RM

COMMONWEALTH OF MASSACHUSETTS

CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	608858-125266
P.V. =	$3,518,000.00
PLANS	YES

FOR

Federal Aid Project No. STP(BR-OFF)-003S(716)X
Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook

in the Town of

CHARLEMONT

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS and BRIDGES dated 2024

This Proposal to be opened and read: **TUESDAY, MARCH 19, 2024 at 2:00 P.M.**

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DOCUMENT 00010

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

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DOCUMENT 00104

NOTICE TO CONTRACTORS

Electronic proposals for the following project will be received through the internet using Bid Express 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 Bid Express.

TUESDAY, MARCH 19, 2024 at 2:00 P.M.**
CHARLEMONT
Federal Aid Project No. STP(BR-OFF)-003S(716)X
Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook
****Date Subject to Change**

PROJECT VALUE = $3,518,000.00

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.

Plans will be on display and information will be available at the MassDOT Boston Office and at the District Office in LENOX.

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.

NOTICE TO CONTRACTORS (Continued)

PRICE ADJUSTMENTS

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 $637.50 per ton, Portland cement $181.15 per ton, diesel fuel $3.167 per gallon, and gasoline $2.483 per gallon, and Steel Base Price Index 448.0. 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, FEBRUARY 17, 2024

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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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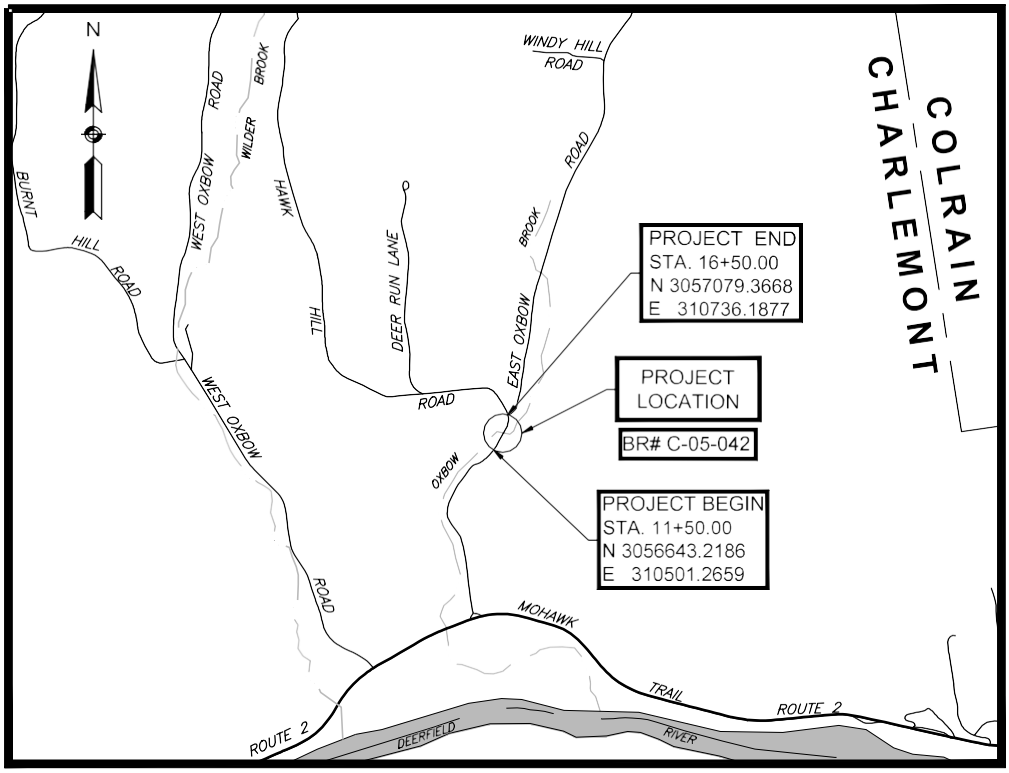
DOCUMENT 00331

LOCUS MAP

CHARLEMONT
Federal Aid Project No. STP(BR-OFF)-003S(716)X
Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook



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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

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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: _____

_____

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WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

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Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 02/14/24

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2024, the 1996 METRIC CONSTRUCTION AND TRAFFIC STANDARD DETAILS, the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the 2017 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.

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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-

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 **8 %**
(*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

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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DOCUMENT 00813

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

January 18, 2024

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	$0.70
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	$0.95
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$0.95
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$0.99
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	$1.05
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	$0.98
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	$1.05
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	$0.98
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	$1.09
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	$0.99
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	$1.09
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	$0.99
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	$1.15
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	$1.22
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	$1.86
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	$1.09
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	$0.99
18	ASTM A276 Type 316 Stainless Steel	$5.57
19	ASTM A240 Type 316 Stainless Steel	$5.57
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	$1.92
21	ASTM A53 Grade B Structural Steel Pipe	$1.23
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$1.23
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$0.97
24	ASTM 252, Grade 2 Permanent Steel Casing	$0.97
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	$1.04
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$1.83
27	ASTM A572 / A572M, Grade 50 Sheetpiling	$1.83
28	ASTM A36/36M, Grade 50	$1.05
29	ASTM A570, Grade 50	$1.04
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$1.05
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$1.23
32	AREA 140 LB Rail and Track Accessories	$0.63

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:_____ **Project No.** 608858 **Federal Aid No.:** STP(BR-OFF)-003S(716)X

Location: CHARLEMONT

Project Description: Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook

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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MAURA HEALEY
Governor

KIM DRISCOLL
Lt. Governor

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

Prevailing Wage Rates

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

Contract Number: 125266 **City/Town:** CHARLEMONT

Description of Work: CHARLEMONT: Federal Aid Project No. STP(BR-OFF)-003S(716)X Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook

Job Location: East Oxbow Road over Oxbow Brook

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 annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- 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.

Issue Date: 02/20/2024 **Wage Request Number:** 20240220-029

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$38.95	$15.07	$18.67	$0.00	$72.69
	06/01/2024	$39.95	$15.07	$18.67	$0.00	$73.69
	12/01/2024	$39.95	$15.07	$20.17	$0.00	$75.19
	01/01/2025	$39.95	$15.57	$20.17	$0.00	$75.69
	06/01/2025	$40.95	$15.57	$20.17	$0.00	$76.69
	12/01/2025	$40.95	$15.57	$21.78	$0.00	$78.30
	01/01/2026	$40.95	$16.17	$21.78	$0.00	$78.90
	06/01/2026	$41.95	$16.17	$21.78	$0.00	$79.90
	12/01/2026	$41.95	$16.17	$23.52	$0.00	$81.64
	01/01/2027	$41.95	$16.77	$23.52	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.02	$15.07	$18.67	$0.00	$72.76
	06/01/2024	$40.02	$15.07	$18.67	$0.00	$73.76
	12/01/2024	$40.02	$15.07	$20.17	$0.00	$75.26
	01/01/2025	$40.02	$15.57	$20.17	$0.00	$75.76
	06/01/2025	$41.02	$15.57	$20.17	$0.00	$76.76
	12/01/2025	$41.02	$15.57	$21.78	$0.00	$78.37
	01/01/2026	$41.02	$16.17	$21.78	$0.00	$78.97
	06/01/2026	$42.02	$16.17	$21.78	$0.00	$79.97
	12/01/2026	$42.02	$16.17	$23.52	$0.00	$81.71
	01/01/2027	$42.02	$16.77	$23.52	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.14	$15.07	$18.67	$0.00	$72.88
	06/01/2024	$40.14	$15.07	$18.67	$0.00	$73.88
	12/01/2024	$40.14	$15.07	$20.17	$0.00	$75.38
	01/01/2025	$40.14	$15.57	$20.17	$0.00	$75.88
	06/01/2025	$41.14	$15.57	$20.17	$0.00	$76.88
	12/01/2025	$41.14	$15.57	$21.78	$0.00	$78.49
	01/01/2026	$41.14	$16.17	$21.78	$0.00	$79.09
	06/01/2026	$42.14	$16.17	$21.78	$0.00	$80.09
	12/01/2026	$42.14	$16.17	$23.52	$0.00	$81.83
	01/01/2027	$42.14	$16.77	$23.52	$0.00	$82.43
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$31.16	$9.65	$14.53	$0.00	$55.34
	06/01/2024	$31.98	$9.65	$14.53	$0.00	$56.16
	12/01/2024	$32.79	$9.65	$14.53	$0.00	$56.97
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.87	$9.65	$15.60	$0.00	$58.12
	06/01/2024	$34.06	$9.65	$15.60	$0.00	$59.31
	12/01/2024	$35.24	$9.65	$15.60	$0.00	$60.49
	06/01/2025	$36.48	$9.65	$15.60	$0.00	$61.73
	12/01/2025	$37.71	$9.65	$15.60	$0.00	$62.96
	06/01/2026	$39.75	$9.65	$15.60	$0.00	$65.00
	12/01/2026	$41.04	$9.65	$15.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASBESTOS WORKER (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	12/01/2023	$36.72	$14.50	$10.55	$0.00	$61.77
	06/01/2024	$37.62	$14.50	$10.55	$0.00	$62.67
	12/01/2024	$38.52	$14.50	$10.55	$0.00	$63.57
	06/01/2025	$39.42	$14.50	$10.55	$0.00	$64.47
	12/01/2025	$40.32	$14.50	$10.55	$0.00	$65.37
ASPHALT RAKER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.37	$9.65	$15.60	$0.00	$57.62
	06/01/2024	$33.56	$9.65	$15.60	$0.00	$58.81
	12/01/2024	$34.74	$9.65	$15.60	$0.00	$59.99
	06/01/2025	$35.98	$9.65	$15.60	$0.00	$61.23
	12/01/2025	$37.21	$9.65	$15.60	$0.00	$62.46
	06/01/2026	$39.25	$9.65	$15.60	$0.00	$64.50
	12/01/2026	$40.54	$9.65	$15.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"						
BATCH/CEMENT PLANT - ON SITE *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$31.16	$9.65	$14.53	$0.00	$55.34
	06/01/2024	$31.98	$9.65	$14.53	$0.00	$56.16
	12/01/2024	$32.79	$9.65	$14.53	$0.00	$56.97
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.87	$9.65	$15.60	$0.00	$58.12
	06/01/2024	$34.06	$9.65	$15.60	$0.00	$59.31
	12/01/2024	$35.24	$9.65	$15.60	$0.00	$60.49
	06/01/2025	$36.48	$9.65	$15.60	$0.00	$61.73
	12/01/2025	$37.71	$9.65	$15.60	$0.00	$62.96
	06/01/2026	$39.75	$9.65	$15.60	$0.00	$65.00
	12/01/2026	$41.04	$9.65	$15.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2024	$48.12	$7.07	$20.60	$0.00	$75.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$31.28	$7.07	$13.22	$0.00	$51.57
2	65	$31.28	$7.07	$13.22	$0.00	$51.57
3	70	$33.68	$7.07	$14.23	$0.00	$54.98
4	75	$36.09	$7.07	$15.24	$0.00	$58.40
5	80	$38.50	$7.07	$16.25	$0.00	$61.82
6	85	$40.90	$7.07	$17.28	$0.00	$65.25
7	90	$43.31	$7.07	$18.28	$0.00	$68.66
8	95	$45.71	$7.07	$19.32	$0.00	$72.10

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	02/01/2024	$50.81	$11.49	$21.46	$0.00	$83.76
	08/01/2024	$52.06	$11.49	$21.46	$0.00	$85.01
	02/01/2025	$53.36	$11.49	$21.46	$0.00	$86.31
	08/01/2025	$55.51	$11.49	$21.46	$0.00	$88.46
	02/01/2026	$56.86	$11.49	$21.46	$0.00	$89.81
	08/01/2026	$59.06	$11.49	$21.46	$0.00	$92.01
	02/01/2027	$60.46	$11.49	$21.46	$0.00	$93.41

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Springfield/Pittsfield*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.41	$11.49	$21.46	$0.00	$58.36
2	60	$30.49	$11.49	$21.46	$0.00	$63.44
3	70	$35.57	$11.49	$21.46	$0.00	$68.52
4	80	$40.65	$11.49	$21.46	$0.00	$73.60
5	90	$45.73	$11.49	$21.46	$0.00	$78.68

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.03	$11.49	$21.46	$0.00	$58.98
2	60	$31.24	$11.49	$21.46	$0.00	$64.19
3	70	$36.44	$11.49	$21.46	$0.00	$69.39
4	80	$41.65	$11.49	$21.46	$0.00	$74.60
5	90	$46.85	$11.49	$21.46	$0.00	$79.80

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL*OPERATING*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49

ENGINEERS LOCAL 98

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN	12/01/2023	$45.48	$9.65	$18.22	$0.00	$73.35
LABORERS - FOUNDATION AND MARINE	06/01/2024	$46.96	$9.65	$18.22	$0.00	$74.83
	12/01/2024	$48.43	$9.65	$18.22	$0.00	$76.30
	06/01/2025	$49.93	$9.65	$18.22	$0.00	$77.80
	12/01/2025	$51.43	$9.65	$18.22	$0.00	$79.30
	06/01/2026	$52.98	$9.65	$18.22	$0.00	$80.85
	12/01/2026	$54.48	$9.65	$18.22	$0.00	$82.35

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING LABORER	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
LABORERS - FOUNDATION AND MARINE	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS LOCAL 336 - HAMPDEN HAMPSHIRE FRANKLIN*	09/01/2023	$40.51	$7.91	$18.15	$0.00	$66.57
	03/01/2024	$41.41	$7.91	$18.15	$0.00	$67.47
	09/01/2024	$42.36	$7.91	$18.15	$0.00	$68.42
	03/01/2025	$43.26	$7.91	$18.15	$0.00	$69.32
	09/01/2025	$44.21	$7.91	$18.15	$0.00	$70.27
	03/01/2026	$45.11	$7.91	$18.15	$0.00	$71.17
	09/01/2026	$46.06	$7.91	$18.15	$0.00	$72.12
	03/01/2027	$46.96	$7.91	$18.15	$0.00	$73.02

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Local 336 Hampden Hampshire Franklin*

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.26	$7.91	$1.38	$0.00	$29.55
2	60	$24.31	$7.91	$1.38	$0.00	$33.60
3	70	$28.36	$7.91	$13.95	$0.00	$50.22
4	75	$30.38	$7.91	$13.95	$0.00	$52.24
5	80	$32.41	$7.91	$15.35	$0.00	$55.67
6	80	$32.41	$7.91	$15.35	$0.00	$55.67
7	90	$36.46	$7.91	$16.75	$0.00	$61.12
8	90	$36.46	$7.91	$16.75	$0.00	$61.12

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.71	$7.91	$1.38	$0.00	$30.00
2	60	$24.85	$7.91	$1.38	$0.00	$34.14
3	70	$28.99	$7.91	$13.95	$0.00	$50.85
4	75	$31.06	$7.91	$13.95	$0.00	$52.92
5	80	$33.13	$7.91	$15.35	$0.00	$56.39
6	80	$33.13	$7.91	$15.35	$0.00	$56.39
7	90	$37.27	$7.91	$16.75	$0.00	$61.93
8	90	$37.27	$7.91	$16.75	$0.00	$61.93

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $26.46/ 3&4 $31.82/ 5&6 $50.38/ 7&8 $55.77

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	10/01/2023	$25.55	$7.02	$4.80	$0.00	$37.37
	10/01/2024	$26.65	$7.02	$4.80	$0.00	$38.47
	10/01/2025	$27.75	$7.02	$4.80	$0.00	$39.57
	10/01/2026	$28.85	$7.02	$4.80	$0.00	$40.67

