name and location of the upland licensed facilities accepting the dredged material for disposal or reuse for review and approval. If the licensed facility is located out of state, documentation shall be provided to MassDEP that the dredged material disposal/reuse has been approved and will be accepted by the receiving State. The dredged material shall not be transported to the facility without concurrence of MassDEP.

40. If excavated sediment is disposed of off-site, BMPs shall be implemented during transportation of the dredged material to the licensed receiving facility. At a minimum, when transported upon public roadways, all dredged material shall have no free liquid as determined by the Paint Filter Test or other suitably analogous methodology acceptable to MassDEP, and a tarpaulin or other means shall be used to cover the dredged material during transport.

Wetland Mitigation

41. A minimum of **895 sf** of wetland restoration shall be completed in coordination with an approved WS. The WS shall oversee all BVW restoration, including final grading, seeding, and

planting. The WS shall confirm that the constructed BVW restoration area has adequate soils and hydrology to promote wetland plant species prior to seeding and installation of plantings and shall recommend measures to amend soils and promote wetland hydrology as needed.

42. Planting and seeding shall not take place between November 15th and April 15th, except as allowed by MassDEP in writing. The WS shall inspect trees and shrubs to ensure they are healthy prior to planting. Trees and shrubs deemed unhealthy in the professional judgment of the WS shall be replaced. Plantings and seed mixes shall consist of native and non-invasive species. Species may be substituted at the recommendation of the WS, and review and approval by MassDEP.

43. At least 75% of the surface area of the BVW restoration area shall be vegetated with indigenous wetland plant species within two growing seasons, or the period required by the Section 404 permit, whichever is longer. Additionally, evidence of hydrology, including hydric soil formation shall be submitted at the same time. Annual monitoring reports shall be submitted by the WS no later than January 15th each year. Monitoring reports shall include an assessment based on the approved success criteria, representative photos, and recommended corrective actions as needed. **(Submittal)**

44. MassDEP reserves the right to determine the success or failure of the BVW restoration area, and reserves the right to require additional plantings, regrading, or other measures deemed necessary to promote success.

Stream Mitigation

45. The FGM shall oversee all LUW restoration. Placement of streambed materials shall take place in no- or low-flow conditions. The Control of Water Plan required in Condition 10 shall include measures to create no-flow conditions for this work such as a pump bypass system or other dewatering method, if needed. Placement of streambed materials during greater than low-flow conditions shall require a placement plan, with a narrative describing turbidity control measures, submitted to MassDEP for review and approval.

46. A minimum of 14 days prior to installation of the streambed materials, the FGM shall meet with the contractor to determine the suitability of stockpiled streambed material for reuse.

47. Upon completion of the LUW restoration, the FGM shall provide photographs and a summary of the completed work to MassDEP and the Hadley Conservation Commission. **(Submittal)**

48. Water shall be slowly introduced back into the restored and dewatered LUW work areas as to not cause erosion and sedimentation. This work shall be overseen by the WS

49. MassDEP reserves the right to determine the success or failure of the LUW restoration areas and reserves the right to require additional measures deemed necessary to promote success.

Post-Construction

50. All temporary erosion controls shall be removed at the conclusion of work once the surrounding area has achieved final stabilization.

General Conditions

51. Any proposed alterations, minor plan changes, or amendment requests, as well as any required submittals shall be sent by email for review and approval to heidi.davis@mass.gov and jaime.iannelli@mass.gov. **(Submittal)**

52. This WQC remains in effect for the same duration as the Section 404 permit that requires it.

53. No Special Condition set forth herein shall be construed or operate to prohibit MassDEP from taking enforcement against the MassDOT or its contractors for any failure to comply with the terms and requirements of this WQC.

54. No activity authorized by this WQC may begin prior to expiration of the 21-day appeal period, or until a final decision is issued by MassDEP in the event of an appeal.

Failure to comply with this Certification is grounds for enforcement, including civil and criminal penalties, under MGL Ch. 21 §42, MGL Ch. 21A §16, or other possible actions/penalties as authorized by the General Laws of the Commonwealth.

This Certification does not relieve the applicant of the obligation to comply with other appropriate state or federal statutes or regulations.

NOTICE OF APPEAL RIGHTS

a.) Appeal Rights and Time Limits

Certain persons shall have a right to request an adjudicatory hearing concerning certifications by MassDEP when an application is required: (a) the applicant or property owner; (b) any person aggrieved by the decision who has submitted written comments during the public comment period; (c) any ten (10) persons of the Commonwealth pursuant to M.G.L. c.30A where a group member has submitted written comments during the public comment period; or (d) any governmental body or private organization with a mandate to protect the environment which has submitted written comments during the public comment period. Any person aggrieved, any ten (10) persons of the Commonwealth, or a governmental body or private organization with a mandate to protect the environment may appeal without having submitted written comments during the public comment period only when the claim is based on new substantive issues arising from material changes to the scope or impact of the activity and not apparent at the time of public notice. To request an adjudicatory hearing pursuant to M.G.L. c.30A, § 10, a Notice of Claim must be made in writing, provided that the request is made by certified mail or hand delivery to MassDEP, with the appropriate filing fee specified within 310 CMR 4.10 along with a DEP Fee Transmittal Form within twenty-one (21) days from the date of issuance of this Certificate, and addressed to:

Case Administrator
Department of Environmental Protection

100 Cambridge Street, 9th Floor
Boston, MA 02114

A copy of the request shall at the same time be sent by certified mail or hand delivery to the Department of Environmental Protection at:

Department of Environmental Protection
Commissioner's Office
100 Cambridge Street, Suite 900
Boston, MA 02114

b.) Contents of Hearing Request

A Notice of Claim for Adjudicatory Hearing shall comply with MassDEP's Rules for Adjudicatory Proceedings, 310 CMR 1.01(6), and shall contain the following information pursuant to 314 CMR 9.10(3):

3. the 401 Certification Transmittal Number;
4. the complete name of the applicant and address of the project;
5. the complete name, address, and fax and telephone numbers of the party filing the request, and, if represented by counsel or other representative, the name, fax and telephone numbers, and address of the attorney;
6. if claiming to be a party aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found at 314 CMR 9.02;
7. a clear and concise statement that an adjudicatory hearing is being requested;
8. a clear and concise statement of (1) the facts which are grounds for the proceedings, (2) the objections to this Certificate, including specifically the manner in which it is alleged to be inconsistent with the MassDEP's Water Quality Regulations, 314 CMR 9.00, and (3) the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written Certification; and
9. a statement that a copy of the request has been sent by certified mail or hand delivery to the applicant, the owner (if different from the applicant), the conservation commission of the city or town where the activity will occur, the Department of Conservation and Recreation (when the certificate concerns projects in Areas of Critical Environmental Concern), the public or private water supplier where the project is located (when the certificate concerns projects in Outstanding Resource Waters), and any other entity with responsibility for the resource where the project is located.

c.) Filing Fee and Address

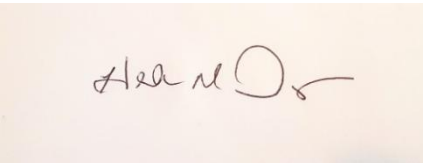
The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
Commonwealth Master Lockbox
PO Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. MassDEP may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Should you have any questions relative to this permit, please contact myself or Jaime Iannelli at heidi.davis@mass.gov and jaime.iannelli@mass.gov.

Very truly yours,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP WERO – Michael McHugh
USACE – Dan Vasconcelos
USACE – Kevin Newton
MassDOT – Michael Joa
MassDOT – Anthony Christakis
Benesch – Ashley Bomley
Hadley Conservation Commission – Kayla Loubriel

ATTACHMENT A
PRE-CONSTRUCTION SUBMITTAL CHECKLIST

Bridge Replacement (H-01-005), Bay Road (Route 47) over Fort River
Hadley, Massachusetts

THIS CHECKLIST MUST BE COMPLETED PRIOR TO THE START OF WORK. NOTE THAT SOME CONDITIONS REQUIRE THAT INFORMATION BE SUBMITTED A SPECIFIC NUMBER OF DAYS PRIOR TO THE START OF WORK OR THE PRE-CONSTRUCTION MEETING.

Pre-Construction Meeting Date: _____

Condition	Required Submittal	Due Date	Date Submitted	Date Approved
PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS				
2 and 3	Name, contact information, and qualifications of the WS and FGM, including specific experience and years to meet requirement	Prior to Pre-Construction Meeting		
4	Name and contact information of the RE	Prior to Pre-Construction Meeting		
6	USACE Work-Start Notification Form	14 days prior to work start		
7	CP/PP	14 days prior to work start		
8	RE, CP/PP Inspector, and other relevant personnel Verification of SWPPP Training	Prior to Work Start		
10	Control of Water Plan	14 days prior to work start		
13	Flood Contingency Plan	Prior to any work within 1% annual chance of flooding zone		
14	Invasive Plant Management Strategy	Prior to Pre-Construction Meeting		
16	Final Construction Plans	30 days prior to Pre-Construction Meeting		

MassDEP 重要 महत्वपूर्ण σημαντικός Important կարեւոր quan trọng مهم

Communication for Non-English-Speaking Parties

This document is important and should be translated immediately.

If you need this document translated, please contact MassDEP's Director of Environmental Justice at the telephone number listed below.

Español Spanish

Este documento es importante y debe ser traducido inmediatamente. Si necesita traducir este documento, póngase en contacto con el Director de Justicia Ambiental de MassDEP (*MassDEP's Director of Environmental Justice*) en el número de teléfono que figura más abajo.

Português Portuguese

Este documento é importante e deve ser traduzido imediatamente. Se você precisar traduzir este documento, entre em contato com o Diretor de Justiça Ambiental do MassDEP no número de telefone listado abaixo.

繁體中文 Chinese Traditional

本文檔很重要，需要即刻進行翻譯。
如需對本文檔進行翻譯，請透過如下列示電話號碼與 MassDEP 的環境司法總監聯絡。

简体中文 Chinese Simplified

这份文件非常重要，需要立即翻译。
如果您需要翻译这份文件，请通过下方电话与 MassDEP 环境司法主任联系。

Ayisyen Kreyòl Haitian Creole

Dokiman sa a enpòtan epi yo ta dwe tradui l imedyatman. Si w bezwen tradui dokiman sa a, tanpri kontakte Direktè. Jistis Anviwònmantal MassDEP a nan nimewo telefòn ki endike anba a.

Việt Vietnamese

Tài liệu này và quan trọng và phải được dịch ngay. Nếu quý vị cần bản dịch của tài liệu này, vui lòng liên hệ với Giám Đốc Phòng Công Lý Môi Trường của MassDEP theo số điện thoại được liệt kê bên dưới.