All Aspects of New Wood Frame Work

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Wood Frame) - Zone 3*

Effective Date - 10/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$15.33	$7.02	$0.00	$0.00	$22.35
2	60	$15.33	$7.02	$0.00	$0.00	$22.35
3	65	$16.61	$7.02	$1.00	$0.00	$24.63
4	70	$17.89	$7.02	$1.00	$0.00	$25.91
5	75	$19.16	$7.02	$4.80	$0.00	$30.98
6	80	$20.44	$7.02	$4.80	$0.00	$32.26
7	85	$21.72	$7.02	$4.80	$0.00	$33.54
8	90	$23.00	$7.02	$4.80	$0.00	$34.82

Effective Date - 10/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$15.99	$7.02	$0.00	$0.00	$23.01
2	60	$15.99	$7.02	$0.00	$0.00	$23.01
3	65	$17.32	$7.02	$1.00	$0.00	$25.34
4	70	$18.66	$7.02	$1.00	$0.00	$26.68
5	75	$19.99	$7.02	$4.80	$0.00	$31.81
6	80	$21.32	$7.02	$4.80	$0.00	$33.14
7	85	$22.65	$7.02	$4.80	$0.00	$34.47
8	90	$23.99	$7.02	$4.80	$0.00	$35.81

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $18.52/ 3&4 $21.07/ 5&6 $28.70/ 7&8 $31.26

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	01/01/2024	$44.68	$12.90	$18.66	$1.25	$77.49

Apprentice - *CEMENT MASONRY/PLASTERING - Springfield/Pittsfield*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.34	$12.90	$15.86	$0.00	$51.10
2	60	$26.81	$12.90	$18.66	$1.25	$59.62
3	65	$29.04	$12.90	$18.66	$1.25	$61.85
4	70	$31.28	$12.90	$18.66	$1.25	$64.09
5	75	$33.51	$12.90	$18.66	$1.25	$66.32
6	80	$35.74	$12.90	$18.66	$1.25	$68.55
7	90	$40.21	$12.90	$18.66	$1.25	$73.02

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CRANE OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$43.06	$13.78	$15.15	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 3*	01/01/2024	$56.06	$9.95	$23.95	$0.00	$89.96
	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$9.95	$0.00	$0.00	$37.98
2	55	$30.83	$9.95	$6.66	$0.00	$47.44
3	60	$33.64	$9.95	$7.26	$0.00	$50.85
4	65	$36.44	$9.95	$7.87	$0.00	$54.26
5	70	$39.24	$9.95	$20.32	$0.00	$69.51
6	75	$42.05	$9.95	$20.93	$0.00	$72.93
7	80	$44.85	$9.95	$21.53	$0.00	$76.33
8	90	$50.45	$9.95	$22.74	$0.00	$83.14

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$9.95	$0.00	$0.00	$38.58
2	55	$31.49	$9.95	$6.66	$0.00	$48.10
3	60	$34.36	$9.95	$7.26	$0.00	$51.57
4	65	$37.22	$9.95	$7.87	$0.00	$55.04
5	70	$40.08	$9.95	$20.32	$0.00	$70.35
6	75	$42.95	$9.95	$20.93	$0.00	$73.83
7	80	$45.81	$9.95	$21.53	$0.00	$77.29
8	90	$51.53	$9.95	$22.74	$0.00	$84.22

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$44.48	$9.65	$18.07	$0.00	$72.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$45.48	$9.65	$18.07	$0.00	$73.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: BURNERS *LABORERS - ZONE 4 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$45.23	$9.65	$18.07	$0.00	$72.95
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 4 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$45.48	$9.65	$18.07	$0.00	$73.20
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$45.23	$9.65	$18.07	$0.00	$72.95
DEMO: WRECKING LABORER *LABORERS - ZONE 4 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$44.48	$9.65	$18.07	$0.00	$72.20
DIVER *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN (Including Core Drilling) *ELECTRICIANS LOCAL 7*	12/31/2023	$49.01	$12.75	$14.61	$0.00	$76.37
	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 7*

Effective Date - 12/31/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.60	$7.65	$0.59	$0.00	$27.84
2	45	$22.05	$7.65	$0.66	$0.00	$30.36
3	50	$24.51	$12.75	$7.34	$0.00	$44.60
4	55	$26.96	$12.75	$7.41	$0.00	$47.12
5	65	$31.86	$12.75	$9.52	$0.00	$54.13
6	70	$34.31	$12.75	$10.90	$0.00	$57.96

Effective Date - 06/30/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.00	$7.80	$0.60	$0.00	$28.40
2	45	$22.50	$7.80	$0.68	$0.00	$30.98
3	50	$25.01	$13.00	$7.40	$0.00	$45.41
4	55	$27.51	$13.00	$7.48	$0.00	$47.99
5	65	$32.51	$13.00	$9.64	$0.00	$55.15
6	70	$35.01	$13.00	$11.06	$0.00	$59.07

Notes:

Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

Apprentice to Journeyworker Ratio:2:3****

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2024	$61.98	$16.18	$20.96	$0.00	$99.12
	01/01/2025	$62.83	$16.28	$21.36	$0.00	$100.47
	01/01/2026	$63.68	$16.38	$21.76	$0.00	$101.82
	01/01/2027	$64.53	$16.48	$22.16	$0.00	$103.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 41*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.99	$16.18	$0.00	$0.00	$47.17
2	55	$34.09	$16.18	$20.96	$0.00	$71.23
3	65	$40.29	$16.18	$20.96	$0.00	$77.43
4	70	$43.39	$16.18	$20.96	$0.00	$80.53
5	80	$49.58	$16.18	$20.96	$0.00	$86.72

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.42	$16.28	$0.00	$0.00	$47.70
2	55	$34.56	$16.28	$21.36	$0.00	$72.20
3	65	$40.84	$16.28	$21.36	$0.00	$78.48
4	70	$43.98	$16.28	$21.36	$0.00	$81.62
5	80	$50.26	$16.28	$21.36	$0.00	$87.90

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2024	$43.39	$16.18	$20.96	$0.00	$80.53
	01/01/2025	$43.98	$16.28	$21.36	$0.00	$81.62
	01/01/2026	$44.58	$16.38	$21.76	$0.00	$82.72
	01/01/2027	$45.17	$16.48	$22.16	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & BEAM RAIL ERECTOR *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.41	$9.65	$14.53	$0.00	$54.59
	06/01/2024	$31.23	$9.65	$14.53	$0.00	$55.41
	12/01/2024	$32.04	$9.65	$14.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.37	$9.65	$15.60	$0.00	$57.62
	06/01/2024	$33.56	$9.65	$15.60	$0.00	$58.81
	12/01/2024	$34.74	$9.65	$15.60	$0.00	$59.99
	06/01/2025	$35.98	$9.65	$15.60	$0.00	$61.23
	12/01/2025	$37.21	$9.65	$15.60	$0.00	$62.46
	06/01/2026	$39.25	$9.65	$15.60	$0.00	$64.50
	12/01/2026	$40.54	$9.65	$15.60	$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*	06/01/1999	$18.84	$4.80	$4.10	$0.00	$27.74
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$21.33	$4.80	$4.10	$0.00	$30.23
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$22.33	$4.80	$4.10	$0.00	$31.23

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 7*	12/31/2023	$49.01	$12.75	$14.61	$0.00	$76.37
	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 7*	12/31/2023	$49.01	$12.75	$14.61	$0.00	$76.37
	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56

Apprentice - *OPERATING ENGINEERS - Local 98 Class 3*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.42	$13.38	$15.15	$0.00	$51.95
2	70	$27.32	$13.38	$15.15	$0.00	$55.85
3	80	$31.22	$13.38	$15.15	$0.00	$59.75
4	90	$35.13	$13.38	$15.15	$0.00	$63.66

Notes:
Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.

Apprentice to Journeyworker Ratio:1:6

FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$25.48	$9.65	$15.60	$0.00	$50.73
	06/01/2024	$26.51	$9.65	$15.60	$0.00	$51.76
	12/01/2024	$26.51	$9.65	$15.60	$0.00	$51.76
	06/01/2025	$27.59	$9.65	$15.60	$0.00	$52.84
	12/01/2025	$27.59	$9.65	$15.60	$0.00	$52.84
	06/01/2026	$28.71	$9.65	$15.60	$0.00	$53.96
	12/01/2026	$28.71	$9.65	$15.60	$0.00	$53.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE III*	03/01/2023	$40.07	$7.31	$18.15	$0.00	$65.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone III*

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.04	$7.31	$1.38	$0.00	$28.73
2	55	$22.04	$7.31	$1.38	$0.00	$30.73
3	60	$24.04	$7.31	$2.76	$0.00	$34.11
4	65	$26.05	$7.31	$2.76	$0.00	$36.12
5	70	$28.05	$7.31	$15.39	$0.00	$50.75
6	75	$30.05	$7.31	$15.39	$0.00	$52.75
7	80	$32.06	$7.31	$16.77	$0.00	$56.14
8	85	$34.06	$7.31	$16.77	$0.00	$58.14

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $26.72.24/ 3&4 $32.11/ 5&6 $50.75/ 7&8 $56.14

Apprentice to Journeyworker Ratio:1:1

FORK LIFT *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.25	$13.78	$15.15	$0.00	$68.18

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATORS/LIGHTING PLANTS *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.80	$13.78	$15.15	$0.00	$64.73

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 1333*	06/01/2020	$39.18	$10.80	$10.45	$0.00	$60.43

Apprentice - *GLAZIER - Local 1333*

Effective Date - 06/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.59	$10.80	$1.80	$0.00	$32.19
2	56	$22.04	$10.80	$1.80	$0.00	$34.64
3	63	$24.49	$10.80	$2.45	$0.00	$37.74
4	69	$26.94	$10.80	$2.45	$0.00	$40.19
5	75	$29.39	$10.80	$3.15	$0.00	$43.34
6	81	$31.83	$10.80	$3.15	$0.00	$45.78
7	88	$34.28	$10.80	$10.45	$0.00	$55.53
8	94	$36.73	$10.80	$10.45	$0.00	$57.98

Notes:

Apprentice to Journeyworker Ratio:1:3

GRADER/TRENCHING MACHINE/DERRICK *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 63*	01/01/2024	$43.80	$10.64	$17.54	$2.05	$74.03
	07/01/2024	$45.05	$10.64	$17.54	$2.05	$75.28
	01/01/2025	$46.30	$10.64	$17.54	$2.05	$76.53
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 7*	12/31/2023	$49.01	$12.75	$14.61	$0.00	$76.37
	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 63*	01/01/2024	$43.80	$10.64	$17.54	$2.05	$74.03
	07/01/2024	$45.05	$10.64	$17.54	$2.05	$75.28
	01/01/2025	$46.30	$10.64	$17.54	$2.05	$76.53
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.87	$9.65	$15.60	$0.00	$58.12
	06/01/2024	$34.06	$9.65	$15.60	$0.00	$59.31
	12/01/2024	$35.24	$9.65	$15.60	$0.00	$60.49
	06/01/2025	$36.48	$9.65	$15.60	$0.00	$61.73
	12/01/2025	$37.71	$9.65	$15.60	$0.00	$62.96
	06/01/2026	$39.75	$9.65	$15.60	$0.00	$65.00
	12/01/2026	$41.04	$9.65	$15.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	09/01/2023	$42.80	$14.75	$19.61	$0.00	$77.16
	09/01/2024	$45.54	$14.75	$19.61	$0.00	$79.90
	09/01/2025	$48.27	$14.75	$19.61	$0.00	$82.63
	09/01/2026	$51.01	$14.75	$19.61	$0.00	$85.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Springfield*

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.40	$14.75	$14.32	$0.00	$50.47
2	60	$25.68	$14.75	$15.37	$0.00	$55.80
3	70	$29.96	$14.75	$16.43	$0.00	$61.14
4	80	$34.24	$14.75	$17.49	$0.00	$66.48

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.77	$14.75	$14.32	$0.00	$51.84
2	60	$27.32	$14.75	$15.37	$0.00	$57.44
3	70	$31.88	$14.75	$16.43	$0.00	$63.06
4	80	$36.43	$14.75	$17.49	$0.00	$68.67

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (SPRINGFIELD AREA)*	09/16/2023	$39.81	$8.25	$22.70	$0.00	$70.76
	03/16/2024	$40.66	$8.25	$22.70	$0.00	$71.61

Apprentice - *IRONWORKER - Local 7 Springfield*

Effective Date - 09/16/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.89	$8.25	$22.70	$0.00	$54.84
2	70	$27.87	$8.25	$22.70	$0.00	$58.82
3	75	$29.86	$8.25	$22.70	$0.00	$60.81
4	80	$31.85	$8.25	$22.70	$0.00	$62.80
5	85	$33.84	$8.25	$22.70	$0.00	$64.79
6	90	$35.83	$8.25	$22.70	$0.00	$66.78

Effective Date - 03/16/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.40	$8.25	$22.70	$0.00	$55.35
2	70	$28.46	$8.25	$22.70	$0.00	$59.41
3	75	$30.50	$8.25	$22.70	$0.00	$61.45
4	80	$32.53	$8.25	$22.70	$0.00	$63.48
5	85	$34.56	$8.25	$22.70	$0.00	$65.51
6	90	$36.59	$8.25	$22.70	$0.00	$67.54

Notes:

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.41	$9.65	$14.53	$0.00	$54.59
	06/01/2024	$31.23	$9.65	$14.53	$0.00	$55.41
	12/01/2024	$32.04	$9.65	$14.53	$0.00	$56.22

Apprentice - *LABORER - Zone 4 Building and Site*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.25	$9.65	$14.53	$0.00	$42.43
2	70	$21.29	$9.65	$14.53	$0.00	$45.47
3	80	$24.33	$9.65	$14.53	$0.00	$48.51
4	90	$27.37	$9.65	$14.53	$0.00	$51.55

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.74	$9.65	$14.53	$0.00	$42.92
2	70	$21.86	$9.65	$14.53	$0.00	$46.04
3	80	$24.98	$9.65	$14.53	$0.00	$49.16
4	90	$28.11	$9.65	$14.53	$0.00	$52.29

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.12	$9.65	$15.60	$0.00	$57.37
	06/01/2024	$33.31	$9.65	$15.60	$0.00	$58.56
	12/01/2024	$34.49	$9.65	$15.60	$0.00	$59.74
	06/01/2025	$35.73	$9.65	$15.60	$0.00	$60.98
	12/01/2025	$36.96	$9.65	$15.60	$0.00	$62.21
	06/01/2026	$39.00	$9.65	$15.60	$0.00	$64.25
	12/01/2026	$40.29	$9.65	$15.60	$0.00	$65.54

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER (Heavy and Highway) - Zone 4*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$19.27	$9.65	$15.60	$0.00	$44.52
2	70	$22.48	$9.65	$15.60	$0.00	$47.73
3	80	$25.70	$9.65	$15.60	$0.00	$50.95
4	90	$28.91	$9.65	$15.60	$0.00	$54.16

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$19.99	$9.65	$15.60	$0.00	$45.24
2	70	$23.32	$9.65	$15.60	$0.00	$48.57
3	80	$26.65	$9.65	$15.60	$0.00	$51.90
4	90	$29.98	$9.65	$15.60	$0.00	$55.23