ប្រទេសកម្ពុជា Khmer/Cambodian

ឯកសារនេះមានសារៈសំខាន់
ហើយគប្បីត្រូវត្រូវបានបកប្រែភ្លាមៗ។.
ប្រសិនបើអ្នកត្រូវការអោយឯកសារនេះបកប្រែ
សូមទាក់ទងនាយកផ្នែកយុត្តិធម៌បរិស្ថានរបស់
MassDEPតាមរយៈលេខទូរស័ព្ទដែលបានរាយដូចខាងក្រោម។

Kriolu Kabuverdianu Cape Verdean

Es dokumentu sta important i tenki ser tradusidu immediatamenti. Se nho ta presisa ke es dokumentu sta tradisidu, por favor kontata O Diretor di Justisia di Environman di DEP ku es numero di telifoni menxionadu di baixo.

Contact Deneen Simpson 857-406-0738
Massachusetts Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114
TTY# MassRelay Service 1-800-439-2370 • https://www.mass.gov/environmental-justice
(Version revised 8.2.2023) 310 CMR 1.03(5)(a)

Русский Russian

Это чрезвычайно важный документ, и он должен быть немедленно переведен. Если вам нужен перевод этого документа, обратитесь к директору Департамента экологического правосудия MassDEP (MassDEP's Director of Environmental Justice) по телефону, указанному ниже.

العربية Arabic

هذه الوثيقة مهمة وتجب ترجمتها على الفور.

إذا كنت بحاجة إلى ترجمة هذه الوثيقة، فيرجى الاتصال بمدير العدالة البيئية في MassDEP على رقم الهاتف المذكور أدناه.

한국어 Korean

이 문서는 중대하므로 즉시 번역되어야 합니다.
본 문서 번역이 필요하신 경우, 매사추세츠 환경보호부의 "환경정의" 담당자 분께 문의하십시오. 전화번호는 아래와 같습니다.

հայերեն Armenian

Այս փաստաթուղթը կարևոր է, և պետք է անհապաղ թարգմանել այն:
Եթե Ձեզ անհրաժեշտ է թարգմանել այս փաստաթուղթը, դիմեք Մասաչուսեթսի շրջակա միջավայրի պահպանության նախարարության (MassDEP) Բնապահպանական հարցերով արդարադատության ղեկավարին (Director of Environmental Justice)՝ ստորև նշված հեռախոսահամարով

فارسی Farsi Persian

این نوشتار بسیار مهمی است و باید فوراً ترجمه شود.
اگر نیاز به ترجمه این نوشتار دارید لطفاً با مدیر عدالت محیط زیستی MassDEP در شماره تلفن ذکر شده زیر تماس بگیرید.

Français French

Ce document est important et doit être traduit immédiatement. Si vous avez besoin d'une traduction de ce document, veuillez contacter le directeur de la justice environnementale du MassDEP au numéro de téléphone indiqué ci-dessous.

Deutsch German

Dieses Dokument ist wichtig und muss sofort übersetzt werden. Wenn Sie eine Übersetzung dieses Dokuments benötigen, wenden Sie sich bitte an MassDEP's Director of Environmental Justice *(Direktor für Umweltgerechtigkeit in Massachusetts)* unter der unten angegebenen Telefonnummer.

Ελληνική Greek

Το έγγραφο αυτό είναι πολύ σημαντικό και πρέπει να μεταφραστεί αμέσως. Αν χρειάζεστε μετάφραση του εγγράφου αυτού, παρακαλώ επικοινωνήστε με τον Διευθυντή του Τμήματος Περιβαλλοντικής Δικαιοσύνης της Μασαχουσέτης στον αριθμό τηλεφώνου που αναγράφεται παρακάτω

Italiano Italian

Questo documento è importante e deve essere tradotto immediatamente. Se hai bisogno di tradurre questo documento, contatta il Direttore della Giustizia Ambientale di MassDEP al numero di telefono sotto indicato.

Język Polski Polish

Ten dokument jest ważny i powinien zostać niezwłocznie przetłumaczony. Jeśli potrzebne jest tłumaczenie tego dokumentu, należy skontaktować się z dyrektorem ds. sprawiedliwości środowiskowej MassDEP pod numerem telefonu podanym poniżej.

हिन्दी Hindi

यह दस्तावेज महत्वपूर्ण है और इसका अनुवाद तुरंत किया जाना चाहिए। यदि आपको इस दस्तावेज का अनुवाद कराने की जरूरत है, तो कृपया नीचे दिए गए टेलीफोन नंबर पर MassDEP के पर्यावरणीय न्याय निदेशक से संपर्क करें।

Contact Deneen Simpson 857-406-0738
Massachusetts Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114
TTY# MassRelay Service 1-800-439-2370 • https://www.mass.gov/environmental-justice
(Version revised 8.2.2023) 310 CMR 1.03(5)(a)

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DOCUMENT A00844

U.S. FISH AND WILDLIFE SERVICE

NLAA CONCURRENCE VERIFICATION LETTER

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 03/15/2024 14:41:52 UTC
Project code: 2024-0062332
Project Name: 608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER

Subject: Concurrence verification letter for the '608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER' project under the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (NLEB).

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated March 15, 2024 to verify that the **608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER** (Proposed Action) may rely on the concurrence provided in the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures. **At least one of the qualification interview questions indicated an activity or portion of your project is consistent with a not likely to adversely affect determination therefore, the overall determination for your project is, may affect, and is not likely to adversely affect (NLAA) the endangered Indiana bat (*Myotis sodalis*) and/or the endangered northern long-eared bat (*Myotis septentrionalis*)**. Consultation with the Service pursuant to section 7(a)(2) of ESA (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.) is required.

The Service has 14 calendar days to notify the lead Federal action agency or designated non-federal representative if we determine that the Proposed Action does not meet the criteria for a NLAA determination under the PBO. If we do not notify the lead Federal action agency or designated non-federal representative within that timeframe, you may proceed with the Proposed

Action under the terms of the NLAA concurrence provided in the PBO. This verification period allows Service Field Offices to apply local knowledge to implementation of the PBO, as we may identify a small subset of actions having impacts that were unanticipated. In such instances, Service Field Offices may request additional information that is necessary to verify inclusion of the proposed action under the PBO.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities: If your initial bridge/culvert or structure assessment documented signs of bat use or occupancy, or an assessment failed to detect Indiana bats and/or NLEBs, yet are later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of any potential take. In these instances, potential incidental take of Indiana bats and/or NLEBs is covered under the Incidental Take Statement in the 2018 FHWA, FRA, FTA PBO (provided that the take is reported to the Service).

If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA Section 7(a)(2) may be required.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities:
If your initial bridge/culvert or structure assessments failed to detect Indiana bats and/or NLEB use or occupancy, yet bats are later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of the incident. In these instances, potential incidental take of Indiana bats and/or NLEBs may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species, and/or any designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please contact this Service Office.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate

PROJECT DESCRIPTION

The following project name and description was collected in IPaC as part of the endangered species review process.

NAME

608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER

DESCRIPTION

608460 - HADLEY- BRIDGE REPLACEMENT, H-01-005, BAY ROAD (ROUTE 47) OVER THE FORT RIVER

This project will replace the existing Bay Road bridge (Route 47) over the Fort River. The bridge will be reconstructed with wider shoulders and new sidewalks.

Monarch Butterfly: Candidate Species only, no conservation measures at this time.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.3327051,-72.5787180343803,14z



DETERMINATION KEY RESULT

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the endangered Indiana bat and/or the endangered northern long-eared bat, therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the concurrence provided in the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

QUALIFICATION INTERVIEW

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the northern long-eared bat[1]?

   [1] See northern long-eared bat species profile

   Automatically answered
   Yes

3. Which Federal Agency is the lead for the action?

   A) Federal Highway Administration (FHWA)

4. Are *all* project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No

5. Does the project include *any* activities that are **greater than** 300 feet from existing road/rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No

6. Does the project include *any* activities **within** 0.5 miles of a known Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No

7. Is the project located **within** a karst area?

   No

8. Is there *any* suitable[1] summer habitat for Indiana Bat or NLEB **within** the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the User's Guide for the Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat.

   Yes

9. Will the project remove *any* suitable summer habitat[1] and/or remove/trim any existing trees **within** suitable summer habitat?

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   Yes

10. Will the project clear more than 20 acres of suitable habitat per 5-mile section of road/rail?

    No

11. Have presence/probable absence (P/A) summer surveys[1][2] been conducted[3][4] **within** the suitable habitat located within your project action area?

    [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

    [2] Presence/probable absence summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate distance from hibernacula) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    [3] For projects within the range of either the Indiana bat or NLEB in which suitable habitat is present, and no bat surveys have been conducted, the transportation agency will assume presence of the appropriate species. This assumption of presence should be based upon the presence of suitable habitat and the capability of bats to occupy it because of their mobility.

    [4] Negative presence/probable absence survey results obtained using the summer survey guidance are valid for a minimum of two years from the completion of the survey unless new information (e.g., other nearby surveys) suggest otherwise.

    Yes

    SUBMITTED DOCUMENTS

    - *608460_Hadley_PA_Bridge_survey_report.pdf https://ipac.ecosphere.fws.gov/project/MYEBGJLJ75C4TP6RVPTZ3BMC4Q/projectDocuments/140064895*

12. Did the presence/probable absence (P/A) summer surveys detect Indiana bats and/or NLEB[1]?

    [1] P/A summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate home range) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    No

13. Were the P/A summer surveys conducted **within** the fall swarming/spring emergence range of a documented Indiana bat hibernaculum[1]?

    [1] Contact the local Service Field Office for appropriate distance from hibernacula.

    No

14. Does the project include activities **within documented NLEB habitat**[1][2]?

    [1] Documented roosting or foraging habitat – for the purposes of this consultation, we are considering documented habitat as that where Indiana bats and/or NLEB have actually been captured and tracked using (1) radio telemetry to roosts; (2) radio telemetry biangulation/triangulation to estimate foraging areas; or (3) foraging areas with repeated use documented using acoustics. Documented roosting habitat is also considered as suitable summer habitat within 0.25 miles of documented roosts.)

    [2] For the purposes of this key, we are considering documented corridors as that where Indiana bats and/or NLEB have actually been captured and tracked to using (1) radio telemetry; or (2) treed corridors located directly between documented roosting and foraging habitat.

    No

15. Will the removal or trimming of habitat or trees occur **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors?

    Yes

16. What time of year will the removal or trimming of habitat or trees **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors occur?

    C) During both the active and inactive seasons

17. Will *any* tree trimming or removal occur **within** 100 feet of existing road/rail surfaces?

    Yes

18. Will *any* tree trimming or removal occur **between** 100-300 feet of existing road/rail surfaces?

    No

19. Are *all* trees that are being removed clearly demarcated?

    Yes

20. Will the removal of habitat or the removal/trimming of trees involve the use of **temporary** lighting?

    Yes

21. Will the removal of habitat or the removal/trimming of trees include installing new or replacing existing **permanent** lighting?

    No

22. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

    Yes

23. Does the project include slash pile burning?

    No

24. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    Yes

25. Is there *any* suitable habitat[1] for Indiana bat or NLEB **within** 1,000 feet of the bridge? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

    [1] See the Service's current summer survey guidance for our current definitions of suitable habitat.