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.41	$9.65	$14.53	$0.00	$54.59
	06/01/2024	$31.23	$9.65	$14.53	$0.00	$55.41
	12/01/2024	$32.04	$9.65	$14.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.41	$9.65	$14.53	$0.00	$54.59
	06/01/2024	$31.23	$9.65	$14.53	$0.00	$55.41
	12/01/2024	$32.04	$9.65	$14.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.89	$9.65	$14.41	$0.00	$54.95
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$32.41	$9.65	$14.53	$0.00	$56.59
	06/01/2024	$33.23	$9.65	$14.53	$0.00	$57.41
	12/01/2024	$34.04	$9.65	$14.53	$0.00	$58.22
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.37	$9.65	$15.60	$0.00	$57.62
	06/01/2024	$33.56	$9.65	$15.60	$0.00	$58.81
	12/01/2024	$34.74	$9.65	$15.60	$0.00	$59.99
	06/01/2025	$35.98	$9.65	$15.60	$0.00	$61.23
	12/01/2025	$37.21	$9.65	$15.60	$0.00	$62.46
	06/01/2026	$39.25	$9.65	$15.60	$0.00	$64.50
	12/01/2026	$40.54	$9.65	$15.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.41	$9.65	$14.53	$0.00	$54.59
	06/01/2024	$31.23	$9.65	$14.53	$0.00	$55.41
	12/01/2024	$32.04	$9.65	$14.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: TREE REMOVER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.41	$9.65	$14.53	$0.00	$54.59
	06/01/2024	$31.23	$9.65	$14.53	$0.00	$55.41
	12/01/2024	$32.04	$9.65	$14.53	$0.00	$56.22
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 - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.37	$9.65	$15.60	$0.00	$57.62
	06/01/2024	$33.56	$9.65	$15.60	$0.00	$58.81
	12/01/2024	$34.74	$9.65	$15.60	$0.00	$59.99
	06/01/2025	$35.98	$9.65	$15.60	$0.00	$61.23
	12/01/2025	$37.21	$9.65	$15.60	$0.00	$62.46
	06/01/2026	$39.25	$9.65	$15.60	$0.00	$64.50
	12/01/2026	$40.54	$9.65	$15.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	02/01/2024	$41.37	$11.49	$20.53	$0.00	$73.39
	08/01/2024	$43.05	$11.49	$20.53	$0.00	$75.07
	02/01/2025	$44.90	$11.49	$20.53	$0.00	$76.92
	08/01/2025	$45.81	$11.49	$20.53	$0.00	$77.83
	02/01/2026	$46.89	$11.49	$20.53	$0.00	$78.91
	08/01/2026	$48.65	$11.49	$20.53	$0.00	$80.67
	02/01/2027	$49.77	$11.49	$20.53	$0.00	$81.79

Apprentice - *MARBLE-TILE FINISHER-Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.69	$11.49	$20.53	$0.00	$52.71
2	60	$24.82	$11.49	$20.53	$0.00	$56.84
3	70	$28.96	$11.49	$20.53	$0.00	$60.98
4	80	$33.10	$11.49	$20.53	$0.00	$65.12
5	90	$37.23	$11.49	$20.53	$0.00	$69.25

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.53	$11.49	$20.53	$0.00	$53.55
2	60	$25.83	$11.49	$20.53	$0.00	$57.85
3	70	$30.14	$11.49	$20.53	$0.00	$62.16
4	80	$34.44	$11.49	$20.53	$0.00	$66.46
5	90	$38.75	$11.49	$20.53	$0.00	$70.77

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE MASON/TILE LAYER(SP/PT)SeeBrick *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE* See "BRICK/STONE/ARTIFICIAL MASONRY(INCL.MASONRY WATERPROOFING)						
MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
MECHANIC/WELDER/BOOM TRUCK *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
MILLWRIGHT (Zone 3) *MILLWRIGHTS LOCAL 1121 - Zone 3*	01/01/2024	$41.20	$10.08	$21.22	$0.00	$72.50
	01/06/2025	$43.48	$10.08	$21.22	$0.00	$74.78
	01/05/2026	$45.76	$10.08	$21.22	$0.00	$77.06

Apprentice - *MILLWRIGHT - Local 1121 Zone 3*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.66	$10.08	$5.36	$0.00	$38.10
2	65	$26.78	$10.08	$6.34	$0.00	$43.20
3	75	$30.90	$10.08	$18.78	$0.00	$59.76
4	85	$35.02	$10.08	$19.76	$0.00	$64.86

Effective Date - 01/06/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$23.91	$10.08	$5.36	$0.00	$39.35
2	65	$28.26	$10.08	$6.34	$0.00	$44.68
3	75	$32.61	$10.08	$18.78	$0.00	$61.47
4	85	$36.96	$10.08	$19.76	$0.00	$66.80

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 4 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
OILER *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$35.02	$13.78	$15.15	$0.00	$63.95
OTHER POWER DRIVEN EQUIPMENT - CLASS VI *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$32.74	$13.78	$15.15	$0.00	$61.67
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 3*	01/01/2024	$56.06	$9.95	$23.95	$0.00	$89.96
	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$9.95	$0.00	$0.00	$37.98
2	55	$30.83	$9.95	$6.66	$0.00	$47.44
3	60	$33.64	$9.95	$7.26	$0.00	$50.85
4	65	$36.44	$9.95	$7.87	$0.00	$54.26
5	70	$39.24	$9.95	$20.32	$0.00	$69.51
6	75	$42.05	$9.95	$20.93	$0.00	$72.93
7	80	$44.85	$9.95	$21.53	$0.00	$76.33
8	90	$50.45	$9.95	$22.74	$0.00	$83.14

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$9.95	$0.00	$0.00	$38.58
2	55	$31.49	$9.95	$6.66	$0.00	$48.10
3	60	$34.36	$9.95	$7.26	$0.00	$51.57
4	65	$37.22	$9.95	$7.87	$0.00	$55.04
5	70	$40.08	$9.95	$20.32	$0.00	$70.35
6	75	$42.95	$9.95	$20.93	$0.00	$73.83
7	80	$45.81	$9.95	$21.53	$0.00	$77.29
8	90	$51.53	$9.95	$22.74	$0.00	$84.22

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2024	$38.83	$9.65	$19.90	$0.00	$68.38
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 3*	07/01/2024	$40.03	$9.65	$19.90	$0.00	$69.58
	01/01/2025	$41.23	$9.65	$19.90	$0.00	$70.78

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - New*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.42	$9.95	$0.00	$0.00	$29.37
2	55	$21.36	$9.95	$4.43	$0.00	$35.74
3	60	$23.30	$9.95	$4.83	$0.00	$38.08
4	65	$25.24	$9.95	$5.23	$0.00	$40.42
5	70	$27.18	$9.95	$17.49	$0.00	$54.62
6	75	$29.12	$9.95	$17.89	$0.00	$56.96
7	80	$31.06	$9.95	$18.29	$0.00	$59.30
8	90	$34.95	$9.95	$19.10	$0.00	$64.00

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.02	$9.95	$0.00	$0.00	$29.97
2	55	$22.02	$9.95	$4.43	$0.00	$36.40
3	60	$24.02	$9.95	$4.83	$0.00	$38.80
4	65	$26.02	$9.95	$5.23	$0.00	$41.20
5	70	$28.02	$9.95	$17.49	$0.00	$55.46
6	75	$30.02	$9.95	$17.89	$0.00	$57.86
7	80	$32.02	$9.95	$18.29	$0.00	$60.26
8	90	$36.03	$9.95	$19.10	$0.00	$65.08

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	01/01/2024	$36.15	$9.95	$19.90	$0.00	$66.00
	07/01/2024	$37.35	$9.95	$19.90	$0.00	$67.20
	01/01/2025	$38.55	$9.95	$19.90	$0.00	$68.40

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.08	$9.95	$0.00	$0.00	$28.03
2	55	$19.88	$9.95	$4.43	$0.00	$34.26
3	60	$21.69	$9.95	$4.83	$0.00	$36.47
4	65	$23.50	$9.95	$5.23	$0.00	$38.68
5	70	$25.31	$9.95	$17.49	$0.00	$52.75
6	75	$27.11	$9.95	$17.89	$0.00	$54.95
7	80	$28.92	$9.95	$18.29	$0.00	$57.16
8	90	$32.54	$9.95	$19.10	$0.00	$61.59

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.68	$9.95	$0.00	$0.00	$28.63
2	55	$20.54	$9.95	$4.43	$0.00	$34.92
3	60	$22.41	$9.95	$4.83	$0.00	$37.19
4	65	$24.28	$9.95	$5.23	$0.00	$39.46
5	70	$26.15	$9.95	$17.49	$0.00	$53.59
6	75	$28.01	$9.95	$17.89	$0.00	$55.85
7	80	$29.88	$9.95	$18.29	$0.00	$58.12
8	90	$33.62	$9.95	$19.10	$0.00	$62.67

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2024	$37.43	$9.95	$19.90	$0.00	$67.28
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 3*	07/01/2024	$38.63	$9.95	$19.90	$0.00	$68.48
	01/01/2025	$39.83	$9.95	$19.90	$0.00	$69.68

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 3 - BRUSH NEW*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.72	$9.95	$0.00	$0.00	$28.67
2	55	$20.59	$9.95	$4.43	$0.00	$34.97
3	60	$22.46	$9.95	$4.83	$0.00	$37.24
4	65	$24.33	$9.95	$5.23	$0.00	$39.51
5	70	$26.20	$9.95	$17.49	$0.00	$53.64
6	75	$28.07	$9.95	$17.89	$0.00	$55.91
7	80	$29.94	$9.95	$18.29	$0.00	$58.18
8	90	$33.69	$9.95	$19.10	$0.00	$62.74

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.32	$9.95	$0.00	$0.00	$29.27
2	55	$21.25	$9.95	$4.43	$0.00	$35.63
3	60	$23.18	$9.95	$4.83	$0.00	$37.96
4	65	$25.11	$9.95	$5.23	$0.00	$40.29
5	70	$27.04	$9.95	$17.49	$0.00	$54.48
6	75	$28.97	$9.95	$17.89	$0.00	$56.81
7	80	$30.90	$9.95	$18.29	$0.00	$59.14
8	90	$34.77	$9.95	$19.10	$0.00	$63.82

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	01/01/2024	$34.75	$9.95	$19.90	$0.00	$64.60
	07/01/2024	$35.95	$9.95	$19.90	$0.00	$65.80
	01/01/2025	$37.15	$9.95	$19.90	$0.00	$67.00

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - BRUSH REPAINT*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.38	$9.95	$0.00	$0.00	$27.33
2	55	$19.11	$9.95	$4.43	$0.00	$33.49
3	60	$20.85	$9.95	$4.83	$0.00	$35.63
4	65	$22.59	$9.95	$5.23	$0.00	$37.77
5	70	$24.33	$9.95	$17.49	$0.00	$51.77
6	75	$26.06	$9.95	$17.89	$0.00	$53.90
7	80	$27.80	$9.95	$18.29	$0.00	$56.04
8	90	$31.28	$9.95	$19.10	$0.00	$60.33

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.98	$9.95	$0.00	$0.00	$27.93
2	55	$19.77	$9.95	$4.43	$0.00	$34.15
3	60	$21.57	$9.95	$4.83	$0.00	$36.35
4	65	$23.37	$9.95	$5.23	$0.00	$38.55
5	70	$25.17	$9.95	$17.49	$0.00	$52.61
6	75	$26.96	$9.95	$17.89	$0.00	$54.80
7	80	$28.76	$9.95	$18.29	$0.00	$57.00
8	90	$32.36	$9.95	$19.10	$0.00	$61.41

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.12	$9.65	$15.60	$0.00	$57.37
	06/01/2024	$33.31	$9.65	$15.60	$0.00	$58.56
	12/01/2024	$34.49	$9.65	$15.60	$0.00	$59.74
	06/01/2025	$35.73	$9.65	$15.60	$0.00	$60.98
	12/01/2025	$36.96	$9.65	$15.60	$0.00	$62.21
	06/01/2026	$39.00	$9.65	$15.60	$0.00	$64.25
	12/01/2026	$40.29	$9.65	$15.60	$0.00	$65.54
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$38.78	$15.07	$18.67	$0.00	$72.52
	06/01/2024	$39.78	$15.07	$18.67	$0.00	$73.52
	12/01/2024	$39.78	$15.07	$20.17	$0.00	$75.02
	01/01/2025	$39.78	$15.57	$20.17	$0.00	$75.52
	06/01/2025	$40.78	$15.57	$20.17	$0.00	$76.52
	12/01/2025	$40.78	$15.57	$21.78	$0.00	$78.13
	01/01/2026	$40.78	$16.17	$21.78	$0.00	$78.73
	06/01/2026	$41.78	$16.17	$21.78	$0.00	$79.73
	12/01/2026	$41.78	$16.17	$23.52	$0.00	$81.47
	01/01/2027	$41.78	$16.77	$23.52	$0.00	$82.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$43.53	$9.40	$23.12	$0.00	$76.05
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$43.53	$9.40	$23.12	$0.00	$76.05

Apprentice - *PILE DRIVER - Local 56 Zone 3*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 1)
1$57.06/2$61.96/3$66.87/4$69.32/5$71.78/6$71.78/7$76.68/8$76.68

Apprentice to Journeyworker Ratio:1:5

PIPELAYER *LABORERS - ZONE 4 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)* For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2023	$32.37	$9.65	$15.60	$0.00	$57.62
	06/01/2024	$33.56	$9.65	$15.60	$0.00	$58.81
	12/01/2024	$34.74	$9.65	$15.60	$0.00	$59.99
	06/01/2025	$35.98	$9.65	$15.60	$0.00	$61.23
	12/01/2025	$37.21	$9.65	$15.60	$0.00	$62.46
	06/01/2026	$39.25	$9.65	$15.60	$0.00	$64.50
	12/01/2026	$40.54	$9.65	$15.60	$0.00	$65.79
PLUMBER & PIPEFITTER *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PLUMBER/PIPEFITTER - Local 104*

Effective Date - 09/17/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$21.58	$9.55	$10.10	$0.00	$41.23
2	50	$23.98	$9.55	$10.10	$0.00	$43.63
3	55	$26.38	$9.55	$10.10	$0.00	$46.03
4	60	$28.78	$9.55	$10.10	$0.00	$48.43
5	65	$31.17	$9.55	$10.10	$0.00	$50.82
6	70	$33.57	$9.55	$10.10	$0.00	$53.22
7	75	$35.97	$9.55	$10.10	$0.00	$55.62
8	80	$38.37	$9.55	$10.10	$0.00	$58.02
9	80	$38.37	$9.55	$17.10	$0.00	$65.02
10	80	$38.37	$9.55	$17.10	$0.00	$65.02

Effective Date - 03/17/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$22.14	$9.55	$10.10	$0.00	$41.79
2	50	$24.61	$9.55	$10.10	$0.00	$44.26
3	55	$27.07	$9.55	$10.10	$0.00	$46.72
4	60	$29.53	$9.55	$10.10	$0.00	$49.18
5	65	$31.99	$9.55	$10.10	$0.00	$51.64
6	70	$34.45	$9.55	$10.10	$0.00	$54.10
7	75	$36.91	$9.55	$10.10	$0.00	$56.56
8	80	$39.37	$9.55	$10.10	$0.00	$59.02
9	80	$39.37	$9.55	$17.10	$0.00	$66.02
10	80	$39.37	$9.55	$17.10	$0.00	$66.02

Notes: **1:1,2:5,3:9,4:12

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.37	$9.65	$15.60	$0.00	$57.62
	06/01/2024	$33.56	$9.65	$15.60	$0.00	$58.81
	12/01/2024	$34.74	$9.65	$15.60	$0.00	$59.99
	06/01/2025	$35.98	$9.65	$15.60	$0.00	$61.23
	12/01/2025	$37.21	$9.65	$15.60	$0.00	$62.46
	06/01/2026	$39.25	$9.65	$15.60	$0.00	$64.50
	12/01/2026	$40.54	$9.65	$15.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWDERMAN & BLASTER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$31.41	$9.65	$14.53	$0.00	$55.59
	06/01/2024	$32.23	$9.65	$14.53	$0.00	$56.41
	12/01/2024	$33.04	$9.65	$14.53	$0.00	$57.22

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$33.53	$9.65	$15.19	$0.00	$58.37
	06/01/2024	$34.72	$9.65	$15.19	$0.00	$59.56
	12/01/2024	$35.90	$9.65	$15.19	$0.00	$60.74
	06/01/2025	$37.14	$9.65	$15.19	$0.00	$61.98
	12/01/2025	$38.37	$9.65	$15.19	$0.00	$63.21
	06/01/2026	$40.41	$9.65	$15.19	$0.00	$65.25
	12/01/2026	$41.70	$9.65	$15.19	$0.00	$66.54
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 404 - Construction Service (Northampton)*	05/01/2020	$22.44	$11.07	$6.50	$0.00	$40.01
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.66	$9.65	$14.53	$0.00	$54.84
	06/01/2024	$31.48	$9.65	$14.53	$0.00	$55.66
	12/01/2024	$32.29	$9.65	$14.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"						
ROLLER OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Coal tar pitch) *ROOFERS LOCAL 248*	07/16/2023	$38.91	$10.35	$18.00	$0.00	$67.26
For apprentice rates see "Apprentice- ROOFER"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 248*	07/16/2023	$38.41	$10.35	$18.00	$0.00	$66.76

Apprentice - *ROOFER - Local 248*

Effective Date - 07/16/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.05	$10.35	$0.00	$0.00	$33.40
2	65	$24.97	$10.35	$18.00	$0.00	$53.32
3	70	$26.89	$10.35	$18.00	$0.00	$55.24
4	75	$28.81	$10.35	$18.00	$0.00	$57.16
5	80	$30.73	$10.35	$18.00	$0.00	$59.08
6	85	$32.65	$10.35	$18.00	$0.00	$61.00
7	90	$34.57	$10.35	$18.00	$0.00	$62.92
8	95	$36.49	$10.35	$18.00	$0.00	$64.84

Notes:

Steps are 750 hrs.Roofer(Tear Off)1:1; Same as above

Apprentice to Journeyworker Ratio:1:3

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 248*	07/16/2023	$38.91	$10.35	$18.00	$0.00	$67.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- ROOFER"						
SCRAPER *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$15.15	$0.00	$67.56
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-PROPELLED POWER BROOM *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.80	$13.78	$15.15	$0.00	$64.73
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 63*	01/01/2024	$43.80	$10.64	$17.54	$2.05	$74.03
	07/01/2024	$45.05	$10.64	$17.54	$2.05	$75.28
	01/01/2025	$46.30	$10.64	$17.54	$2.05	$76.53

Apprentice - *SHEET METAL WORKER - Local 63*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.71	$4.79	$4.76	$0.92	$30.18
2	50	$21.90	$5.32	$5.29	$1.03	$33.54
3	55	$24.09	$5.85	$5.82	$1.13	$36.89
4	60	$26.28	$6.38	$6.35	$1.23	$40.24
5	65	$28.47	$6.92	$6.88	$1.33	$43.60
6	70	$30.66	$7.45	$7.41	$1.44	$46.96
7	75	$32.85	$7.98	$7.94	$1.54	$50.31
8	80	$35.04	$8.51	$15.42	$1.64	$60.61
9	85	$37.23	$9.04	$15.95	$1.74	$63.96
10	90	$39.42	$9.58	$16.48	$1.85	$67.33

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.27	$4.79	$4.76	$0.92	$30.74
2	50	$22.53	$5.32	$5.29	$1.03	$34.17
3	55	$24.78	$5.85	$5.82	$1.13	$37.58
4	60	$27.03	$6.38	$6.35	$1.23	$40.99
5	65	$29.28	$6.92	$6.88	$1.33	$44.41
6	70	$31.54	$7.45	$7.41	$1.44	$47.84
7	75	$33.79	$7.98	$7.94	$1.54	$51.25
8	80	$36.04	$8.51	$15.42	$1.64	$61.61
9	85	$38.29	$9.04	$15.95	$1.74	$65.02
10	90	$40.55	$9.58	$16.48	$1.85	$68.46

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.24	$15.07	$18.67	$0.00	$72.98
	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.53	$15.07	$18.67	$0.00	$73.27
	06/01/2024	$40.53	$15.07	$18.67	$0.00	$74.27
	12/01/2024	$40.53	$15.07	$20.17	$0.00	$75.77
	01/01/2025	$40.53	$15.57	$20.17	$0.00	$76.27
	06/01/2025	$41.53	$15.57	$20.17	$0.00	$77.27
	12/01/2025	$41.53	$15.57	$21.78	$0.00	$78.88
	01/01/2026	$41.53	$16.17	$21.78	$0.00	$79.48
	06/01/2026	$42.53	$16.17	$21.78	$0.00	$80.48
	12/01/2026	$42.53	$16.17	$23.52	$0.00	$82.22
	01/01/2027	$42.53	$16.77	$23.52	$0.00	$82.82
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 669*	04/01/2023	$47.43	$11.45	$16.61	$0.00	$75.49

Apprentice - *SPRINKLER FITTER - Local 669*

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$21.34	$8.22	$0.00	$0.00	$29.56
2	50	$23.72	$8.22	$0.00	$0.00	$31.94
3	55	$26.09	$11.45	$7.20	$0.00	$44.74
4	60	$28.46	$11.45	$8.35	$0.00	$48.26
5	65	$30.83	$11.45	$8.35	$0.00	$50.63
6	70	$33.20	$11.45	$8.60	$0.00	$53.25
7	75	$35.57	$11.45	$8.60	$0.00	$55.62
8	80	$37.94	$11.45	$8.60	$0.00	$57.99
9	85	$40.32	$11.45	$8.60	$0.00	$60.37
10	90	$42.69	$11.45	$8.60	$0.00	$62.74

Notes:

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 7*	12/31/2023	$49.01	$12.75	$14.61	$0.00	$76.37
	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 7*

Effective Date - 12/31/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.60	$7.05	$0.59	$0.00	$27.24
2	45	$22.05	$7.05	$0.66	$0.00	$29.76
3	50	$24.51	$12.75	$7.34	$0.00	$44.60
4	55	$26.96	$12.75	$7.41	$0.00	$47.12
5	65	$31.86	$12.75	$9.52	$0.00	$54.13
6	70	$34.31	$12.75	$10.90	$0.00	$57.96

Effective Date - 06/30/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.00	$7.20	$0.60	$0.00	$27.80
2	45	$22.50	$7.20	$0.68	$0.00	$30.38
3	50	$25.01	$13.00	$7.40	$0.00	$45.41
4	55	$27.51	$13.00	$7.48	$0.00	$47.99
5	65	$32.51	$13.00	$9.64	$0.00	$55.15
6	70	$35.01	$13.00	$11.06	$0.00	$59.07

Notes:
Steps are 800 hours

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	02/01/2024	$61.34	$11.49	$23.59	$0.00	$96.42
	08/01/2024	$63.44	$11.49	$23.59	$0.00	$98.52
	02/01/2025	$64.74	$11.49	$23.59	$0.00	$99.82
	08/01/2025	$66.89	$11.49	$23.59	$0.00	$101.97
	02/10/2026	$68.24	$11.49	$23.59	$0.00	$103.32
	08/01/2026	$70.44	$11.49	$23.59	$0.00	$105.52
	02/01/2027	$71.84	$11.49	$23.59	$0.00	$106.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER-Local 3 Marble/Tile (Spr/Ptt)*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.67	$11.49	$23.59	$0.00	$65.75
2	60	$36.80	$11.49	$23.59	$0.00	$71.88
3	70	$42.94	$11.49	$23.59	$0.00	$78.02
4	80	$49.07	$11.49	$23.59	$0.00	$84.15
5	90	$55.21	$11.49	$23.59	$0.00	$90.29

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.72	$11.49	$23.59	$0.00	$66.80
2	60	$38.06	$11.49	$23.59	$0.00	$73.14
3	70	$44.41	$11.49	$23.59	$0.00	$79.49
4	80	$50.75	$11.49	$23.59	$0.00	$85.83
5	90	$57.10	$11.49	$23.59	$0.00	$92.18

Notes:

Apprentice to Journeyworker Ratio:1:5

TERRAZZO MECHANIC *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	02/01/2024	$62.42	$11.49	$23.56	$0.00	$97.47
	08/01/2024	$64.52	$11.49	$23.56	$0.00	$99.57
	02/01/2025	$65.82	$11.49	$23.56	$0.00	$100.87
	08/01/2025	$67.97	$11.49	$23.56	$0.00	$103.02
	02/01/2026	$69.32	$11.49	$23.56	$0.00	$104.37
	08/01/2026	$71.52	$11.49	$23.56	$0.00	$106.57
	02/01/2027	$72.92	$11.49	$23.56	$0.00	$107.97

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO MECH - Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.21	$11.49	$23.56	$0.00	$66.26
2	60	$37.45	$11.49	$23.56	$0.00	$72.50
3	70	$43.69	$11.49	$23.56	$0.00	$78.74
4	80	$49.94	$11.49	$23.56	$0.00	$84.99
5	90	$56.18	$11.49	$23.56	$0.00	$91.23

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.26	$11.49	$23.56	$0.00	$67.31
2	60	$38.71	$11.49	$23.56	$0.00	$73.76
3	70	$45.16	$11.49	$23.56	$0.00	$80.21
4	80	$51.62	$11.49	$23.56	$0.00	$86.67
5	90	$58.07	$11.49	$23.56	$0.00	$93.12

Notes:

Apprentice to Journeyworker Ratio:1:5

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$48.33	$9.65	$18.22	$0.00	$76.20
	06/01/2024	$49.81	$9.65	$18.22	$0.00	$77.68
	12/01/2024	$51.28	$9.65	$18.22	$0.00	$79.15
	06/01/2025	$52.78	$9.65	$18.22	$0.00	$80.65
	12/01/2025	$54.28	$9.65	$18.22	$0.00	$82.15
	06/01/2026	$55.83	$9.65	$18.22	$0.00	$83.70
	12/01/2026	$57.33	$9.65	$18.22	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.45	$9.65	$18.22	$0.00	$72.32
	06/01/2024	$45.93	$9.65	$18.22	$0.00	$73.80
	12/01/2024	$47.40	$9.65	$18.22	$0.00	$75.27
	06/01/2025	$48.90	$9.65	$18.22	$0.00	$76.77
	12/01/2025	$50.40	$9.65	$18.22	$0.00	$78.27
	06/01/2026	$51.95	$9.65	$18.22	$0.00	$79.82
	12/01/2026	$53.45	$9.65	$18.22	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRACTORS *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.82	$15.07	$18.67	$0.00	$73.56
	06/01/2024	$40.82	$15.07	$18.67	$0.00	$74.56
	12/01/2024	$40.82	$15.07	$20.17	$0.00	$76.06
	01/01/2025	$40.82	$15.57	$20.17	$0.00	$76.56
	06/01/2025	$41.82	$15.57	$20.17	$0.00	$77.56
	12/01/2025	$41.82	$15.57	$21.78	$0.00	$79.17
	01/01/2026	$41.82	$16.17	$21.78	$0.00	$79.77
	06/01/2026	$42.82	$16.17	$21.78	$0.00	$80.77
	12/01/2026	$42.82	$16.17	$23.52	$0.00	$82.51
	01/01/2027	$42.82	$16.77	$23.52	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2023	$56.56	$9.65	$18.67	$0.00	$84.88
	06/01/2024	$58.04	$9.65	$18.67	$0.00	$86.36
	12/01/2024	$59.51	$9.65	$18.67	$0.00	$87.83
	06/01/2025	$61.01	$9.65	$18.67	$0.00	$89.33
	12/01/2025	$62.51	$9.65	$18.67	$0.00	$90.83
	06/01/2026	$64.06	$9.65	$18.67	$0.00	$92.38
	12/01/2026	$65.56	$9.65	$18.67	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2023	$58.56	$9.65	$18.67	$0.00	$86.88
	06/01/2024	$60.04	$9.65	$18.67	$0.00	$88.36
	12/01/2024	$61.51	$9.65	$18.67	$0.00	$89.83
	06/01/2025	$63.01	$9.65	$18.67	$0.00	$91.33
	12/01/2025	$64.51	$9.65	$18.67	$0.00	$92.83
	06/01/2026	$66.06	$9.65	$18.67	$0.00	$94.38
	12/01/2026	$67.56	$9.65	$18.67	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2023	$48.63	$9.65	$18.67	$0.00	$76.95
	06/01/2024	$50.11	$9.65	$18.67	$0.00	$78.43
	12/01/2024	$51.58	$9.65	$18.67	$0.00	$79.90
	06/01/2025	$53.08	$9.65	$18.67	$0.00	$81.40
	12/01/2025	$54.58	$9.65	$18.67	$0.00	$82.90
	06/01/2026	$56.13	$9.65	$18.67	$0.00	$84.45
	12/01/2026	$57.63	$9.65	$18.67	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2023	$50.63	$9.65	$18.67	$0.00	$78.95
	06/01/2024	$52.11	$9.65	$18.67	$0.00	$80.43
	12/01/2024	$53.58	$9.65	$18.67	$0.00	$81.90
	06/01/2025	$55.08	$9.65	$18.67	$0.00	$83.40
	12/01/2025	$56.58	$9.65	$18.67	$0.00	$84.90
	06/01/2026	$58.13	$9.65	$18.67	$0.00	$86.45
	12/01/2026	$59.63	$9.65	$18.67	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.24	$15.07	$18.67	$0.00	$72.98
	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.37	$9.65	$15.60	$0.00	$57.62
	06/01/2024	$33.56	$9.65	$15.60	$0.00	$58.81
	12/01/2024	$34.74	$9.65	$15.60	$0.00	$59.99
	06/01/2025	$35.98	$9.65	$15.60	$0.00	$61.23
	12/01/2025	$37.21	$9.65	$15.60	$0.00	$62.46
	06/01/2026	$39.25	$9.65	$15.60	$0.00	$64.50
	12/01/2026	$40.54	$9.65	$15.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
WATER METER INSTALLER *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Marine Drilling						
BLASTER *MARINE DRILLING*	01/01/2018	$41.82	$7.63	$3.60	$0.00	$53.05
BOAT CAPTAIN *MARINE DRILLING*	01/01/2018	$33.87	$7.63	$3.30	$0.00	$44.80
BOAT CAPTAIN / Over 1,000 hp *MARINE DRILLING*	01/01/2018	$38.06	$7.63	$3.60	$0.00	$49.29
CORE DRILLER *MARINE DRILLING*	01/01/2018	$31.43	$7.63	$2.90	$0.00	$41.96
CORE DRILLER HELPER *MARINE DRILLING*	01/01/2018	$28.47	$7.63	$3.00	$0.00	$39.10
DRILLER *MARINE DRILLING*	01/01/2018	$39.70	$7.63	$3.60	$0.00	$50.93
ENGINEER *MARINE DRILLING*	01/01/2018	$39.69	$7.63	$3.50	$0.00	$50.82
HELPER *MARINE DRILLING*	01/01/2018	$34.24	$7.63	$3.00	$0.00	$44.87
MACHINIST *MARINE DRILLING*	01/01/2018	$38.88	$7.63	$3.30	$0.00	$49.81
OILER - MARINE DRILLING *MARINE DRILLING*	01/01/2018	$34.24	$7.63	$3.00	$0.00	$44.87
TUG DECKHAND *MARINE DRILLING*	01/01/2018	$27.61	$7.63	$3.00	$0.00	$38.24
WELDER *MARINE DRILLING*	01/01/2018	$38.88	$7.63	$3.30	$0.00	$49.81
Op Eng Marine (Dredging Work)						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BOAT OPERATOR *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$29.26	$7.63	$3.30	$0.00	$40.19
CERTIFIED WELDER *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$31.09	$7.63	$3.60	$0.00	$42.32
CHIEF WELDER/ CHIEF MATE *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$33.02	$7.63	$3.60	$0.00	$44.25
DERRICK / SPIDER / SPILLBARGE OPERATOR *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$33.02	$7.63	$3.60	$0.00	$44.25
DRAG BARGE OPERATOR / WELDER / MATE *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$30.24	$7.63	$3.30	$0.00	$41.17
ENGINEER / ELECTRICIAN *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$33.02	$7.63	$3.60	$0.00	$44.25
LICENSED BOAT OPERATOR *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$33.02	$7.63	$3.60	$0.00	$44.25
LICENSED TUG OPERATOR OVER 1000HP *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$38.18	$7.63	$3.60	$0.00	$49.41
MAINTENANCE ENGINEER *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$33.03	$7.63	$3.60	$0.00	$44.26
OILER - MARINE DIVISION *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$24.30	$7.63	$3.00	$0.00	$34.93
OPERATOR / LEVERMAN *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$38.18	$7.63	$3.60	$0.00	$49.41
RODMAN / SCOWMAN *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$24.30	$7.63	$3.00	$0.00	$34.93
SHOREMAN / DECKHAND *OPERATING ENGINEERS - MARINE DIVISION*	10/01/2017	$24.30	$7.63	$3.00	$0.00	$34.93
Outside Electrical - West						
EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42* For apprentice rates see "Apprentice- LINEMAN"	09/01/2019	$44.67	$8.00	$12.55	$0.00	$65.22
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42* For apprentice rates see "Apprentice- LINEMAN"	09/01/2019	$30.58	$8.00	$5.48	$0.00	$44.06
GROUNDMAN / TRUCK DRIVER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42* For apprentice rates see "Apprentice- LINEMAN"	09/01/2019	$39.97	$8.00	$10.96	$0.00	$58.93
HEAVY EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42* For apprentice rates see "Apprentice- LINEMAN"	09/01/2019	$47.01	$8.00	$13.22	$0.00	$68.23
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$51.71	$8.00	$15.55	$0.00	$75.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LINEMAN (Outside Electrical) - West Local 42*