    Yes

26. Has a bridge assessment[1] been conducted **within** the last 24 months[2] to determine if the bridge is being used by bats?

    [1] See User Guide Appendix D for bridge/structure assessment guidance

    [2] Assessments must be completed no more than 2 years prior to conducting any work below the deck surface on all bridges that meet the physical characteristics described in the Programmatic Consultation, regardless of whether assessments have been conducted in the past. Due to the transitory nature of bat use, a negative result in one year does not guarantee that bats will not use that bridge/structure in subsequent years.

    Yes

    SUBMITTED DOCUMENTS

    - *608460_Hadley_PA_Bridge_survey_report.pdf https://ipac.ecosphere.fws.gov/project/MYEBGJLJ75C4TP6RVPTZ3BMC4Q/projectDocuments/140064895*

27. Did the bridge assessment detect *any* signs of Indiana bats and/or NLEBs roosting in/under the bridge (bats, guano, etc.)[1]?

    [1] If bridge assessment detects signs of *any* species of bats, coordination with the local FWS office is needed to identify potential threatened or endangered bat species. Additional studies may be undertaken to try to identify which bat species may be utilizing the bridge prior to allowing *any* work to proceed.

    Note: There is a small chance bridge assessments for bat occupancy do not detect bats. Should a small number of bats be observed roosting on a bridge just prior to or during construction, such that take is likely to occur or does occur in the form of harassment, injury or death, the PBO requires the action agency to report the take. Report all unanticipated take within 2 working days of the incident to the USFWS. Construction activities may continue without delay provided the take is reported to the USFWS and is limited to 5 bats per project.

    No

28. Will the bridge removal, replacement, and/or maintenance activities include installing new or replacing existing **permanent** lighting?

    No

29. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No

30. Will the project involve the use of *any* **temporary** lighting in addition to the lighting already indicated for habitat removal (including the removal or trimming of trees), or bridge/structure removal, replacement or maintenance activities?

    Yes

31. Is there *any* suitable habitat **within** 1,000 feet of the location(s) where **temporary** lighting (other than the lighting already indicated for habitat removal (including the removal or trimming of trees) or bridge/structure removal, replacement or maintenance activities) will be used?

    Yes

32. Will the project install new or replace existing **permanent** lighting?

    No

33. Does the project include percussives or other activities (**not including tree removal/ trimming or bridge/structure work**) that will increase noise levels above existing traffic/ background levels?

    Yes

34. Will the activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the active season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

35. Will *any* activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the inactive season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

36. Are *all* project activities that are **not associated with** habitat removal, tree removal/ trimming, bridge and/or structure activities, temporary or permanent lighting, or use of percussives, limited to actions that DO NOT cause any additional stressors to the bat species?

    Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

    Yes

37. Will the project raise the road profile **above the tree canopy**?

    No

38. Are the wetland or stream protection activities associated with compensatory wetland/ stream mitigation portion of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because your activities associated with compensatory wetland/stream mitigation activities do not clear suitable summer habitat and are not within 0.5 miles of Indiana bat or NLEB hibernaculum.

39. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the active season within undocumented habitat.

40. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) and/or increase noise levels above existing traffic/background levels consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the inactive season

41. Is the location of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because no bats were detected during presence/probable absence surveys conducted during the summer survey season and outside of the fall swarming/spring emergence periods. Additionally, all activities were at least 0.5 miles from any hibernaculum.

42. Is the bridge removal, replacement, or maintenance activities portion of this project consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the bridge has been assessed using the criteria documented in the BA and no signs of bats were detected

43. **General AMM 1**
    Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

    Yes

PROJECT QUESTIONNAIRE

1. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

   N/A

2. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

   N/A

3. How many acres[1] of trees are proposed for removal between 0-100 feet of the existing road/rail surface?

   [1] If described as number of trees, multiply by 0.09 to convert to acreage and enter that number.

   1.2

4. Please describe the proposed bridge work:

   The proposed bridge substructure consists of two (2) integral abutments and two (2) pipe pile bents with reinforced concrete pile caps. New riprap will be installed at the base of the south and north abutment walls.

   The entire bridge superstructure will be replaced and widened using a combination of S36-18 and S48-18 precast concrete deck beams. The superstructure supports a 8” cast-in-place reinforced concrete slab with 3” HMA overlay and one sidewalk along the east side of the bridge. The total bridge is 126’ long, with spans of 42’, 42’ and 42’ from centerline of bearings.
   The total out-to-out width is 42’-6”, all within current right-of-way limits. This superstructure replacement requires a 15” rise in profile to maintain the bridge low chord.

5. Please state the timing of all proposed bridge work:

   October 1st, 2024 to June 16th, 2025

6. Please enter the date of the bridge assessment:

   6/16/2023

AVOIDANCE AND MINIMIZATION MEASURES (AMMS)

This determination key result includes the committment to implement the following Avoidance and Minimization Measures (AMMs):

GENERAL AMM 1

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

DETERMINATION KEY DESCRIPTION: FHWA, FRA, FTA PROGRAMMATIC CONSULTATION FOR TRANSPORTATION PROJECTS AFFECTING NLEB OR INDIANA BAT

This key was last updated in IPaC on October 30, 2023. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the endangered **northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPAC USER CONTACT INFORMATION

Agency: Massachusetts Department of Transportation
Name: Ian Battles
Address: 10 Park Plaza
City: Boston
State: MA
Zip: 02116
Email ian.h.battles@dot.state.ma.us
Phone: 8572623378

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

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DOCUMENT A00846

Turtle Protection Plan

Mass Wildlife
Natural Heritage and Endangered Species Program

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WOOD TURTLE (*Glyptemys insculpta*) PROTECTION PLAN

General

This section outlines the requirements of the Natural Heritage and Endangered Species Program (NHESP) of the Division of Fisheries and Wildlife (DFW) for projects that occur in the vicinity of high-priority wood turtle (*Glypemys insculpta*) populations. The requirements consist of monitoring and protecting turtles during the replacement of the Bay Road Bridge over the Fort River in Hadley, Massachusetts (MassDOT Project 608460/NHESP File: 23-6213)

One Time Sweeps – Prior to Vegetation Clearing and In-water Cofferdam Installation

The Turtle Monitor (the Monitor) shall be a MassDOT biologist (David J. Paulson, (857) 262-3378, david.j.paulson@dot.state.ma.us; or a representative from MassDOT Wildlife and Endangered Species Unit) approved by the Natural Heritage and Endangered Species Program (NHESP). The Monitor shall obtain a scientific collecting permit from the NHESP to handle wood turtles. The Monitor shall visit the site prior to the start of work, and the Contractor and/or Resident Engineer shall coordinate this site visit with the Monitor at least 60 days prior to construction commencement. The Monitor shall sweep the site prior to any site clearing, grubbing, earth disturbance, or site preparations. The Monitor shall inspect vegetation within 200' of the stream, prior to the establishment of the limit of work line and Turtle Exclusion Fence Barrier.

In addition, the Monitor shall provide a sweep of the site prior to any work in water. The Monitor shall inspect all areas of land under water where cofferdams are to be installed, paying close attention to overhanging banks and in water coarse woody debris.

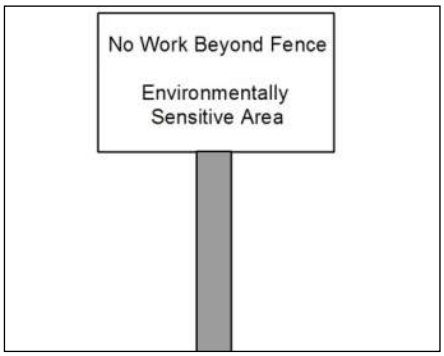
The Monitor shall visually sweep the described areas immediately before machines enter the area and relocate any turtles to suitable habitat immediately beyond the construction site. The Monitor shall provide contact information to the project supervisor in the event a wood turtle is discovered on-site. The Monitor may visit the site on only one day if the vegetation clearing and in-water work are initiated on the same day. Upon completion of the monitoring, the Monitor shall provide the NHESP with a summary of activities at the construction site. This report shall include the number and duration of visits and rare species observation forms for all state-listed species encountered. In the event of finding an injured turtle, the turtle shall be transported to a suitable veterinarian. In the event of finding a turtle with a radio transmitter, the NHESP and the contact on the transmitter shall be alerted immediately.

Additionally, since the road will remain open to traffic during construction, the Resident Engineer trained by a qualified MassDOT Biologist shall provide a sweep of the site prior to each workday and relocate any turtles to suitable habitat immediately beyond the construction site. In the event a wood turtle is discovered on site, the Registered Engineer must contact the Monitor. Contact information of the Monitor will be provided to the Resident Engineer.

All state-listed species encountered in or near the project shall be reported to the NHESP through a Rare Animal/Plan Observation Report with the required supporting materials within 10 days of the observation. No state-listed species may be removed from the project site unless under the direct supervision of the Monitor or the NHESP.

Establishment of a Limit of Work Barrier

Following the sweep of the work site, a limit of work barrier shall be installed. This line shall consist of staked compost filter tubes and Turtle Exclusion Fence Barrier (silt fence as the outer boundary) and shall contain signage clearly identifying it as the limits of work in all four quadrants. Refer to the attached sketch for the approximate location of the Turtle Exclusion Fence Barrier.



Example limit of work sign.

Installation of the barrier must be conducted using methods that result in a minimum of disturbance (i.e., hand-dug, "2-man" trencher or auger). It is not appropriate to clear large access paths prior to sweeps for turtle. No clearing may occur outside the limit of work approved by the NHESP without additional review and approval by the NHESP.

1. The barrier must be composed of at least 2 1/2 feet of vertical barrier above ground and an additional 4-6 inches buried below ground.
2. The face of the material must be relatively smooth. Materials commonly used are staked at 6 - 10 foot intervals and include tightly woven geotextile, aluminum flashing, or other such materials stapled or tacked to stakes. Loosely woven geotextile fabrics, hay/straw bales, wattles or tubular materials are not generally sufficient.
3. The bottom of the silt fencing must be carefully buried in a 4-6 inch deep trench. The trench must be backfilled and compacted. If it is not possible to dig a trench, then the bottom of the barrier must be affixed to the surface.
4. If project phasing and the traffic management plan allow, the barrier shall only include a single gap at each limit of the project large enough for vehicle passage to access the construction area. These gaps must be closed each night during the turtle active season (March 15 – October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations. The turtle barrier gate must be keyed into the barrier so that turtles cannot enter the construction area.
5. If hay or straw bales are to be used with silt fencing, they shall be installed on the work-side of the silt fence to avoid turtles using these to breach the barrier.
6. Once installed, the barrier shall be taut between the stakes. Slumps or loose materials will undermine the effectiveness of the barrier. In some circumstances, geotextile fabrics may need to be reinforced with backer material to ensure integrity. Backer material is typically similar to hardware cloth.

Once per week, a person familiar with silt barrier maintenance and installation shall inspect the barrier and facilitate any repairs or alterations. The limit of work barrier should remain taut between stakes and any holes along the bottom repaired. MassDOT shall provide the NHESP with the name and contact information of the Resident Engineer responsible for coordinating necessary sweeps and maintaining appropriate barriers.

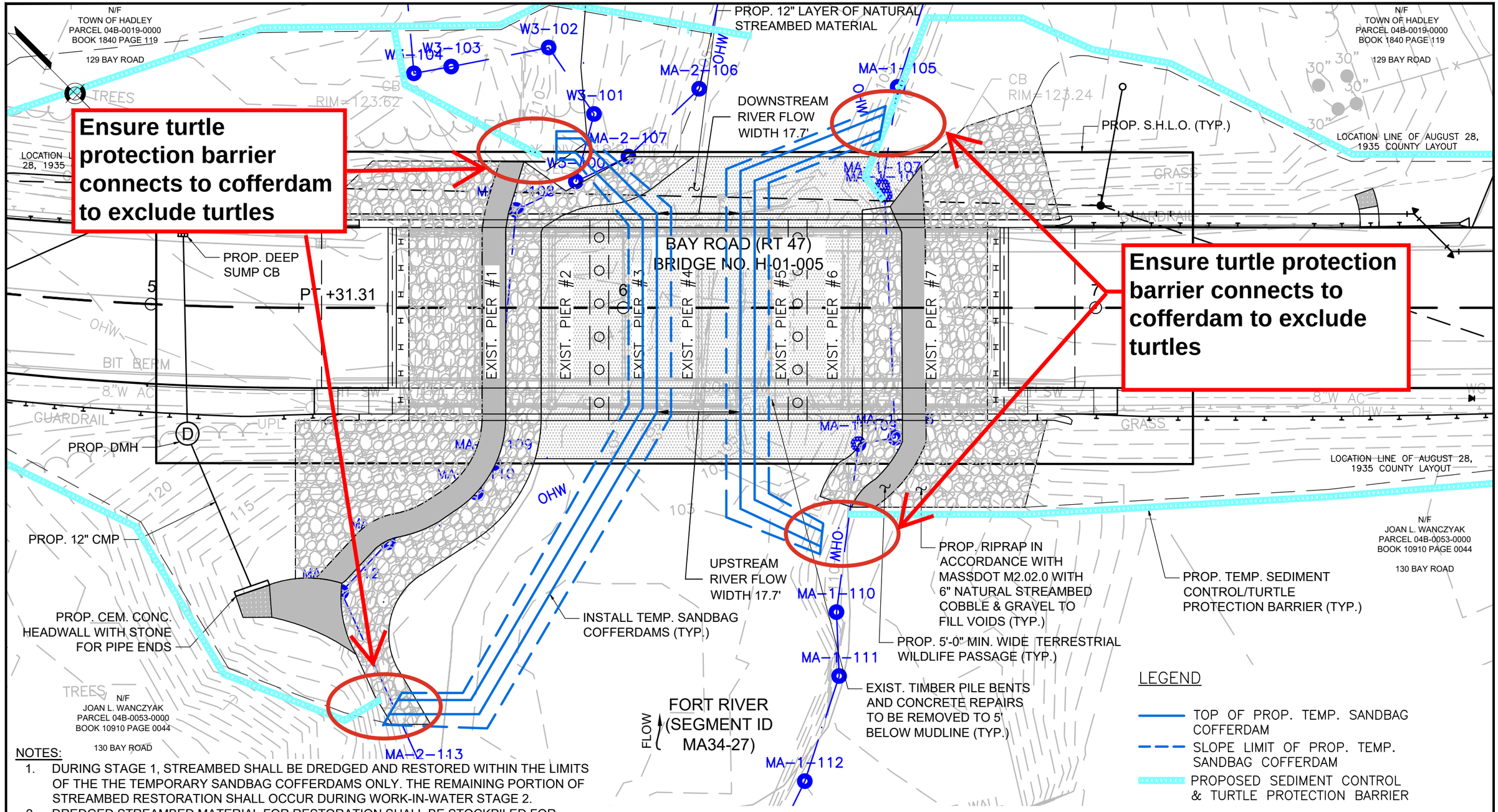
Construction Worker Training:
The Monitor shall provide to the construction foreperson wood turtle identification and handling pamphlets. All construction, landscaping, and other sub-contractors associated with the Project shall be informed in writing of the likely presence of State-listed Species on the Property and what measures (observation and injury protection) should be implemented to minimize direct harm to State-listed Species.

Further, no wildlife shall be removed from the Property without approval of a qualified wildlife biologist or the Division except as necessary to receive veterinary treatment in the case of harm during construction.

This protocol may require only one to three days of labor, including field surveys and correspondence with the NHESP.

Basis of Payment:
There will be no payment for the work conducted by the Turtle Monitor, as the Monitor will be provided to the Contractor as a free service by MassDOT.

Installation of a limit of work barrier, turtle barrier gates, and limit of work signage shall be considered incidental under ITEM 767.121 SEDIMENT CONTROL BARRIER.



NOTES:

1. DURING STAGE 1, STREAMBED SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY. THE REMAINING PORTION OF STREAMBED RESTORATION SHALL OCCUR DURING WORK-IN-WATER STAGE 2.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

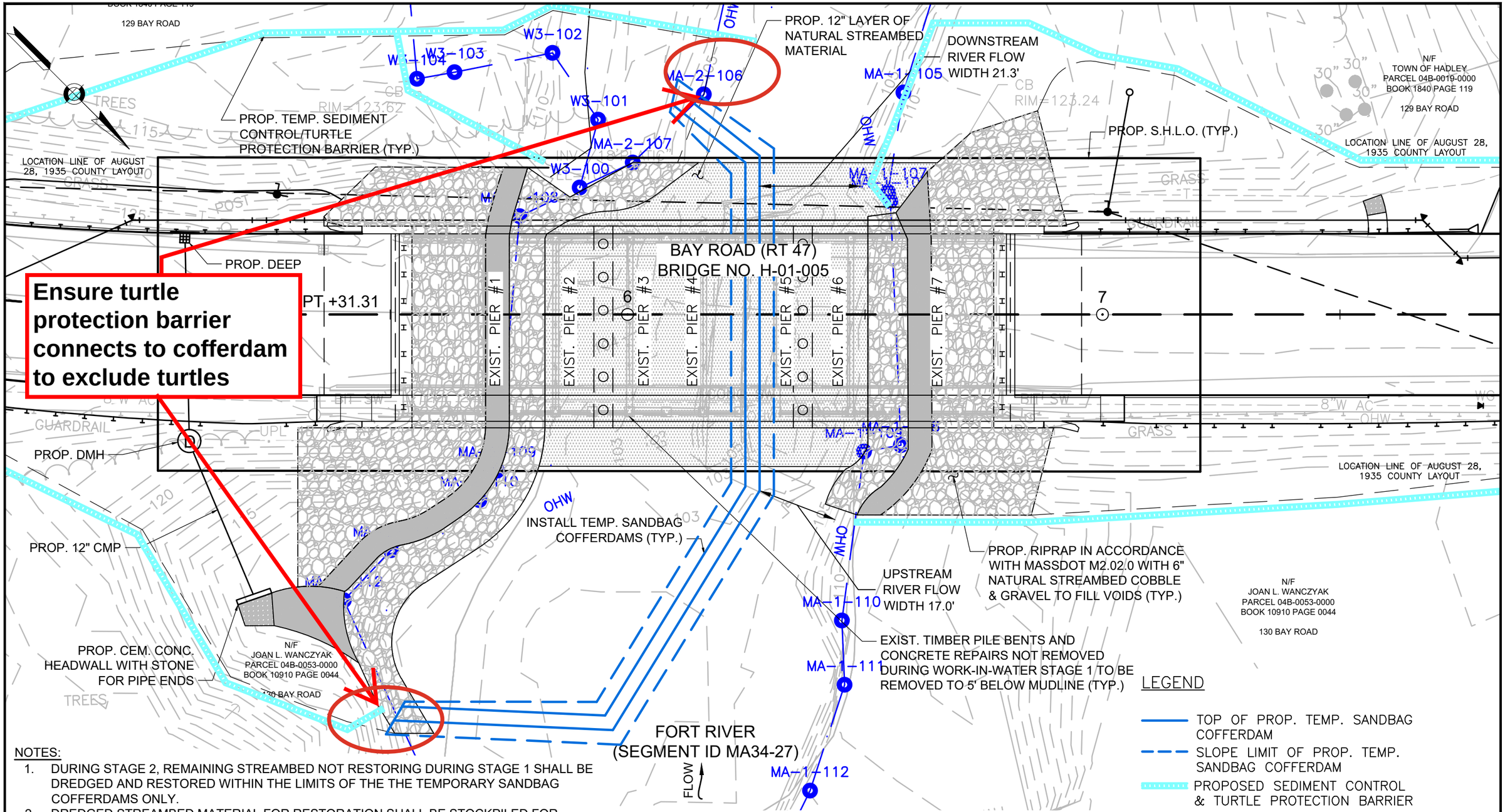
WORK-IN-WATER STAGE 1

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

Turtle Protection Plan Sketch, Page 1
See Turtle Protection Plan Special Provision for details
For further guidance, contact the MassDOT Wildlife Unit
David Paulson, MassDOT Wildlife Unit Supervisor

(david.j.paulson@state.dot.ma.us)



Ensure turtle protection barrier connects to cofferdam to exclude turtles

NOTES:

1. DURING STAGE 2, REMAINING STREAMBED NOT RESTORING DURING STAGE 1 SHALL BE DREDGED AND RESTORED WITHIN THE LIMITS OF THE THE TEMPORARY SANDBAG COFFERDAMS ONLY.
2. DREDGED STREAMBED MATERIAL FOR RESTORATION SHALL BE STOCKPILED FOR REGRADING AS REQUIRED AND REPLACEMENT AT EXISTING PIER REMOVAL LOCATIONS.
3. THIS STAGING IS BASED UPON LOW FLOW CONDITIONS ONLY. IF CONTRACTOR IS REQUIRED TO WORK IN PERIODS OF HIGHER FLOWS, WORK-IN-WATER STAGING MAY BE RELOCATED TO ACCOMMODATE A GREATER RIVER WIDTH & SUB-STAGING ADDED.