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$31.03	$8.00	$3.43	$0.00	$42.46
2	65	$33.61	$8.00	$3.51	$0.00	$45.12
3	70	$36.20	$8.00	$3.59	$0.00	$47.79
4	75	$38.78	$8.00	$5.16	$0.00	$51.94
5	80	$41.37	$8.00	$5.24	$0.00	$54.61
6	85	$43.95	$8.00	$5.32	$0.00	$57.27
7	90	$46.54	$8.00	$7.40	$0.00	$61.94

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TRACTOR-TRAILER DRIVER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$44.67	$8.00	$12.55	$0.00	$65.22
Rental of Equipment - West						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$38.95	$15.07	$0.00	$0.00	$54.02
	06/01/2024	$39.95	$15.07	$0.00	$0.00	$55.02
	12/01/2024	$39.95	$15.07	$0.00	$0.00	$55.02
	01/01/2025	$39.95	$15.57	$0.00	$0.00	$55.52
	06/01/2025	$40.95	$15.57	$0.00	$0.00	$56.52
	12/01/2025	$40.95	$15.57	$0.00	$0.00	$56.52
	01/01/2026	$40.95	$16.17	$0.00	$0.00	$57.12
	06/01/2026	$41.95	$16.17	$0.00	$0.00	$58.12
	12/01/2026	$41.95	$16.17	$0.00	$0.00	$58.12
	01/01/2027	$41.95	$16.77	$0.00	$0.00	$58.72
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.02	$15.07	$0.00	$0.00	$54.09
	06/01/2024	$40.02	$15.07	$0.00	$0.00	$55.09
	12/01/2024	$40.02	$15.07	$0.00	$0.00	$55.09
	01/01/2025	$40.02	$15.57	$0.00	$0.00	$55.59
	06/01/2025	$41.02	$15.57	$0.00	$0.00	$56.59
	12/01/2025	$41.02	$15.57	$0.00	$0.00	$56.59
	01/01/2026	$41.02	$16.17	$0.00	$0.00	$57.19
	06/01/2026	$42.02	$16.17	$0.00	$0.00	$58.19
	12/01/2026	$42.02	$16.17	$0.00	$0.00	$58.19
	01/01/2027	$42.02	$16.77	$0.00	$0.00	$58.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.14	$15.07	$0.00	$0.00	$54.21
	06/01/2024	$40.14	$15.07	$0.00	$0.00	$55.21
	12/01/2024	$40.14	$15.07	$0.00	$0.00	$55.21
	01/01/2025	$40.14	$15.57	$0.00	$0.00	$55.71
	06/01/2025	$41.14	$15.57	$0.00	$0.00	$56.71
	12/01/2025	$41.14	$15.57	$0.00	$0.00	$56.71
	01/01/2026	$41.14	$16.17	$0.00	$0.00	$57.31
	06/01/2026	$42.14	$16.17	$0.00	$0.00	$58.31
	12/01/2026	$42.14	$16.17	$0.00	$0.00	$58.31
	01/01/2027	$42.14	$16.77	$0.00	$0.00	$58.91
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$103.05	$9.40	$0.00	$0.00	$112.45
BACKHOE/FRONT-END LOADER OPERATOR *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.56	$13.78	$0.00	$0.00	$53.34
BATCH/CEMENT PLANT - ON SITE *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.03	$13.38	$0.00	$0.00	$52.41
BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL*OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.56	$13.78	$0.00	$0.00	$53.34
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.03	$13.38	$0.00	$0.00	$52.41
CRANE OPERATOR *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$43.06	$13.78	$0.00	$0.00	$56.84
DIVER *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$68.70	$9.40	$0.00	$0.00	$78.10
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$49.07	$9.40	$0.00	$0.00	$58.47
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$73.60	$9.40	$0.00	$0.00	$83.00
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$103.05	$9.40	$0.00	$0.00	$112.45
FIREMAN *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$0.00	$0.00	$52.41

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 98 Class 3*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.42	$13.38	$0.00	$0.00	$36.80
2	70	$27.32	$13.38	$0.00	$0.00	$40.70
3	80	$31.22	$13.38	$0.00	$0.00	$44.60
4	90	$35.13	$13.38	$0.00	$0.00	$48.51

Notes:
Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.

Apprentice to Journeyworker Ratio:1:6

FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$25.48	$9.65	$0.00	$0.00	$35.13
	06/01/2024	$26.51	$9.65	$0.00	$0.00	$36.16
	12/01/2024	$26.51	$9.65	$0.00	$0.00	$36.16
	06/01/2025	$27.59	$9.65	$0.00	$0.00	$37.24
	12/01/2025	$27.59	$9.65	$0.00	$0.00	$37.24
	06/01/2026	$28.71	$9.65	$0.00	$0.00	$38.36
	12/01/2026	$28.71	$9.65	$0.00	$0.00	$38.36
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FORK LIFT/CHERRY PICKER 27F WEST*OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.25	$13.78	$0.00	$0.00	$53.03
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATORS/LIGHTING PLANTS *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.80	$13.78	$0.00	$0.00	$49.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GRADER/TRENCHING MACHINE/DERRICK *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$0.00	$0.00	$53.34
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
LABORER *LABORERS - ZONE 4 (BUILDING & SITE)*	12/01/2023	$30.41	$9.65	$0.00	$0.00	$40.06
	06/01/2024	$31.23	$9.65	$0.00	$0.00	$40.88
	12/01/2024	$32.04	$9.65	$0.00	$0.00	$41.69

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 4 Building and Site*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.25	$9.65	$0.00	$0.00	$27.90
2	70	$21.29	$9.65	$0.00	$0.00	$30.94
3	80	$24.33	$9.65	$0.00	$0.00	$33.98
4	90	$27.37	$9.65	$0.00	$0.00	$37.02

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.74	$9.65	$0.00	$0.00	$28.39
2	70	$21.86	$9.65	$0.00	$0.00	$31.51
3	80	$24.98	$9.65	$0.00	$0.00	$34.63
4	90	$28.11	$9.65	$0.00	$0.00	$37.76

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2023	$32.12	$9.65	$0.00	$0.00	$41.77
	06/01/2024	$33.31	$9.65	$0.00	$0.00	$42.96
	12/01/2024	$34.49	$9.65	$0.00	$0.00	$44.14
	06/01/2025	$35.73	$9.65	$0.00	$0.00	$45.38
	12/01/2025	$36.96	$9.65	$0.00	$0.00	$46.61
	06/01/2026	$39.00	$9.65	$0.00	$0.00	$48.65
	12/01/2026	$40.29	$9.65	$0.00	$0.00	$49.94

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER (Heavy and Highway) - Zone 4*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$19.27	$9.65	$0.00	$0.00	$28.92
2	70	$22.48	$9.65	$0.00	$0.00	$32.13
3	80	$25.70	$9.65	$0.00	$0.00	$35.35
4	90	$28.91	$9.65	$0.00	$0.00	$38.56

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$19.99	$9.65	$0.00	$0.00	$29.64
2	70	$23.32	$9.65	$0.00	$0.00	$32.97
3	80	$26.65	$9.65	$0.00	$0.00	$36.30
4	90	$29.98	$9.65	$0.00	$0.00	$39.63

Notes:

Apprentice to Journeyworker Ratio:1:5

MECHANIC/WELDER/BOOM TRUCK *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$0.00	$0.00	$52.41
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.02	$13.78	$0.00	$0.00	$48.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS VI *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$32.74	$13.78	$0.00	$0.00	$46.52
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$38.78	$15.07	$0.00	$0.00	$53.85
	06/01/2024	$39.78	$15.07	$0.00	$0.00	$54.85
	12/01/2024	$39.78	$15.07	$0.00	$0.00	$54.85
	01/01/2025	$39.78	$15.57	$0.00	$0.00	$55.35
	06/01/2025	$40.78	$15.57	$0.00	$0.00	$56.35
	12/01/2025	$40.78	$15.57	$0.00	$0.00	$56.35
	01/01/2026	$40.78	$16.17	$0.00	$0.00	$56.95
	06/01/2026	$41.78	$16.17	$0.00	$0.00	$57.95
	12/01/2026	$41.78	$16.17	$0.00	$0.00	$57.95
	01/01/2027	$41.78	$16.77	$0.00	$0.00	$58.55
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$0.00	$0.00	$53.34
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.38	$0.00	$0.00	$52.41
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROLLER OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$0.00	$0.00	$52.20
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SCRAPER *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.03	$13.38	$0.00	$0.00	$52.41
SELF-PROPELLED POWER BROOM *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$35.80	$13.78	$0.00	$0.00	$49.58
SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.24	$15.07	$0.00	$0.00	$54.31
	06/01/2024	$40.24	$15.07	$0.00	$0.00	$55.31
	12/01/2024	$40.24	$15.07	$0.00	$0.00	$55.31
	01/01/2025	$40.24	$15.57	$0.00	$0.00	$55.81
	06/01/2025	$41.24	$15.57	$0.00	$0.00	$56.81
	12/01/2025	$41.24	$15.57	$0.00	$0.00	$56.81
	01/01/2026	$41.24	$16.17	$0.00	$0.00	$57.41
	06/01/2026	$42.24	$16.17	$0.00	$0.00	$58.41
	12/01/2026	$42.24	$16.17	$0.00	$0.00	$58.41
	01/01/2027	$42.24	$16.77	$0.00	$0.00	$59.01
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.53	$15.07	$0.00	$0.00	$54.60
	06/01/2024	$40.53	$15.07	$0.00	$0.00	$55.60
	12/01/2024	$40.53	$15.07	$0.00	$0.00	$55.60
	01/01/2025	$40.53	$15.57	$0.00	$0.00	$56.10
	06/01/2025	$41.53	$15.57	$0.00	$0.00	$57.10
	12/01/2025	$41.53	$15.57	$0.00	$0.00	$57.10
	01/01/2026	$41.53	$16.17	$0.00	$0.00	$57.70
	06/01/2026	$42.53	$16.17	$0.00	$0.00	$58.70
	12/01/2026	$42.53	$16.17	$0.00	$0.00	$58.70
	01/01/2027	$42.53	$16.77	$0.00	$0.00	$59.30
TRACTORS *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$38.42	$13.78	$0.00	$0.00	$52.20
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.82	$15.07	$0.00	$0.00	$54.89
	06/01/2024	$40.82	$15.07	$0.00	$0.00	$55.89
	12/01/2024	$40.82	$15.07	$0.00	$0.00	$55.89
	01/01/2025	$40.82	$15.57	$0.00	$0.00	$56.39
	06/01/2025	$41.82	$15.57	$0.00	$0.00	$57.39
	12/01/2025	$41.82	$15.57	$0.00	$0.00	$57.39
	01/01/2026	$41.82	$16.17	$0.00	$0.00	$57.99
	06/01/2026	$42.82	$16.17	$0.00	$0.00	$58.99
	12/01/2026	$42.82	$16.17	$0.00	$0.00	$58.99
	01/01/2027	$42.82	$16.77	$0.00	$0.00	$59.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
VAC-HAUL/CATCH BASIN CLEANING *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	01/01/2024	$39.24	$15.07	$0.00	$0.00	$54.31
	06/01/2024	$40.24	$15.07	$0.00	$0.00	$55.31
	12/01/2024	$40.24	$15.07	$0.00	$0.00	$55.31
	01/01/2025	$40.24	$15.57	$0.00	$0.00	$55.81
	06/01/2025	$41.24	$15.57	$0.00	$0.00	$56.81
	12/01/2025	$41.24	$15.57	$0.00	$0.00	$56.81
	01/01/2026	$41.24	$16.17	$0.00	$0.00	$57.41
	06/01/2026	$42.24	$16.17	$0.00	$0.00	$58.41
	12/01/2026	$42.24	$16.17	$0.00	$0.00	$58.41
	01/01/2027	$42.24	$16.77	$0.00	$0.00	$59.01

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

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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 00880

Revised January 12, 2022

DEPARTMENT OF LABOR

Employment Standards Administration

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS

"General Decision Number: MA20240007 01/19/2024

Superseded General Decision Number: MA20230007

State: Massachusetts

Construction Type: Highway

County: Franklin 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 $17.20 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 2024.
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 $12.90 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 2024.