WORK-IN-WATER STAGE 2

benesch

BAY ROAD (ROUTE 47) OVER FORT RIVER
(segment ID MA34-27)
HADLEY, MA

Turtle Protection Plan Sketch, Page 2
See Turtle Protection Plan Special Provision for details
For further guidance, contact the MassDOT Wildlife Unit
David Paulson, MassDOT Wildlife Unit Supervisor

(david.j.paulson@state.dot.ma.us)

HIGHWAY GUARD DETAILS

RIGHT SIDE:
STA. 4+69 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

LEFT SIDE:
STA. 2+80 TO STA. 5+06 GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED)
STA. 5+06 TO STA. 5+40 TRANSITION TO BRIDGE RAIL

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

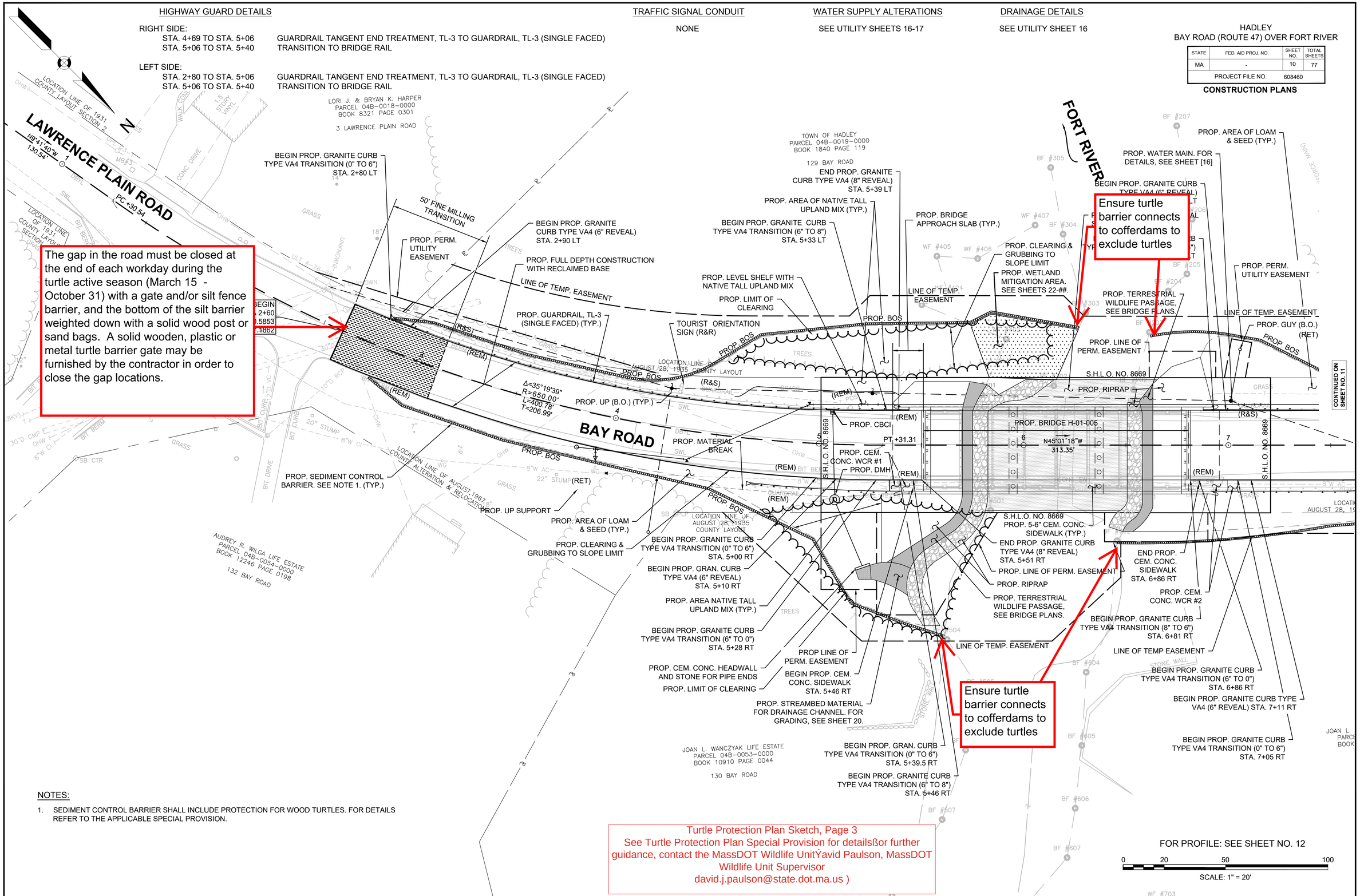
DRAINAGE DETAILS

SEE UTILITY SHEET 16

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS



NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.

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HIGHWAY GUARD DETAILS

RIGHT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 9+72	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

LEFT SIDE:

STA. 6+91 TO STA. 7+25	TRANSITION TO BRIDGE RAIL
STA. 7+25 TO STA. 7+79	GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3
STA. 8+26 TO STA. 9+76	GUARDRAIL TANGENT END TREATMENT, TL-3 TO GUARDRAIL, TL-3 (SINGLE FACED) TO GUARDRAIL TANGENT END TREATMENT, TL-3

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE UTILITY SHEETS 16-17

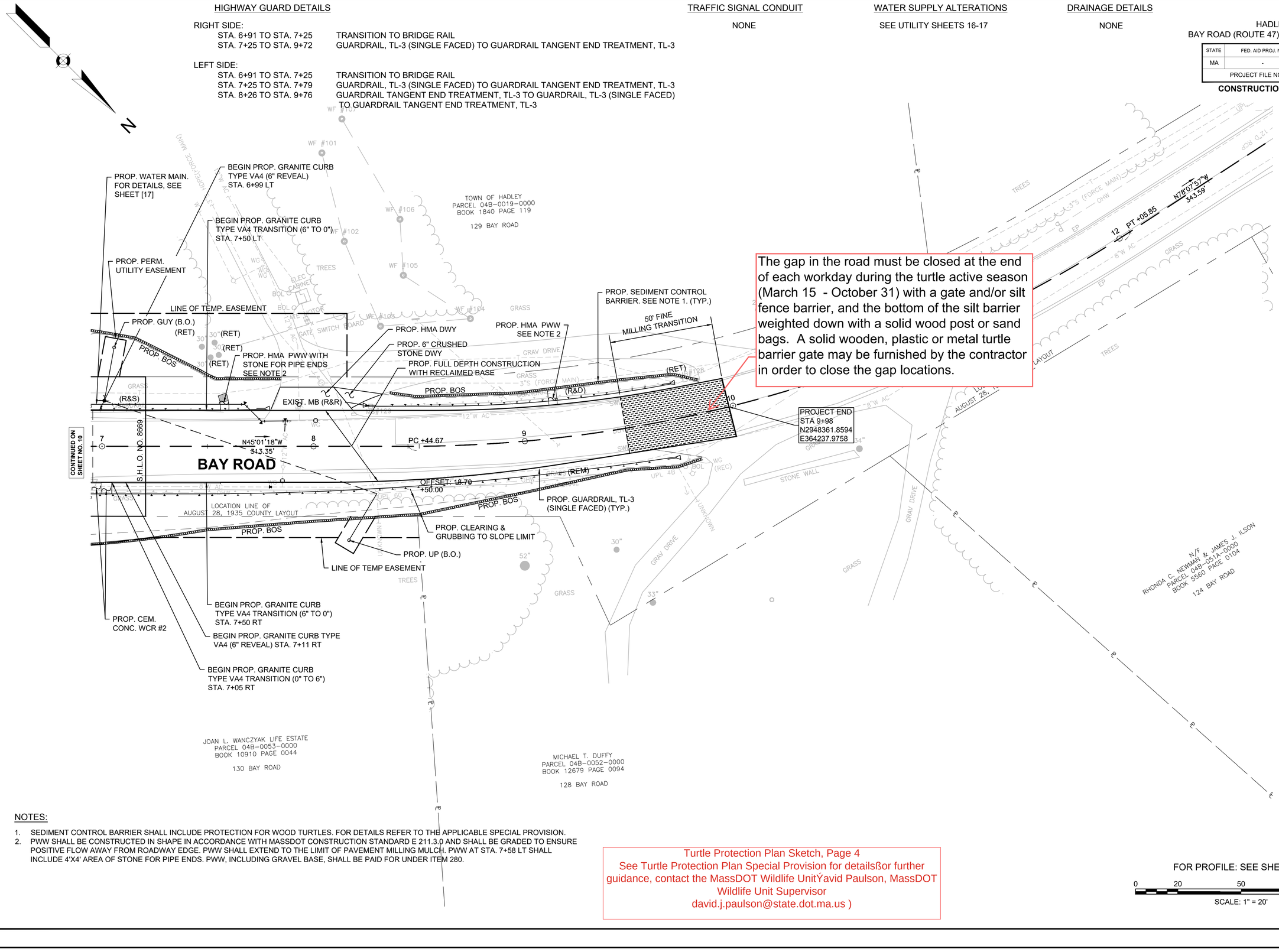
DRAINAGE DETAILS

NONE

HADLEY
BAY ROAD (ROUTE 47) OVER FORT RIVER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	77
PROJECT FILE NO.	608460		

CONSTRUCTION PLANS



The gap in the road must be closed at the end of each workday during the turtle active season (March 15 - October 31) with a gate and/or silt fence barrier, and the bottom of the silt barrier weighted down with a solid wood post or sand bags. A solid wooden, plastic or metal turtle barrier gate may be furnished by the contractor in order to close the gap locations.

NOTES:

1. SEDIMENT CONTROL BARRIER SHALL INCLUDE PROTECTION FOR WOOD TURTLES. FOR DETAILS REFER TO THE APPLICABLE SPECIAL PROVISION.
2. PWW SHALL BE CONSTRUCTED IN SHAPE IN ACCORDANCE WITH MASSDOT CONSTRUCTION STANDARD E 211.3.0 AND SHALL BE GRADED TO ENSURE POSITIVE FLOW AWAY FROM ROADWAY EDGE. PWW SHALL EXTEND TO THE LIMIT OF PAVEMENT MILLING MULCH. PWW AT STA. 7+58 LT SHALL INCLUDE 4'X4' AREA OF STONE FOR PIPE ENDS. PWW, INCLUDING GRAVEL BASE, SHALL BE PAID FOR UNDER ITEM 280.

Turtle Protection Plan Sketch, Page 4
See Turtle Protection Plan Special Provision for detailsßor further guidance, contact the MassDOT Wildlife UnitŸavid Paulson, MassDOT Wildlife Unit Supervisor
david.j.paulson@state.dot.ma.us)

FOR PROFILE: SEE SHEET NO. 13

0 20 50 100
SCALE: 1" = 20'

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DOCUMENT A00875

POLICY DIRECTIVE P-22-001
AND
POLICY DIRECTIVE P-22-002

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massDOT Massachusetts Department of Transportation Highway Division

Number: P-22-001
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Off-Site Stockpiling of Soil from MassDOT Construction Projects

Purpose

The purpose of this Policy Directive is to formally establish a policy and procedures for managing and stockpiling soil generated and transported from MassDOT construction projects. This Policy Directive does not supersede any Federal, State, or Local regulations.

Date of Effect

This Policy Directive is effective immediately for all projects, including active construction projects.

For active construction projects and for other projects advertised prior to October 15, 2022, changes to the contract documents needed to implement the requirements of this Policy Directive will be considered on a case-by-case basis and shall be approved by the District Highway Director, as necessary.

For projects advertised on or after October 15, 2022, MassDOT will include the requirements and implementation procedures of this Policy Directive in the construction contract documents.

Policy Requirements

This policy is intended to prevent the off-site relocation of excavated soil generated from MassDOT projects to areas near residential receptors and to control potential fugitive dusts and/or contaminants. To that end, excavated soil may not be moved from the project site without knowledge of the content of the material. Knowledge may include visual field observations for presence of staining, odor, and/or debris, screening with a photoionization detector (PID), laboratory analysis, and/or site history. Pavement millings and other non-soil materials are not subject to the requirements of this Policy Directive.

Moving soil from a MassDOT project site to a temporary off-site storage location must be approved in writing by the District Highway Director.

The Contractor must select a storage location that is at least 500 feet away from residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially

zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.

Temporary off-site storage of excavated soil from a MassDOT project is only permissible at a location approved and permitted by MassDOT. The temporary storage location should be located within the same municipality where the soil was excavated, where possible. Stockpiled soil must be securely covered, and appropriate measures must be taken to minimize fugitive dust and erosion.

Signs indicating the source of the soil, the date the soil was generated, and contact information must be erected and maintained until the stockpiled soils are transported to a disposal facility or reused on the project site.

Implementation Procedures

To ensure that off-site storage of excavated soils is managed properly on MassDOT projects, this policy requires the following:

1. **Off-Site Stockpile Storage Locations**
    a. The Contractor shall provide proposed off-site storage locations to the Engineer for approval at least 30 days prior to transporting soil off site. Off-site storage locations should be in the same municipality as the work site.
    b. The Contractor shall keep excavated soil on site until adequately characterized to the satisfaction of the Engineer.
    c. The Contractor shall provide notification of the approved off-site storage location to the local Board of Health and the Town Manager's/Mayor's Office at least 7-days prior to transporting soil off site.
    d. The Contractor shall provide the Engineer with at least 3-days' notice prior to transporting soil off site.
    e. For off-site storage locations on MassDOT property, the Contractor is required to obtain an Access Permit through the District Permits Office prior to storage of soil or other materials. MassDOT will issue these permits at no cost to the Contractor. Information to be submitted by the Contractor as part of the permit application shall include:
        i. A description of material to be stored off-site, including available analytical data;
        ii. A figure of the location with distances to residences and residential receptors; and
        iii. Anticipated duration of temporary storage.
    f. Stockpile locations should not be within 500 feet of residential receptors (e.g., residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities).
        i. If the stockpile location must be within 500 feet of residential receptors, then soil must be less than RCS-1 (per 310 CMR 40.1600) and free of potentially hazardous or regulated items.

g. For off-site storage locations on non-MassDOT property, the Contractor must notify the property owner(s) at least 7 days prior to transporting material.
h. Exceptions to these rules will be reviewed by MassDOT and may be approved by the District Highway Director on a case-by-case basis.

2. Off-Site Stockpile Management

a. The Contractor shall keep soil stockpiles on impermeable surfaces (e.g., asphalt or concrete) or on 10-mil polyethylene sheeting.
b. The Contractor shall cover soil stockpiles with 10-mil polyethylene sheeting and surround with a berm made of hay bales, straw wattles, or similar.
    i. Piles that are actively being worked on must be covered and re-secured at the end of the work shift.
c. The Contractor shall label stockpiles with signs, including:
    i. Location of origin (including any Release Tracking Numbers)
    ii. Stockpile ID number (including MassDOT District office-assigned tracking ID, if different)
    iii. Date of initial accumulation
    iv. Applicable telephone numbers for the Contractor and MassDOT.
d. The Contractor shall mitigate fugitive dust at storage locations under the direction of an appropriately trained/certified environmental professional.
e. The Contractor shall remedy noncompliance with this policy within 48 hours.
f. The Contractor shall remedy noncompliance with this policy on the SAME DAY for potentially hazardous material, as determined by the Engineer.
g. The Contractor shall handle excavated soil according to federal, state, and local regulations.
h. The Contractor shall use appropriate shipping documents for all movements of excavated soil on public roadways (e.g., Bill of Lading, Material Shipping Record, Manifest, Asbestos Waste Shipment Record, etc.).

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massDOT
Massachusetts Department of Transportation
Highway Division

Number: P-22-002
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Use of MassDOT Property for Staging and other Construction-Related Operations

Purpose

This Policy Directive is intended to address the use of MassDOT property by MassDOT Contractors for construction staging and other construction-related operations that are not specifically defined in the construction contract. Such use of MassDOT property will only be allowed if permitted by the District Office in accordance with 700 CMR 13.00, Approval of Access to MassDOT Highways and Other Property. This includes the use of MassDOT property for staging, laydown, and storage of equipment and materials, including soil excavated from a project site.

This Policy Directive requires the Contractor/applicant to obtain a Non-Vehicular Access Permit from MassDOT to use MassDOT property for these purposes.

This Policy Directive is effective immediately and applies to all MassDOT construction projects.

General Permit Considerations and Conditions

In addition to other normal MassDOT Access Permit procedures, MassDOT shall consider the following during the application, review, implementation and monitoring processes of Access Permits required by this Policy Directive:

- Storage and placement of the Contractor's equipment and materials should not be allowed within the clear zone of the roadway.
- Stockpiled soils should not be located within 500 feet of residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.
- The Contractor/applicant shall identify the access/egress locations of the proposed storage areas. MassDOT will only approve locations determined to be safe for roadway users, construction workers and the general public.
- The Contractor may be required to submit a Traffic Management Plan and/or Lighting Plan for MassDOT review and approval as part of the permit application, depending on the proposed use of the area.

- The Contractor shall submit the permit application through MassDOT's online State Highway Access Permit System (SHAPS).
- MassDOT will waive the permit application fee for any application received from a MassDOT Contractor for any permit required by this Policy Directive and will waive any subsequent amendment and extension fees that may otherwise be required.
- MassDOT will review the permit application in accordance with applicable standard procedures and will apply standard permit terms and conditions, as necessary.
- The Resident Engineer will verify that the permit is approved before allowing the Contractor to use the affected area for the requested purpose.
- Areas permitted are for use by the approved applicant only and are not to be shared with or used by other vendors. Subcontractors specifically engaged with the applicant working on the specific MassDOT project will be allowed to use the area in accordance with the terms of the permit.
- Permits are issued on an annual basis and will require the Contractor to file for an extension each year to continue use.

Exemptions from Permit Requirements

Equipment and materials being used for active construction operations and located within the work zone of the construction contract are exempt from this permit requirement, provided they do not interfere with the safety or operation of the roadway or the work zone. Examples of these types of exempt uses are:

- Equipment and materials parked or stored within a protected (barriered) work zone.
- Materials placed in the work zone prior to same-day installation or use.
- Soils excavated temporarily and scheduled to be replaced, such as for trenching operations or for installation of drainage structures.

DOCUMENT B00420

PROPOSAL

HADLEY

For: **Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River**

COMMONWEALTH OF MASSACHUSETTS

LOCATION

The work referred to herein is in the Town of HADLEY in Hampshire County, in the Commonwealth of Massachusetts, and is shown by the locus map (Document 00331) in the Proposal Pamphlet, the work locations extend as follows:

Bay Road (Route 47)

Bridge H-01-005

Beginning – Station 2+60.00 +/-
Ending –Station 9+98.00 +/-

The contract prices shall include the furnishing of all materials (except as otherwise herein specified), the performing of all the labor requisite or proper, the providing of all necessary machinery, tools, apparatus and other means of construction, the doing of all the abovementioned work in the manner set forth, described and shown in the specifications and on the drawings for the work, and in the form of contract, and the completion thereof within **1330 CALENDAR DAYS** upon receipt of a Notice to Proceed, except that if the completion date falls between December 1 and March 15 then the same number of days beyond December 1st will be extended after March 15th.

The Work of this project is described by the following Items and quantities.

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Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
101.	1	CLEARING AND GRUBBING AT _____ PER ACRE		
102.1	250	TREE TRIMMING AT _____ PER FOOT		
102.3	16	HERBICIDE TREATMENT OF INVASIVE PLANTS AT _____ PER HOUR		
102.33	16	INVASIVE PLANT MANAGEMENT STRATEGY AT _____ PER HOUR		
102.511	10	TREE PROTECTION - ARMORING AND PRUNING AT _____ EACH		
102.521	145	TREE AND PLANT PROTECTION FENCE AT _____ PER FOOT		
114.1	1	DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. H-01-005 AT _____ LUMP SUM		
120.	150	EARTH EXCAVATION AT _____ PER CUBIC YARD		
121.	3	CLASS A ROCK EXCAVATION AT _____ PER CUBIC YARD		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
127.1	15	REINFORCED CONCRETE EXCAVATION AT _____ PER CUBIC YARD		
127.51	81	TIMBER PILE - REMOVED AND DISCARDED AT _____ EACH		
140.	515	BRIDGE EXCAVATION AT _____ PER CUBIC YARD		
141.1	10	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		
142.	100	CLASS B TRENCH EXCAVATION AT _____ PER CUBIC YARD		
143.	1,500	CHANNEL EXCAVATION AT _____ PER CUBIC YARD		
144.	155	CLASS B ROCK EXCAVATION AT _____ PER CUBIC YARD		
146.	2	DRAINAGE STRUCTURE REMOVED AT _____ EACH		
150.	740	ORDINARY BORROW AT _____ PER CUBIC YARD		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
151.	590	GRAVEL BORROW AT _____ PER CUBIC YARD		
151.1	235	GRAVEL BORROW FOR BRIDGE FOUNDATION AT _____ PER CUBIC YARD		
151.2	150	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES AT _____ PER CUBIC YARD		
154.	80	SAND BORROW AT _____ PER CUBIC YARD		
156.	495	CRUSHED STONE AT _____ PER TON		
170.	2,050	FINE GRADING AND COMPACTING - SUBGRADE AREA AT _____ PER SQUARE YARD		
180.01	1	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM AT _____ LUMP SUM		
180.02	350	PERSONAL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
180.03	150	LICENSED SITE PROFESSIONAL SERVICES AT _____ PER HOUR		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
181.11	95	DISPOSAL OF UNREGULATED SOIL AT _____ PER TON		
181.12	175	DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY AT _____ PER TON		
181.13	690	DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY AT _____ PER TON		
181.14	45	DISPOSAL OF HAZARDOUS WASTE AT _____ PER TON		
182.1	1	INSPECTION AND TESTING FOR ASBESTOS AT _____ LUMP SUM		
182.2	100	REMOVAL OF ASBESTOS AT _____ PER FOOT		
183.1	500	TREATMENT OF CONTAMINATED GROUNDWATER AT _____ PER GALLON		
183.2	500	DISPOSAL OF GRANULAR ACTIVATED CARBON AT _____ PER POUND		
184.1	85	DISPOSAL OF TREATED WOOD PRODUCTS AT _____ PER TON		