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	01/05/2024
1	01/19/2024

* CARP0336-015 11/01/2023

	Rates	Fringes
CARPENTER	$ 40.51	26.19

ENGI0098-006 12/01/2016

	Rates	Fringes
Power equipment operators:		
(1) Backhoe/Excavator/Trackhoe	$ 33.68	23.96+A
(1) Loader	$ 33.68	23.96+A
(4) Roller	$ 32.54	23.96+A
Crane	$ 37.18	23.96+A

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

IRON0007-025 09/16/2023

	Rates	Fringes
IRONWORKER (REINFORCING AND STRUCTURAL)	$ 39.05	32.42

LABO0596-002 12/01/2021

	Rates	Fringes
LABORER		
Asphalt, Includes Raker, Shoveler, Spreader, and Distributor	$ 32.75	23.96
Common or General	$ 32.50	23.96
Guardrail Installation	$ 32.75	23.96
Landscape	$ 32.50	23.96

SUMA2014-003 01/11/2017

	Rates	Fringes
PAINTER: Spray (Linestriping)	$ 38.85	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 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 classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which 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. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of 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. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write 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 the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write 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 by 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

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

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DOCUMENT A00801

SPECIAL PROVISIONS

CHARLEMONT
Federal Aid Project No. STP(BR-OFF)-003S(716)X
Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook

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 *2024 Standard Specifications for Highways and Bridges*, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control,* 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 American Standard for Nursery Stock*; the Plans and these Special Provisions.

The scope of work under this Contract is for the replacement of Bridge No. C-05-042, which carries East Oxbow Road over Oxbow Brook in the Town of Charlemont, Massachusetts. The existing structure, originally constructed in 1940, is one span and consists of four steel beams supporting a reinforced concrete deck. The proposed bridge will also be one span, but will have five steel beams composite with an 8" reinforced concrete deck. The span length will be increased and the skew of abutments will be reduced. Currently, the bridge is considered to have one lane, but vehicles travel northbound and southbound on East Oxbow Road. The existing curb-to-curb width on the bridge will be increased to allow for two-way traffic. There are no sidewalks along East Oxbow Road or nearby roadways and no sidewalks are proposed.

The existing foundations are concrete spill-through abutments with short wingwalls. Both abutments are supported by two rectangular concrete columns and footings. The entire existing structure, except for the footings, will be demolished and removed. Integral concrete abutments with U-wingwalls are proposed to be installed behind the existing foundations. However, due to soil conditions, micropiles are to be used for the abutments instead of traditional steel H-piles. Abutment micropiles will be socketed into bedrock. The vertical clearance under the bridge varies as there are large boulders in the channel. Low chord elevations will be raised, which requires an adjustment to the vertical profile at the bridge and approaches. The horizontal alignment of East Oxbow Road will also be modified to accommodate the wider roadway.

SCOPE OF WORK (Continued)

There are numerous parameters and constraints at the project site. Existing steel beams have lead paint and soils samples collected adjacent to bridge abutment footings revealed contamination with lead (see Hazardous Materials Report included herein as Appendix B - Document A00824 for more information). Artesian pressures were monitored with piezometers, and shall be considered for all subsurface work (see the Geotechnical Engineering Report included herein as Appendix A - Document A00822 for more information).

There are Agricultural Preservation Restrictions (APR) east of the bridge prohibiting any work on that land. There are Chapter 61 restrictions west of the bridge, but temporary easements have been secured. Overhead wires located over the bridge will need to be temporarily relocated to the west to facilitate construction. A temporary bridge shall be installed west of the existing bridge to maintain traffic throughout construction. The temporary roadway realignment and utility relocation require tree removal within the Chapter 61 land.

Trees cut down within the Chapter 61 land will not become the property of the Contractor. The owners of the Chapter 61 land, Stephanie Gelfan and Wolfe Lowenthal, have requested the woodchips and cordwood resulting from trees being cut down on their land. Coordination is required between the Chapter 61 property owners, the Contractor, and MassDOT to determine the specific details of how and where the trees removed will be transported. It is assumed the trees will be transported within one mile of the project site. The Contractor will not receive additional compensation for coordination or transportation. Related costs should be considered incidental to the Contract.

Site conditions constrict the width of the temporary bridge to only allow one lane of alternating traffic, so a temporary signal shall be utilized during construction. Short-term full closures are anticipated to be required to facilitate various construction activities including, but not limited to, beam installation, placement/removal of the temporary bridge, and final paving. The use of a detour shall be limited as much as possible. Hawk Hill Road is located just north of the bridge and the only other access route is West Oxbow Road, which is narrow and mostly unpaved. For planning purposes, closures at the bridge requiring the use of a detour shall be restricted to non-winter and non-mud seasons, which is considered to be from April 1st to November 30th. Due to the unpredictability of the weather impacting the roadway condition, the Town and Engineer may determine if a detour is permissible at any point throughout the year. The Contractor shall provide justification for all detour requests, receive approval from both the Town and Engineer prior to the implementation of all detours, and give residents expected to utilize the detour adequate advanced notice of any closures.

Limiting environmental impacts to Oxbow Brook and adjacent ROW land is a priority. Therefore, demolishing the existing structure, constructing the new bridge, and installing the temporary bridge requires significant temporary support of excavation and/or retaining walls. Approximate limits of these temporary structures are shown on the plans.

SCOPE OF WORK (Continued)

In summary, the work under this Contract includes, but is not limited to, demolition and removal of the existing structure, bridge construction, roadway reconstruction, utility relocations, tree removal, support of excavation, temporary bridge installation and removal, traffic management, and other incidental items required to complete the required work. All work shall be performed in accordance with all environmental permits included in this Contract document.

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.

ENVIRONMENTAL PERMITTING

The proposed work occurs in jurisdictional wetland resources subject to Section 401 and Section 404 of the Clean Water Act; therefore, the project requires a Water Quality Certification from the Massachusetts Department of Environmental Protection and authorization from the US Army Corps of Engineers. The proposed work qualifies for the bridge exemption authorized in the Transportation Bond Bill and is therefore not subject to the Massachusetts Wetlands Protection Act, the Massachusetts Public Waterfront Act (Chapter 91), or the Massachusetts Environmental Policy Act.

If field conditions and/or Contractor-proposed erection, demolition, staging, or other procedures require work to occur in or otherwise impact water or wetland resource areas, the Contractor shall not begin any associated work until all required environmental permits have been obtained allowing such work. The Contractor must notify the District 1 Highway Director and Resident Engineer in writing at least 60 days prior to desire commencement of the proposed activity. All environmental submittals, including any Contract with Local, State, or Federal environmental agencies, must be coordinated with the District 1 Environmental Engineer. The Contractor shall fully cooperate with requests for information and provide same in a timely manner. The Department will not entertain a delay claim due to the time required to obtain the environmental permits.

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 project file number and municipality is to be placed in the subject line.

SECTION 6.00: CONTROL OF MATERIALS

Subsection 6.01: Source of Supply and Quality

Replace this subsection with the following:

The Engineer may approve material at the source of supply before delivery to the project.

The Department reserves the right to require approval of the source of supply for any material to be incorporated into the work prior to delivery or manufacture.

The Engineer reserves the right to prohibit the use of materials, products, or components which, in their opinion, may be supplied in a manner not reasonably consistent with contract requirements.

The determination of the Engineer shall be final upon all questions which pertain to supplier approval.

Fabricators of structural steel, miscellaneous steel and aluminum products, and producers of precast concrete and prestressed concrete must be on the Department's approved fabricators list on the date the bids are opened. Only approved fabricators will be allowed to perform work for the Department.

The Contractor shall furnish all materials required for the work specified in the Contract. Said materials shall meet the requirements of the specifications for the kind of work involving their use. For any materials named or described in these specifications, an approved equivalent to that named or described in the said specifications, may be furnished.

Chapter 7, Section 22, Clause 17, of the General Laws, as amended, shall apply to the purchase by the Contractor of supplies and materials to be used in the execution of this Contract.

The rules referred to require a preference in the purchase of supplies and materials, other considerations being equal, in favor first, of supplies and materials manufactured and sold within the Commonwealth, and second, of supplies and materials manufactured and sold within the United States.

SECTION 6.00 (Continued)

All iron and steel products, manufactured products, and construction materials shall comply with all Federal Buy America and Federal Build America Buy America (BABA) requirements, where applicable.

In Contracts requiring structural steel, precast, or prestress concrete, the Contractor shall furnish approved shop drawings, and fabrication procedures to the Department's inspector at the supply source or fabrication site. Materials for permanent construction shall be new, shall conform to the requirements of these specifications, and shall be approved by the Engineer.

Materials for temporary structures or supports adjacent to traveled ways, the failure of which would compromise the safety of the public or the traveled ways, need not be new but the Contractor shall be required to submit certification by a Structural Professional Engineer that the material meets the requirements for the intended use and shall be approved by the Engineer. Any fabrication shall conform to the requirements of these specifications. These requirements shall not apply to gantry systems and supports as well as other mechanized systems.

If testing finds that an approved supplier does not furnish a uniform product, or if the product from such source proves unacceptable at any time, the Contractor shall, at their own expense, take any and all steps necessary to furnish approved materials.

The Contractor shall submit to the Department for approval a notarized Certificate of Compliance (COC) from the Manufacturer or Supplier for each kind of manufactured or fabricated material furnished.

The COC shall certify compliance with the specifications and shall contain the following information:

1. Contract Number, City or Town, Name of Road and Federal Aid Number;
2. Name of the Contractor to which the material is supplied;
3. Kind of material supplied;
4. Quantity of material represented by the certificate;
5. Means of definitively identifying the consignment, such as invoice number, lot number, bill of lading number, label, marking, etc.;
6. Date and method of shipment;
7. Statement indicating that the material has been tested and found in conformity with the pertinent parts of the Contract;
8. Statement indicating that the material meets the requirements of Buy America and BABA, where applicable;
9. Results of all required tests including the chemical analysis in the case of metal: or in lieu of furnishing the results a statement that results of all required tests pertinent to the certificate and not submitted shall be maintained available by the undersigned for a period of not less than three years from date of final acceptance or not less than three years from date of final payment (whichever period is the longest shall apply).
10. Signature of a person having legal authority to bind the supplier.

SECTION 6.00 (Continued)

These COCs shall be delivered to the contract site at the same time that the materials are delivered and before such materials are incorporated into the work. The Contractor shall attach to the COC a document listing the contract bid item number(s), sub item(s), or lump sum breakdown item number(s), as applicable, under which the material will be compensated. Payment for the item in which the materials are incorporated may be withheld until these COCs are received in a form that meets the contract requirements.

If the Contractor has new materials purchased for use on a previous Department Contract which have never been used and which comply with the specifications, these materials may be furnished and used. The Contractor shall submit their own sworn statement certifying that such materials were purchased for use on a previous Contract (naming and identifying such Contract) and shall attach the original COC.

Any cost involved in furnishing the certificate shall be borne by the Contractor.

Subsection 6.03: Delivery and Storage of Materials
Replace this Subsection with the following:

Materials and equipment shall be progressively delivered to or removed from the site so that there will be neither delay in the progress of the work nor an accumulation of materials that are not to be used or removed within a reasonable time. All materials shall be stored in pre-approved locations per the conditions of the property owner.

Delivered materials and materials originating from the site, shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection.

Approved portions of the State Highway Layout (SHLO) may be used for storage of project materials and for the placing of the Contractor's plant and equipment upon obtaining a state highway access permit. All storage sites shall be restored to their original condition by the Contractor. No additional compensation shall be given for the design, construction, preparation, or restoration of the storage site(s) or obtaining the access permit which may include but is not limited to a Traffic Management Plan (TMP), utilities, and lighting.

The application for a permit shall contain a locus map identifying the proposed location, a description of the specific activities and uses of the staging area, a TMP in accordance with Subsection 7.10 depicting minimum setbacks from the roadway and any existing structures for stored materials and equipment and how equipment will safely access and exit the staging area.

Any additional space required must be provided by the Contractor at their expense. Municipal, private, or other state-owned property shall not be used for storage purposes without written permission of the owner or lessee, and copies of such written permission shall be furnished to the Engineer.

NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service (USFWS) has listed the northern long-eared bat (NLEB) as threatened under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. 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.

On July 29 - August 2, 2021, Normandeau, 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 2020 survey guidelines. The survey (included herein as Document A00856) did not detect northern long-eared bat, and as stated within the survey guidelines, the survey is valid for five years. Due to the 5-year validity of the negative presence/absence survey, it is recommended that the contractor conduct all activities that could result in stressors to the bats such as tree removal/trimming, bridge and/or structure removal/maintenance, lighting, or use of percussive, by July 29, 2026. 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.

Due to the negative survey results, the project is eligible for a May Affect, Not Likely to Adversely Affect (NLAA) determination, without 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 USFWS NLAA). Therefore, the project has completed Section 7 consultation through the Endangered Species Act, and no AMMs apply to the project.

The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB, including all applicable AMMs. NLEB Bat information (https://www.fws.gov/midwest/endangered/mammals/nleb/) shall be made available to all personnel.

ARTESIAN PRESSURES

Artesian conditions were suspected to potentially exist at the site based on known conditions at nearby project sites and the general hydrogeologic conditions of the area. To evaluate the presence of this condition, Nobis installed three piezometers within the bedrock at the site. These piezometers were continuously read via automated monitoring equipment between May 2020 and August 2022. During this time, piezometric pressures have been recorded as high as 12 feet above the ground surface indicating the presence of flowing artesian conditions. Refer to the geotechnical report prepared by Nobis, dated March 9, 2023, for a graphical representation of the piezometric pressures at the site with respect to both elevation and depth below the ground surface. The geotechnical report is attached as Appendix A Document A00822. The artesian pressures at the site are believed to be contained within the bedrock and are confined by the cohesive glacial till overburden. However, the Contractor should plan to encounter artesian pressures throughout the entire soil overburden.

The Contractor shall anticipate encountering flowing artesian conditions as noted herein and shall utilize equipment and methods necessary during all construction operations (including, but not limited to, performing excavations, and installing micropiles and other structures) in a way that eliminates potential impact from artesian conditions. Any construction delay, lost production, or installation of replacement piles, as required due to the artesian conditions, shall not be measured, or paid for separately, but all costs in connection therewith shall be included in the Contract.

To minimize effects of the potential artesian pressures that have been documented at the site, potential options for the Contractor may include, but are not limited to the following:

- Having appropriate dewatering plans and equipment in place to handle anticipated flows into excavations including contingency plans;
- restricting excavations and micropile installations to drier seasons;
- using hollow bars for micropile installations;
- including additives to the grout for the purpose of increasing its weight; and/or,
- grouting micropiles under pressure.

The Contactor shall submit detailed procedures on how the artesian water pressure conditions will be addressed if they are encountered. The Contractor shall address measures performed during any excavation performed and during installation of the micropiles, and upon completion of the micropiles. The Contractor shall also address what remedial measures will be taken if artesian pressures become too high or there is water seepage/flow outside of the casing.

A mandatory pre-construction meeting will be scheduled by the Engineer and held prior to the start of construction. The Design Consultant, MassDOT Resident Engineer, Prime Contractor, and Micropile Contractor, including QC personnel, shall attend the meeting. The preconstruction meeting will be conducted to address artesian pressure conditions at the site and means that the conditions will be addressed.

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.

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.

HOLIDAY WORK RESTRICTIONS (Continued)

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.

NOTICE TO OWNERS OF UTILITIES

The following are names of owners and representatives of the principal utilities that may be affected. Completeness of the list is not guaranteed by MassDOT.