Project # 608460 Contract # 130088				
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
201.	2	CATCH BASIN AT _____ EACH		
202.	1	MANHOLE AT _____ EACH		
208.	1	DROP INLET, TYPE C AT _____ EACH		
221.	1	FRAME AND COVER AT _____ EACH		
222.1	2	FRAME AND GRATE - MASSDOT CASCADE TYPE AT _____ EACH		
222.2	1	FRAME AND GRATE - MASSDOT DROP INLET AT _____ EACH		
223.1	2	FRAME AND GRATE (OR COVER) REMOVED AND STACKED AT _____ EACH		
227.3	3	REMOVAL OF DRAINAGE STRUCTURE SEDIMENT AT _____ PER CUBIC YARD		
227.31	50	REMOVAL OF DRAINAGE PIPE SEDIMENT AT _____ PER FOOT		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
230.112	100	12 INCH CORRUGATED METAL PIPE 16 GAGE AT _____ PER FOOT		
241.12	100	12 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
241.121	1	12 INCH REINFORCED CONCRETE PIPE CHECK VALVE AT _____ EACH		
258.	10	STONE FOR PIPE ENDS AT _____ PER SQUARE YARD		
280.	5	HOT MIX ASPHALT WATERWAY AT _____ PER SQUARE YARD		
302.12	250	12 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET) AT _____ PER FOOT		
303.12	210	12 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) AT _____ PER FOOT		
309.	2,400	DUCTILE IRON FITTINGS FOR WATER PIPE AT _____ PER POUND		
315.08	400	8 INCH WATER MAIN REMOVED AND STACKED AT _____ PER FOOT		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
350.12	3	12 INCH GATE AND GATE BOX AT _____ EACH		
357.08	1	8 INCH GATE BOX AT _____ EACH		
357.12	2	12 INCH GATE BOX AT _____ EACH		
371.12	2	12 INCH COUPLING AT _____ EACH		
373.12	215	12 INCH WATER PIPE INSULATION AT _____ PER FOOT		
379.075	1	3/4 INCH AIR RELEASE VALVE AT _____ EACH		
403.	2,000	RECLAIMED PAVEMENT FOR BASE COURSE AND/OR SUB-BASE AT _____ PER SQUARE YARD		
415.2	340	PAVEMENT FINE MILLING AT _____ PER SQUARE YARD		
440.	9,400	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL AT _____ PER POUND		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
443.	6.5	WATER FOR ROADWAY DUST CONTROL AT _____ PER 1000 GALLONS		
450.31	290	SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC -12.5) AT _____ PER TON		
450.42	650	SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) AT _____ PER TON		
450.60	210	SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B - 9.5) AT _____ PER TON		
450.70	45	SUPERPAVE BRIDGE PROTECTIVE COURSE - 9.5 (SPC-B - 9.5) AT _____ PER TON		
451.	30	HMA FOR PATCHING AT _____ PER TON		
452.	375	ASPHALT EMULSION FOR TACK COAT AT _____ PER GALLON		
453.	2,330	HMA JOINT SEALANT AT _____ PER FOOT		
472.	5	TEMPORARY ASPHALT PATCHING AT _____ PER TON		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
504.	375	GRANITE CURB TYPE VA4 - STRAIGHT AT _____ PER FOOT		
504.2	4	GRANITE CURB TYPE VA4 - SPLAYED END AT _____ EACH		
509.	75	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - STRAIGHT AT _____ PER FOOT		
514.	2	GRANITE CURB INLET - STRAIGHT AT _____ EACH		
594.	24	CURB REMOVED AND DISCARDED AT _____ PER FOOT		
595.	1	CURB INLET REMOVED AND DISCARDED AT _____ EACH		
620.13	680	GUARDRAIL, TL-3 (SINGLE FACED) AT _____ PER FOOT		
627.83	6	GUARDRAIL TANGENT END TREATMENT, TL-3 AT _____ EACH		
628.24	4	TRANSITION TO BRIDGE RAIL AT _____ EACH		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
630.2	340	HIGHWAY GUARD REMOVED AND DISCARDED AT _____ PER FOOT		
657.	650	TEMPORARY FENCE AT _____ PER FOOT		
657.5	1,700	TEMPORARY FENCE REMOVED AND RESET AT _____ PER FOOT		
697.1	12	SILT SACK AT _____ EACH		
698.31	160	GEOTEXTILE FABRIC FOR TEMPORARY SOIL PROTECTION AT _____ PER SQUARE YARD		
701.	10	CEMENT CONCRETE SIDEWALK AT _____ PER SQUARE YARD		
701.2	20	CEMENT CONCRETE PEDESTRIAN CURB RAMP AT _____ PER SQUARE YARD		
702.	30	HOT MIX ASPHALT SIDEWALK OR DRIVEWAY AT _____ PER TON		
715.1	2	MAIL BOX REMOVED AND RESET AT _____ EACH		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
722.2	1	SCHEDULE OF OPERATIONS (TYPE B) - FIXED PRICE $48000 AT Forty Eight Thousand Dollars LUMP SUM	$48,000.00	$48,000.00
740.	45	ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE A) AT _____ PER MONTH		
748.	1	MOBILIZATION AT _____ LUMP SUM		
751.	255	LOAM FOR ROADSIDES AT _____ PER CUBIC YARD		
751.7	5	COMPOST BLANKET AT _____ PER CUBIC YARD		
755.45	105	WETLAND RESTORATION AT _____ PER SQUARE YARD		
756.1	1	CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN AT _____ LUMP SUM		
765.	1,865	SEEDING AT _____ PER SQUARE YARD		
765.451	5	PART SHADE ROADSIDE MIX AT _____ PER POUND		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
765.555	2	WETLAND MIX - PART SHADE AT _____ PER POUND		
765.635	1,840	NATIVE SEEDING AND ESTABLISHMENT AT _____ PER SQUARE YARD		
767.121	1,430	SEDIMENT CONTROL BARRIER AT _____ PER FOOT		
767.122	100	SEDIMENT BARRIER - COIR LOG AT _____ PER FOOT		
769.	860	PAVEMENT MILLING MULCH UNDER GUARD RAIL AT _____ PER FOOT		
776.523	2	MAPLE - RED 2-2.5 INCH CALIPER AT _____ EACH		
778.164	10	BIRCH - RIVER HERITAGE 8-10 FOOT CLUMP AT _____ EACH		
789.633	6	BLUEBERRY - HIGHBUSH 2-3 FEET / #3 AT _____ EACH		
790.631	28	DOGWOOD - REDOSIER 18-24 INCH / #1 AT _____ EACH		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
790.719	15	DOGWOOD - SILKY 2-3 FEET / #3 AT _____ EACH		
791.033	23	ELDERBERRY 2-3 FEET / #2 AT _____ EACH		
795.013	10	VIBURNUM - ARROWWOOD 3-4 FEET / #5 AT _____ EACH		
795.153	20	WINTERBERRY - MALE 24-30 INCH / #3 AT _____ EACH		
795.189	8	WITCH HAZEL - SPRING BLOOMING 2-3 FEET / #3 AT _____ EACH		
816.71	1	PORTABLE SOLAR POWERED TRAFFIC SIGNAL SYSTEM AT _____ LUMP SUM		
851.1	150	TRAFFIC CONES FOR TRAFFIC MANAGEMENT AT _____ PER DAY		
852.	560	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		
853.1	9	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ EACH		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
853.21	630	TEMPORARY BARRIER REMOVED AND RESET AT _____ PER FOOT		
853.23	310	TEMPORARY BARRIER (TL-3) AT _____ PER FOOT		
853.33	140	TEMPORARY BARRIER - LIMITED DEFLECTION (TL-3) AT _____ PER FOOT		
853.403	8	TRUCK MOUNTED ATTENUATOR AT _____ PER DAY		
853.501	2	TEMPORARY IMPACT ATTENUATOR (TL-3) REMOVED AND RESET AT _____ EACH		
853.53	2	TEMPORARY IMPACT ATTENUATOR UNIDIRECTIONAL, NON-REDIRECTIVE (TL-3) AT _____ EACH		
853.8	50	TEMPORARY ILLUMINATION FOR WORK ZONE AT _____ PER DAY		
854.016	8,000	TEMPORARY PAVING MARKINGS - 6 INCH (PAINTED) AT _____ PER FOOT		
854.1	3,320	PAVEMENT MARKING REMOVAL AT _____ PER SQUARE FOOT		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
856.	50	ARROW BOARD AT _____ PER DAY		
859.1	1,610	REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS AT _____ PER DAY		
866.206	1,550	6 INCH REFLECTORIZED WHITE LINE (POLYUREA) (RECESSED) AT _____ PER FOOT		
867.206	1,550	6 INCH REFLECTORIZED YELLOW LINE (POLYUREA) (RECESSED) AT _____ PER FOOT		
874.2	2	TRAFFIC SIGN REMOVED AND RESET AT _____ EACH		
901.	14	4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE AT _____ PER CUBIC YARD		
910.	35	STEEL REINFORCEMENT FOR STRUCTURES AT _____ PER POUND		
942.124	900	STEEL PILE HP 12 X 84 AT _____ PER FOOT		
943.24	730	STEEL PIPE PILE 24 INCH OUTSIDE DIAMETER AT _____ PER FOOT		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
948.1	1	SHORT DURATION LOAD TEST AT _____ EACH		
948.4	5	DYNAMIC LOAD TEST PREPARATION AT _____ EACH		
948.41	5	DYNAMIC LOAD TEST BY CONTRACTOR AT _____ EACH		
948.5	26	PILE SHOES AT _____ EACH		
950.11	1,080	TEMPORARY EARTH SUPPORT SYSTEMS AT _____ PER SQUARE FOOT		
983.2	720	RIPRAP AT _____ PER CUBIC YARD		
983.521	165	STREAMBED RESTORATION AT _____ PER CUBIC YARD		
991.1	1	CONTROL OF WATER - STRUCTURE NO. H-01-005 AT _____ LUMP SUM		
993.5	1	TEMPORARY WALKWAY STRUCTURE AT _____ LUMP SUM		

Project # 608460	Contract # 130088			
Location : HADLEY				
Description : Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
995.01	1	BRIDGE STRUCTURE, BRIDGE NO. H-01-005 AT _____ LUMP SUM		
Total Qty:	61,806.5			

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DOCUMENT B00853

SCHEDULE OF PARTICIPATION
BY DISADVANTAGED BUSINESS ENTERPRISES (DBEs)

APPENDIX F – FORM F3: DBE SCHEDULE OF PARTICIPATION

PRIME BIDDER: _____

DATE OF BID OPENING: _____ MassDOT PROJECT NO.: 608460

FEDERAL AID PROJECT NUMBER: NHP(BRR-ON)-003S(813)X

PROJECT LOCATION: HADLEY

Name Address and Phone Number of DBE	Name of Activity	NAICS Code(s)	(a) DBE Contractor Activity Amount *Construction Work*	(b) DBE Other Business Amount *Services, Supplies, Material*	(c) Total amount eligible for credit
Total Bid Amount	TOTALS:		$		$
$ 204,889	DBE Percentage of Total bid:		%		%

A copy of the DBE's most recent certification and an original affidavit must be attached to this document.

Is a Joint Check Approval being submitted for any of the above? ☐ Yes X No
Will any of the contractors listed above be using a third party to deliver materials or perform any portion of work?
☐ Yes X No
(i.e. manufacturing)

SIGNATURE:_____ DATE_____

NAME AND TITLE (*PRINT*):_____

EMAIL ADDRESS: _____TEL NO.:_____

Rev'd 5/8/13

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DOCUMENT B00854

DBE Letter of Intent

(To be completed by the DBE – Page 1 of 2)

The DBE firm will also include the latest MassUCP letter with this Letter of Intent.

To: _____ (Prime Bidder)

From: _____ (DBE Firm)

Federal Aid Project No.: NHP(BRR-ON)-003S(813)X Bid Opening or Due Date: _____

Project Name: _____ Project Location: HADLEY

I, _____, authorized signatory of the above-reference DBE firm hereby declare:

(Print Name)

(a) My company is currently certified as a Disadvantaged Business Enterprise (DBE) by the Massachusetts Supplier Diversity Office (SDO), as a (check all that apply):

☐ CONTRACTOR ☐ REGULAR DEALER ☐ OTHER
☐ MANUFACTURER ☐ TRUCKING OPERATIONS ☐ PROFESSIONAL SERVICES

[Additional guidance is available at Title 49, Code of Federal Regulations, Part 26.55 (49 CFR Part 26.55)]

(b) My firm has the ability to manage, supervise and perform the activity described on page 3 of this Letter of Intent. If you are awarded the contract, my company intends to enter into a contract with your firm to perform the items of work or other activity described on the following sheet for the prices indicated.

(c) There have been no changes affecting the ownership, control or independence of my company since my last certification review on _____. If any such change is planned or occurs prior to my company's completion of this proposed work, I will give prior written notification to your firm and to the Office of Diversity and Civil Rights (ODCR)(MBTA/MassDOT) and SDO.

(d) I have read the MassDOT proposal for the Project, and acknowledge that my company will comply with that document and the requirements of 49 CFR Part 26.

(e) For the purpose of obtaining subcontractor approval from the MassDOT, my firm will provide to you:

a. ***The following construction work:***
   i. a complete list of contact information for proposed Superintendent, i.e., address, phone number and e-mail address, and;
   ii. a list of projects completed in the last 10 years. I shall also include, for each project: the name and telephone number of a contact person for the contracting authority, person, or organization; project title / location (City/State), dollar value of the work; a description of the work; and the date project completed .

b. The following professional services work:
   i. resume, stating the qualifications and experience of person responsible for project oversight and contact information, i.e., address, phone number and e-mail address.
   ii. proposed team and organization,
   iii. resumes of key personnel;
   iv. example projects

c. The following services, materials or supplies:
   i. a written agreement and invoices for the materials or supplies, and any other documents evidencing the terms of providing such items to be sent to the Office of Diversity and Civil Rights Government Compliance Unit designee;
   ii. information concerning brokers fees and commissions for providing services or materials.

DBE Firm Authorized Signature | Date

DBE Letter of Intent (Continued)

(To be completed by the DBE – Page 2 of 2)

Prime Bidder: _____

DBE Firm: _____

Federal Aid Project No.: NHP(BRR-ON)-003S(813)X Bid Opening or Due Date: _____

Project Name: _____ Project Location: HADLEY

Item number if applicable	NAICS Code	Description of Activity with notations such as Services, or Brokerage, Labor Only, Material Only, or Complete	Quantity	Unit Price	Amount
			TOTAL AMOUNT:		

Please give full explanations, attach additional sheets if necessary.

I HEREBY VERIFY THAT _____

(DBE Firm)

WILL SOLELY PERFORM THE WORK, OR PROVIDE THE SERVICES OR MATERIALS, AS DESCRIBED ABOVE.

DBE Authorized Signature: _____

_____

Name (Print): _____

Title: _____

Email Address: _____

Phone Number: _____ Fax Number: _____

END OF DOCUMENT

DOCUMENT B00855

DBE JOINT CHECK ARRANGEMENT APPROVAL FORM

(to be submitted by Prime Contractor)

Contract No: 130088 **Project No.** 608460 **Federal Aid No.:** NHP(BRR-ON)-003S(813)X

Location: HADLEY **Bid Opening Date:** _____

Project Description: Bridge Replacement, H-01-005, Bay Road (Route 47) over the Fort River

We have received the attached request for the use of a joint check arrangement from _____ _____ , a DBE on the above- referenced Contract and _____ _____, a Material Supplier/Vendor for the subject Contract. The DBE has complied with the requirements of 49 CFR Part 26.55(c)(1). In particular, the DBE has:

- a written agreement with the material supplier/vendor;
- applied for credit with the subject material supplier and has supplied the vendor's response;
- shown that it will place all orders to the subject material supplier/vendor;
- made and retains all decision-making responsibilities concerning the materials; and
- provided a Joint Check Agreement that is acceptable to MassDOT;

As the Contractor for the Project, we agree to issue joint checks (made payable to the Material Supplier/Vendor and the DBE) for payment of sums due pursuant to invoices from the Supplier/Vendor and DBE.

Contractor:

_____ _____
Company Name Signature
Duly Authorized

_____
Printed Name

_____ _____
Date Title

SubContractor:

_____ _____
Company Name Signature –
Duly Authorized

_____
Printed Name

_____ _____
Date Title

*** END OF DOCUMENT ***

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DOCUMENT B00856

JOINT VENTURE AFFIDAVIT

(All Firms)

- All Information Requested By This Schedule Must Be Answered. Additional Sheets May Be Attached.
- If, there is any change in the information submitted, the Joint Venture parties must inform MassDOT Pre-Qualifications Office (and, if one of the companies is a DBE, the Director of Contract Compliance, Office of Civil Rights) *prior* to such change, in writing, either directly or through the Prime Contractor if the Joint Venture is a subcontractor.
- If the Joint Venture Entity will be the bidder on a prime Contract, it must bid and submit all required documents (insurance, worker's compensation, bonds, etc.) in the name of the Joint Venture Entity.

I. Name of Joint Venture: _____

Type of Entity if applicable (Corp., LLC):_____Filing State _____

Address of joint venture: _____

_____

Phone No(s) for JV Entity: _____E-mail:_____

Contact Person(s)_____

Tax ID/EIN of Joint Venture: _____Vendor Code:_____

II. Identify each firm or party to the Joint Venture:

Name of Firm: _____

Address: _____

Phone : _____E-mail:_____

Contact person(s) _____

Name of Firm: _____

Address: _____

Phone: _____E-mail:_____

Contact Person(s)_____

III. Describe the role(s) of the each party to the Joint Venture:

_____

_____

IV. Attach a copy of the Joint Venture Agreement. The proposed Joint Venture Agreement should include specific details including, but not limited to: (1) the contributions of capital and equipment; (2) work items to be performed by each company's forces, (3) work items to be performed under the supervision of any DBE Venturer; (4) the commitment of management, supervisory and operative personnel employed by the DBE to be dedicated to the performance of the Project; and (5) warranty, guaranty, and indemnification clauses.

V. Attach any applicable Corporate or LLC Votes, Authorizations, etc.

VI. Ownership of the Joint Venture:

A. What is the percentage(s) of each company's ownership in the Joint Venture?

ownership percentage(s): _____

ownership percentage(s): _____

B. Specify percentages for each of the following (provide narrative descriptions and other detail as applicable):

1. Sharing of profit and loss: _____
2. Capital contributions:

(a) Dollar amounts of initial contribution: _____

(b) Dollar amounts of anticipated on-going contributions: _____

(c) Contributions of equipment (specify types, quality and quantities of equipment to be provided by each firm): _____

_____

4. Other applicable ownership interests, including ownership options or other agreements, which restrict or limit ownership and/or control:

_____

_____

5. Provide copies of all other written agreements between firms concerning bidding and operation of this Project or projects or contracts.

6. Identify all current contracts and contracts completed during the past two (2) years by either of the Joint Venture partners to this Joint Venture:

_____

_____

VII. Control of and Participation in the Joint Venture. Identify by name and firm those individuals who are, or will be, responsible for and have the authority to engage in the following management functions and policy decisions. (Indicate any limitations to their authority such as dollar limits and co-signatory requirements.):

A. Joint Venture check signing:

_____

_____

B. Authority to enter Contracts on behalf of the Joint Venture:

_____

_____

C. Signing, co-signing and/or collateralizing loans:

_____

_____

D. Acquisition of lines of credit:

_____

_____

E. Acquisition and indemnification of payment and performance bonds:

_____

_____

F. Negotiating and signing labor agreements:

_____

_____

G. Management of contract performance. *(Identify by name and firm only)*:

1. Supervision of field operations: _____
2. Major purchases: _____
3. Estimating: _____
4. Engineering: _____

VIII. Financial Controls of Joint Venture:

A. Which firm and/or individual will be responsible for keeping the books of account?

_____

_____

B. Identify the "Managing Partner," if any, and describe the means and measure of their compensation:

_____

_____

C. What authority does each firm have to commit or obligate the other to insurance and bonding companies, financing institutions, suppliers, subcontractors, and/or other parties participating in the performance of this Contract or the work of this Project?

_____

IX. Personnel of Joint Venture: State the approximate number of personnel (by trade) needed to perform the Joint Venture's work under this Contract. Indicate whether they will be employees of the majority firm, DBE firm, or the Joint Venture.

	Firm 1 (number)	Firm 2 (number)	Joint Venture (number)
Trade			
Professional			
Administrative/Clerical			
Unskilled Labor			

Will any personnel proposed for this Project be employees of the Joint Venture?: _____

If so, who: _____

A. Are any proposed Joint Venture employees currently employed by either firm?

Employed by Firm 1: _____ Employed by firm 2 _____

B. Identify by name and firm the individual who will be responsible for Joint Venture hiring: ____

_____

X. Additional Information. Please state any material facts and additional information pertinent to the control and structure of this Joint Venture.

_____

_____

XI. AFFIDAVIT OF JOINT VENTURE PARTIES. The undersigned affirm that the foregoing statements and attached documents are correct and include all material information necessary to identify and explain the terms and operations of our Joint Venture and the intended participation of each firm in the undertaking. Further, the undersigned covenant and agree to provide to MassDOT current, complete and accurate information regarding actual Joint Venture work, payments, and any proposed changes to any provisions of the Joint Venture, or the nature, character of each party to the Joint Venture. We understand that any material misrepresentation will be grounds for terminating any Contract awarded and for initiating action under Federal or State laws concerning false statements.

Firm 1	Firm 2
Signature Duly Authorized	Signature Duly Authorized
Printed Name and Title	Printed Name and Title
Date	Date

*** END OF DOCUMENT ***