DISTRICT UTILITY/CONSTRUCTABILITY ENGINEER:

Franklin County
District 1

Mark Page
857-368-1033
Mark.Page@dot.state.ma.us

ELECTRIC:

National Grid Electric
548 Haydenville Road
Leeds, MA 01053

Sandra Annis
413-582-7424
sandra.annis@nationalgrid.com

TELEPHONE:

Verizon
385 Myles Standish Blvd.
Taunton, MA 02780

Karen Mealey
774-409-3160
karen.m.mealey@verizon.com

SEWER:

Charlemont Sewer District
P.O. Box 137
Charlemont, MA 01339

Dawn Peters
413-339-5767

CABLE:

Westfield Gas and Electric - Fiber
P.O. Box 990
Westfield, MA 01086

Chris LaVertu
413-572-0219
clavertu@gweld.org

DPW:

Charlemont Highway Department
12 Factory Road – P.O. Box 253
Charlemont, MA 01339

Gordon Hathaway
413-339-4335
chrhwy@bcn.net

OTHER:

Local Linx
30 Elmview Circle
Dover, NH 03820

Jason Wing
403-538-4545
jason.wing@locallinx.com

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS

ELECTRIC:

Outage/ Emergency: 1-800-465-1212
New Service: 1-800-375-7405
Customer Support: 1-800-322-3223

SUBSECTION 8.03 PROSECUTION OF WORK
Add/amend the following at the end of the Section:

This Contract contains the following Contractual Milestones and Durations that are to be included in the Contractor's Baseline Contract Progress Schedule submission. The Contractor shall identify the completion of the work pertaining to each Contractual Milestone and Duration through the inclusion of a Finish Milestone in the accepted baseline Contract Progress Schedule using the stated description.

Milestones:

MS #01 – Contractor Field Completion: The Contractor shall achieve Contractor Field Completion within 960 calendar days from Notice to Proceed.

> Contractor Field Completion shall be defined as the date of completion of all physical Contract work, including the punch list work, and the Contractor has fully de-mobilized from field operations.

MS #02 – Substantial Completion: The Contractor shall achieve Substantial Completion within 915 calendar days from Notice to Proceed.

> Substantial Completion shall be described as the date that a walkthrough of the entire Contract work has been performed by the Resident Engineer and the work required by the Contract, including paperwork, has been completed. This excludes work having a Contract price of less than one percent of the adjusted total contract price, including overruns, underruns, and all contract amendments. All material submittals must be received by the District Materials Lab.

MS #03 – Full Beneficial Use: **T**he Contractor shall achieve Full Beneficial Use within 889 calendar days from Notice to Proceed.

> Full Beneficial Use shall be described as the date that the majority of the Contract work has been completed and the asset(s) have 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 bridge. All anticipated lane takings have been completed except for minor, short-term work items.

SUBSECTION 8.06 LIMITATIONS OF OPERATIONS

Add/amend the following at the end of the Subsection:

This Contract contains the following limitations that are to be included in the Contractor's Baseline Contract Progress Schedule submission.

Access Restraints:

This Contract will contain Access Restraint(s) to provide an anticipated start date of certain portions of the Work that are restrained by a Utility Party. The Contract Time (duration) has considered these portions of the utility work and has been developed with the initial information that has been provided by the Utility Party, and accepted by MassDOT. The Contractor shall communicate and coordinate with all affected Utilities, and may be required to perform support aspects of the utility relocation (as noted in the Contract Documents) well in advance of the start of the applicable utility relocation. The Contractor must clearly identify all aspects of this work in the preparation of the Construction Schedule and throughout the Contract duration.

This Contract contains the following enabling work related to utilities:

1. Temporary OHW relocation must be completed prior to the installation of the temporary bridge.

Seasonal Restrictions:

1. Winter Restrictions – Concrete placement and soil compaction is not allowed from December 1 to March 15.

2. Asphalt Paving Restriction – Base paving (HMA) placement is allowed from April 1 to November 15.

3. Planting and Seeding Restriction – Work is allowed from April 15 to May 31 and from August 15 to October 31.

4. Closures at the bridge requiring the use of a detour shall be restricted to non-winter and non-mud seasons, which is from April 1st to November 30th.

Winter Inefficiencies:

1. "ABP10 – Adverse Weather Condition" considering winter inefficiencies in terms of lost day(s) per week in winter months is recommended.

SUBSECTION 8.06 LIMITATIONS OF OPERATIONS (Continued)

Traffic Controls:

1. Bridge closures will be implemented during the entire project construction. A temporary bridge and temporary road will be constructed west of the existing bridge.

2. Site conditions constrict the width of the temporary bridge to only allow one lane of alternating traffic, so a temporary signal shall be utilized during construction.

3. Short-term full closures are anticipated to be required to facilitate various construction activities, such as beam installation, placement/removal of the temporary bridge, and final paving, but the use of a detour shall be limited as much as possible.

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 (Pub. L. No. 117-58, §§ 70901-52). 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 the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; 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.

NOTE: The requirements for manufactured products indicated in paragraph (2) above are not in effect for this contract.

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.

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 <0.3 Million 18-kip (80-kn) ESALs.

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.

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

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.

SUBSECTION 8.14 (Continued)

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.

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.

SUBSECTION 8.14 (Continued)

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.

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.

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.

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.

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 when required in this Subsection. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.

The requirements for scheduling submissions are established based on the Project Value at the time of the bid and are designated as Type A, B, C or D. The definitions of these Schedule Requirement Types are summarized below. Complete descriptions of all detailed requirements are established elsewhere in this specification.

Type A – for all Site-Specific Contracts with a Project Value over $20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Resource-Loading
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Cost-loaded CPM
- Contractor-furnished CPM software, computer and training

Type B – for all Site-Specific Contracts with a Project Value between $10 Million and $20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded CPM
- Resource-Loading
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

SECTION 722 (Continued)

Type C – for all Site-Specific Contracts with a Project Value between $3 Million and $10 Million

- 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, computer and training

Type D - for all contracts with a Project Value less than $3 Million; various locations contracts of any dollar amount; contracts with durations less than one-hundred and eighty (180) Calendar Days; and other contracts as determined by the Engineer.

- Bar chart schedule updated monthly or at the request of the Engineer (See Section 722.62.B - Bar Charts.)
- Monthly Projected Spending Report (PSR) (See Section 722.62.F - Projected Spending Reports.)

MATERIALS, EQUIPMENT, PERSONNEL

722.40 General

A. Software Requirements (Types A, B and C)

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 within twenty-eight (28) Calendar Days after Notice to Proceed. The computer and software shall be maintained and serviced as recommended by the computer manufacturer and/or as required by the Engineer during the duration of the Contract at no additional cost to the Department. The Contractor shall provide professional training in the basic use of the software for up to eight (8) Department employees. The trainer shall be approved by the Engineer. This training shall be provided within twenty-eight (28) Calendar Days after Notice to Proceed.

B. Scheduler Requirements

For all schedule types, if the Contractor plans to use outside scheduling services, the scheduler shall be approved as a subcontractor 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.

SECTION 722 (Continued)

CONSTRUCTION METHODS

722.60 General

A. Schedule Planning Session
(Types A, B and C)

The Contractor shall conduct a schedule planning session within seven (7) Calendar Days after the Contractor receives the NTP and 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;
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 minimum of five (5) copies of 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 (All Types)

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. Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

2. Contract Progress Schedule / Monthly Update Reviews
   The Engineer will respond to each submittal within twenty one (21) Calendar Days. Schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

   Failure to submit schedules as and when required could result in the withholding of full or partial pay estimate payments by the Engineer.

SECTION 722 (Continued)

722.61 Schedule Content and Preparation Requirements
(Types A, B and C unless otherwise noted)

Each Contract Progress Schedule shall fully conform to these requirements.

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.

B. ACTIVITIES

The schedules shall clearly define the progression of the Work from NTP to Contractor Field Completion (CFC) by using separate activities for each of the following items:

1. NTP
2. Each component of the Work defined by specific activities
3. Detailed activities to satisfy permit requirements
4. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before purchasing
5. 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
6. 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
7. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting the Contract
8. The Critical Path, clearly defined and organized
9. Float shall be clearly identified
10. 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
11. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
12. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
13. Full Beneficial Use (FBU) Contract Milestone per the requirements of Subsection 8.03 - Prosecution of Work
14. Contractor’s request for validation of FBU (ready to open to traffic)
15. The Department’s confirmation of completed work to allow for FBU

SECTION 722 (Continued)

16. Substantial Completion Contract Milestone per the requirements of Subsections 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
17. Contractor's request for validation of Substantial Completion
18. Punchlist 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 and 8.03 - Prosecution of Work
19. Contractor confirmation that all punchlist work and documentation has been completed
20. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
21. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
22. Contractor Field Completion Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
23. 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
24. Traffic work zone set-up and removal, night work and phasing
25. Early Utility Relocation (by others) that has been identified in the Contract
26. Right-of-Way (ROW) takings that have been identified in the Contract
27. Material Certifications
28. Work Breakdown Structure in accordance with the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at: https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit
29. For Type A and B Contracts only: All items to be paid, 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.

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.

SECTION 722 (Continued)

D. DURATIONS

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration to 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.

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 (for Types A and B only)

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 as specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

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.

SECTION 722 (Continued)

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.
- 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 required by the Engineer. Refer to the Project Special Provisions for specific restrictions.
- 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. Refer to the Project Special Provisions for specific restrictions.
- 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: Refer to the Project Special Provisions for specific restrictions.
- Night-time paving and striping operations, traffic and temperature restrictions: Refer to the Project Special Provisions for specific 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.

SECTION 722 (Continued)

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.
8. For Type A Schedules, each month, the Contractor will be paid using the Cost-loaded CPM activities for Lump Sum payment items. This requirement supersedes any requirements elsewhere in this Contract regarding partial payments of schedule-of-values for all Lump Sum items.

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

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.

Except as stated elsewhere in this subsection, schedule submittals shall include each of the documents listed below, prepared in two formats, for distribution as follows:

a. four (4) compact discs (CD); one (1) each for the Office of Project Controls and Performance Oversight (O-PC&PO), the Boston Construction Section Office, the District Construction Office and the Resident Engineer's Office. Additional copies shall be required if the work is performed in more than one district.
b. two (2) hard copies plotted in color on 24" X 36" paper; one (1) copy each for the District Construction Office and the Resident Engineer's Office. No copies for the O-PC&PO and the Boston Construction Section Office. Additional copies shall be required if the work is performed in more than one district.

SECTION 722 (Continued)

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;
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.

SECTION 722 (Continued)

B. Bar Charts (Types A, B, C and D)

One (1) time-scaled 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 time-scaled 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.

Bar Charts shall be printed in color and submitted on 11" X 17" paper or, if approved by the Engineer, as a .pdf file.

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. The DASC 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

The reports described in Subsections D, E and F below shall be submitted with all of the schedules listed in Subsection722.20 - General:

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.

For Unit Price pay items, in addition to the above, estimates to complete and 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 (Types B, C and D)

A Projected Spending Report (PSR) shall be prepared and submitted in accordance with the instructions listed at the end of this section. 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. If the difference between the Contractor's monthly projections vs. the actual spending is greater than 10%, the Contractor's monthly spending projection shall be revised and resubmitted within fifteen (15) Calendar Days.

The Projected Spending Report (PSR) shall be depicted in a tabular format and printed in color on 11 x 17-sized paper or larger as approved by the Engineer. For additional instructions and a template for preparing the Projected Spending Report (PSR), refer to the Contractor's Construction Schedule Toolkit located on the MassDOT-Highway Division website at: https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit or consult with the District Construction Scheduler.

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 (Types A, B, C and D)

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 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 as-built sequencing and as-built dates for completed and in-progress activities. As-built 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.

Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

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 bar chart 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.

SECTION 722 (Continued)

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.

Failure to submit Short-Term Construction Schedules every two (2) weeks may result in withholding of full or partial payments by the Engineer.

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 three (3) Calendar Days 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 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 fourteen (14) 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 most efficiently demonstrate the schedule impacts 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 resource 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/Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule within fourteen (14) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

SECTION 722 (Continued)

During the prosecution of the Work, should the Contractor's progress on a critical operation clearly not meet anticipated production, without cause by fault of the Department, or should a critical activity or series of activities not be staffed in accordance with the Contractor's approved Baseline Schedule resource planning, the Contractor shall be obligated to recover such delay. Recovery Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements within fourteen (14) Calendar Days of any of the cases listed above.

Recovery Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in to the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions, without additional compensation for any Contractor delays, if it is determined to be in the best interest of the Department to do so.

During the review of any Recovery Schedule, all Contract Progress Schedules shall continue to be required every month.

The Engineer may request that the Contractor prepare a Recovery Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

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/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 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.

Changes represented in 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.

SECTION 722 (Continued)

E. Disputes (Types A, B, C and D)

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.

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

COMPENSATION

722.80 Method of Measurement and Basis of Payment (Types A, B, C and D)

The Special Provisions will specify the fixed-price amount to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this lump-sum, fixed-price bid item amount in his/her bid. Failure to do so may be grounds for the rejection of the bid.

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.

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.

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:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of Item 100.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

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.

SECTION 722 (Continued)

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. Late submittal of missed Contract Progress Monthly Updates 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 withholding of full or partial payments by the Engineer.

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 required by the Engineer. Item 100. will be the basis for this Equitable Adjustment.

722.82 Payment Items

100.	SCHEDULE OF OPERATIONS - FIXED PRICE $_____	LUMP SUM

ITEM 114.1 DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. C-05-042 (0G1) LUMP SUM

The work to be done under this Item shall conform to the relevant provisions of Subsection 112 of the Standard Specifications and the following:

The work under this Item includes the removal and proper disposal of the existing superstructure including the wearing surface, bridge railings, reinforced concrete deck, steel beams, steel diaphragms, bearing assemblies, and any other superstructure elements attached to the beams.

CONSTRUCTION METHODS

The Contractor will make their own investigation of the structure to be demolished including the materials that are part of the structure. 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, taxes, etc. shall be included in the bid price of the demolition item.

The Contractor shall take care not to damage any portion of the substructure scheduled to remain as part of the demolition work under this Item. Any items required to be retained as part of the permanent structure which are damaged or otherwise made unsatisfactory for continued use by the Contractor's operations, shall be repaired at the Contractor's expense, as required by the Engineer.

The Contractor shall make adequate provisions, including the erection of a temporary protective shielding for protection of the waterway, roadway, and personnel from damage or injury due to demolition operations and debris removal. See Item 994.01 of these special provisions.

All materials removed under this Item shall become the property of the Contractor and shall be removed from the jobsite and properly disposed of unless such materials are designated to be reused in the proposed construction.

The Contractor shall prepare and submit a plan indicating his/her proposed demolition procedures and methods to be used including equipment, tools, devices, crane capacity and location, lifting hardware, schedule of operations, methods of utility protection (if required) to the Engineer for approval. The requirements for the equipment and all procedures used shall be in conformance with Subsection 960.61 Erection, of the Standard Specifications. The demolition procedures and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in Massachusetts certifying that all existing structural members are suitably braced and have sufficient capacity throughout the demolition operation. The Contractor shall consider all loading combinations including traffic and the Contractor's equipment at each stage of the construction. Calculations shall be performed in conformance with the latest AASHTO Standard Specification for Highway Bridges, AASHTO Guide Design Specification for Bridge Temporary Works, and AASHTO Construction Handbook for Bridge Temporary Works. Work under this Item shall not start until the Engineer has provided written approval to the Contractor.

ITEM 114.1 (Continued)

BASIS OF PAYMENT

Item 114.1 will be paid for at the Contract unit price per LUMP SUM, which price shall include all labor, materials, equipment, design, submittals, and all incidental costs required to complete the work.

The demolition of portions of the reinforced concrete substructure elements is included in Item 127.1 – Reinforced Concrete Excavation.

ITEM 127.1 REINFORCED CONCRETE EXCAVATION CUBIC YARD

Work under this Item shall conform to the relevant provisions of Subsection 112 of the Standard Specifications and the following:

The work to be done under this Item includes furnishing all labor, materials, and equipment required to perform demolition and removal of the existing bridge abutments and wingwalls to the limits shown on the plans or as required by the Engineer. Any temporary earth support, earth excavation, and gravel borrow for backfilling required to perform the demolition of this Item shall be considered incidental to the project.

The Contractor is advised to conduct a field investigation prior to bidding. Contractor shall verify all conditions, dimensions and materials in the field and shall base his/her bid on his/her own findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions for the materials to be removed. All materials removed under this Item shall become the property of the Contractor and shall be removed from the job site. The Contractor shall be responsible for satisfactory disposal of all materials removed from the site in accordance with the Standard Specifications and these Special Provisions at no additional cost to the Department.

Prior to the start of work, the Contractor shall locate all utilities and shall submit to the Engineer and the utility companies his proposed method of protecting them during the demolition operations. Procedure submittal shall not serve to relieve the Contractor of his responsibility to protect all utilities from damage at all times. Any damage done to utilities by the Contractor shall be immediately repaired at his expense. The Contractor shall obtain all required permits, coordinate with the utility owners relative to relocation of utilities, and make all required submittals under this Item prior to beginning any demolition work.

The Contractor shall also prepare and submit a plan indicating his/her proposed demolition procedures and methods to be used including equipment, tools, devices, and schedule of operations to the Engineer for review. The demolition procedures and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in Massachusetts. Work under this Item may not commence until the Engineer has given written approval.

The Contractor shall use suitable means to prevent demolition material and debris from falling into the waterway. Temporary shielding to prevent debris from falling into the waterway below the bridge shall be paid for under Item 994.01 – Temporary Protective Shielding Bridge No. C-05-042 (0G1). Any equipment, debris or excavated material that falls into the waterway due to the Contractor's activities shall be promptly removed by him at his expense and as required by the Engineer.

ITEM 127.1 (Continued)

METHOD OF MEASUREMENT

Item 127.1 will be measured for payment by the CUBIC YARD of Reinforced Concrete Excavation. Pay limits for Item 127.1 are restricted to the demolition elevations and dimensions provided in the plans.

BASIS OF PAYMENT

Item 127.1 will be paid for at the Contract unit price per CUBIC YARD, which price shall include all labor, materials, equipment, design, submittals, sawcutting, and all incidental costs required to complete the work.

ITEM 153.1 CONTROLLED DENSITY FILL – NON-EXCAVATABLE CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsection 150 of the Standard Specification and the following:

Controlled density fill (CDF) shall be used to backfill around the base of the precast guardrail transitions as shown on the Plans.

CDF shall not be used to backfill utility excavations or trenches.

Controlled density fill shall conform to the requirements of Subsection M4.08.0 Type 1. The Producer of the Controlled Density Fill material shall be selected from the MassDOT Qualified Construction Materials list.

METHOD OF MEASUREMENT

Item 153.1 will be measured for payment by the CUBIC YARD of Controlled Density Fill – Non-Excavatable furnished and placed within the pay limits shown on the plans.

BASIS OF PAYMENT

Item 153.1 will be 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.

ITEM 157. STONE FOR DRAINAGE END SQUARE YARD

The work under this Item shall conform to the relevant provisions of Subsection 258 of the Standard Specifications and the following:

The work under this Item includes placing stone for drainage end as shown on the Plans and as required by the Engineer.

Stone for drainage end shall comply with the provisions of M2.02.3: Stone for Pipe Ends.

METHOD OF MEASUREMENT

Item 157. will be measured for payment in place by the SQUARE YARD of Stone for Drainage End furnished and placed.

BASIS OF PAYMENT

Item 157. will be paid for at the Contract unit price per SQUARE YARD, which price shall include all labor, excavation, materials, equipment, and all incidental costs required to complete the work.

No payment will be made beyond the dimensions indicated or required by the Engineer.

ITEM 170.001 GRADING AND COMPACTING FOR DETOUR LUMP SUM

The work under this Item shall conform to the relevant provisions of Subsection 170 of the Standard Specifications and the following:

The work under this Item includes grading and compacting the areas of unpaved roadway along the detour route. The roadway shall be graded and compacted to achieve a smooth roadway surface that is suitable for the traveling public utilizing the existing roadway material. The roadway shall be free of pot holes and other defects. The Contractor shall grade and compact areas of the roadway along the detour route where and as required by the Engineer. The intent is to utilize the existing road material and regrade the existing material to provide a smooth roadway surface. All grading and compacting required along the detour route shall be completed prior to implementing the detour route. The detour route shall be maintained to the acceptance of the Engineer for the duration the detour is in place.

BASIS OF PAYMENT

Item 170.001 will be paid for at the Contract unit price LUMP SUM, which price shall include all labor, equipment, maintenance, and all incidental costs required to complete and maintain the Grading and Compacting for Detour. The Contractor will only be compensated for Item 170.001 Grading and Compacting for Detour if a detour is utilized during construction and if the grading and compacting of the detour is completed and maintained in a condition acceptable to the Engineer..

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, required 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 required 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, 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).

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.

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 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 penalties and/or for 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 657. TEMPORARY FENCE FOOT

The work under this Item shall conform to the relevant provisions of Subsection 644 of the Standard Specifications and the following:

The work under this Item includes furnishing, installing, removal, relocation, maintaining, and final removal of Temporary Chain Link Fence and Gates at locations established by the Engineer. The fence shall be used to close off the construction work area.

The fence will be at least 72 inches high. A top tension cable will be required on all portions of the temporary fence. All end, corner, gate, and intermediate parts will be supported, so as to maintain the structural integrity of the fence and provide adequate protection and control access to the work area. It may be necessary to move sections of the temporary fence at times during construction.

The fence shall not be removed without prior approval of the Engineer.

Material need not be new, but shall not be deteriorated, nor in any way jeopardize the security purposes intended. All fencing shall meet the approval of the Engineer. Fencing that is damaged due to construction accidents, vandalism, and/or any other manner shall be replaced without additional compensation.

The Contractor is responsible for maintenance of the temporary fence, and shall be responsible and cognizant that it remains secure, and that the area is sealed off at all times to the general public.

METHOD OF MEASUREMENT

Item 657. will be measured for payment by the FOOT, of fence installed, complete in place as required by the Engineer. Final removal of the fence will not be measured for payment but deemed to be included for payment under this Item.

BASIS OF PAYMENT

Item 657. will be paid for 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.

No separate payment will be made for all posts including end, corner, and intermediate brace posts, all gates and gate posts, removing and resetting of temporary fence or providing privacy screening, the replacement and/or restoration of fence damaged due to construction accidents, vandalism and/or any other manner, and final removal, but all costs in connection therewith shall be included in the Contract unit price bid.

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ITEM 698.3 GEOTEXTILE FABRIC FOR SEPARATION SQUARE YARD

The work under this Item shall conform to the relevant provisions of Subsection 670 of the Standard Specifications and the following:

The work under this Item shall consist of furnishing and installing geotextile fabric below the crushed stone bedding for the modified rockfill swale as shown on the plans.

MATERIALS

Geotextile Fabric for Separation shall be non-woven and shall conform to Subsection M9.50.0 of the Standard Specification, with property requirements per Table 3. The fabric shall also be listed on the MassDOT Qualified Construction Materials List (QCML) for the approved application of separation.

CONSTRUCTION

The geotextiles shall be protected from exposure to sunlight during transport and storage. After placement, the geotextile shall not be left uncovered for more than two (2) weeks.

Traffic or construction equipment will not be permitted directly on the geotextile fabric. Geotextile fabric may be joined either by sewing or overlapping.

Sewn seams shall be lapped a 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 18 inches

All seams shall be subject to the approval of the Engineer.

METHOD OF MEASUREMENT

Item 698.3 will be measured for payment by the SQUARE YARD of Geotextile Fabric for Separation placed, complete in place. No separate measurement shall be made for overlapping material.

BASIS OF PAYMENT

Item 698.3 will be paid for at the Contract unit price per SQUARE YARD, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for overlapping material but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 698.4 GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL SQUARE YARD

The work under this Item shall conform to all relevant provisions of Subsections 260 and 670 of the Standard Specifications and the following:

The Work under this Item consists of furnishing and placing geotextile fabric for permanent erosion control at the locations and grades shown on the Plans or as required by the Engineer.

MATERIALS

Geotextile Fabric for Permanent Erosion Control shall be selected from the MassDOT Qualified Construction Materials List and shall conform to Subsection M9.350.0 of the Standard Specification, with property requirements per Table 5.

SUBMITTALS

The Contractor shall submit the following to the Engineer for approval:

Certificate stating the manufacturer, product name, style number, chemical composition of the filaments and other pertinent information to fully describe the geotextiles.

Test results that show the geotextile meets the requirements of Material Subsection M9.50.0 and of the Standard Specifications and AASHTO M 288.

CONSTRUCTION METHODS

Geotextile for Permanent Erosion Control shall be installed according to the manufacturer's instructions and in reasonable close conformity with the location, lines and grades indicated on the Plans.

Overlapped seams at roll ends shall be a minimum of 1 foot except if placed under water. In such instances the overlap shall be a minimum of 3 feet. Overlaps of adjacent rolls shall be a minimum of 1 foot in all instances.

Any section of fabric that is damaged shall be repaired in accordance with the Manufacturer's requirements and AASHTO M 288 and to the acceptance of the Engineer or it shall be replaced at the cost of the Contractor.

METHOD OF MEASUREMENT

Item 698.4 will be measured for payment by the SQUARE YARD of Geotextile Fabric For Permanent Erosion Control furnished and installed, complete in place.

Seam overlap and joints will be measured as one layer of fabric. Any embedment or wrapping at the toe or top of the slope will be measured for payment.

BASIS OF PAYMENT

Item 698.4 will be paid for at the Contract unit price per SQUARE YARD, which price shall include all labor, materials, equipment, sewing, vertical edges, overlapping, and all incidental costs required to complete the work.

ITEM 740. ENGINEERS 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 a 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 required by the Engineer.

ITEM 751.7 COMPOST BLANKET CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsections 751 and M1.06.0Organic Soil Additives 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 plantgrowth.

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 constitutefinal 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 may be a blended product of compost and fine wood chips. No kiln-dried wood, construction debris or ground palette is allowed. Material shall meet the following criteria:

- 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
- Stability test shall produce a maximum of 8mg CO2-C/gram of organic material per day
- Particle size shall not exceed ¾ inch
- 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.

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.

ITEM 751.7 (Continued)

Compost blanket shall be pneumatically applied (blown on) to a minimum depth of one half to oneinch. Where shown on the plans or when required 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) shallbe 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 workof 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 andspread, tilled existing soil, or other specified substrate.

Seeding will be compensated for under the appropriate seeding items.

ITEM 765.451 SEEDING – PART SHADE ROADSIDE MIX POUND

Work under this Item shall consist of furnishing the mix(es) specified below in the required quantity.

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

ITEM 765.451 (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)

Calculating Pure Live Seed (PLS)

Quantities specified are PURE LIVE SEED. Greater quantities of ordered seed may be required to achieve actual specified seeding rates.

Pure Live Seed (PLS) is defined as a percentage calculated by multiplying the percent of pure seed by the percent of viable seed (total germination, hard seed, and dormant seed). For example:

If a seed label indicates 90% purity, 78% germination, 10% hard seed, and 2% dormancy, it is calculated to be 90% x [78 + 10 + 2]% = 81% PLS.

Therefore, each pound of PLS would need 1 pound / 0.81 = 1.2 pounds of seed with a 90% purity and 90% total germination.

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.

ITEM 765.451 (Continued)

765.451 Part Shade Roadside Mix

	Botanical Name	Common Name	% PLS by Weight
Grass			
	Festuca rubra	Creeping Red Fescue	25.70%
	Elymus virginicus	Virginia Wild Rye	24.00%
	Schizachyrium scoparium	Little Blue Stem	22.50%
	Panicum virgatum	Switch Grass	10.00%
	Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	7.00%
	Carex vulpinoidea	Fox Sedge	2.00%
	Agrostis perennans	Upland Bentgrass	2.00%
	Juncus effusus	Soft Rush	0.20%
			93.40%
Herb/Forb			
	Chamaecrista fasciculata	Partridge Pea	3.00%
	Penstemon digitalis	Beard-tongue	1.00%
	Zizia aurea	Golden Alexanders	0.30%
	Desmodium canadense	Showy Tick Trefoil	0.30%
	Solidago bicolor	White Goldenrod	0.20%
	Solidago caesia	Woodland Goldenrod	0.20%
	Rudbeckia hirta-VT ecotype	Black-eyed Susan-VT ecotype	0.20%
	Aster novae-angliae	New England Aster	0.20%
	Solidago odora	Licorice Scented Goldenrod	0.20%
	Aster divaricatus	White Wood Aster	0.20%
	Heliopsis helianthoides	Ox-Eye Sunflower	0.20%
	Pycnanthemum tenuifolium	Slender Mountain Mint	0.20%
	Monarda fistulosa	Wild Bergamot	0.10%
	Eupatorium perfoliatum	Boneset	0.10%
	Aster lateriflorus	Calico Aster	0.10%
	Oenothera fruticosa var. fruticosa	Sundrops	0.10%
			6.60%
			100.00%
	Seeding Rate: 15.0 lbs PLS/Acre		

Application Rate

Part Shade Roadside Mix: 15.0 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

ITEM 765.451 (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 Seed (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.*

ITEM 765.451 (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: _____

ITEM 765.451 (Continued)

METHOD OF MEASUREMENT

Item 765.451 will be measured for payment by the POUND of seeding - part shade roadside mix furnished.

BASIS OF PAYMENT

Item 765.451 will be paid for at the Contract unit price per Pound, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

REV. 2022.02.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

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 Subsection 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 Subsection 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 required. 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 required by the Engineer at the Contractor’s expense.

ITEM 767.9 JUTE MESH SQUARE YARD

REV. 2022.02.01 (REV. DATE TO BE REMOVED BY CONTRACTS)

The work under this Item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following.

The work under this Item shall consist of furnishing and installing jute mesh fabric to prevent soil erosion. Jute mesh shall be placed over all areas of exposed soil in locations shown on the plans or as required by the Engineer.

MATERIALS

Jute netting or similar material shall be new, unused, undyed, and unbleached 100% biodegradable yarn (no polypropylene) and of uniform plain weave. The materials should weigh approximately 1.0 (+/- 5%) pounds per linear yard (assuming a 4-foot width).

Shall meet the following minimum requirements:

Open Area:	70-75%
Mesh Size:	approximately 1/2 inch with an open area of 60-65%.
Roll Weight:	approximately 1.0 (+/- 5%) pounds per linear yard
Warp Ends:	78 per linear yard
Weft Ends:	41 per linear yard
Recommended flow:	6 fps (1.8 m/s)
Functional Longevity:	6-9 months

Anchoring devices shall be 11-gauge steel staples 6-inch minimum length. In loose soils the length of the staples shall be 9-inches.

For areas that will be routinely mowed anchoring devices shall consist of minimum 8” wooden stakes. Longer stakes shall be used where loose soils or other conditions obligate, as required by the Engineer.

CONSTRUCTION METHODS

Area shall be seeded prior to installation of jute netting.

Installation shall be such as to ensure continuous contact with soil without folds or wrinkles. Jute netting shall be laid such that upslope fabric is placed over lower slope fabric by a minimum of 3 feet. Adjoining rolls shall be overlapped a minimum 6 inches. The netting shall extend beyond at least 1 foot beyond the edge of the seeded area.

The Contractor shall bury the ends of the jute netting 6-8 inches in anchor trenches at top and bottom of slopes.

ITEM 767.9 (Continued)

Jute netting shall be anchored in place with vertically driven metal staples. The staples shall be driven in until their tops are flush with the soil. Staples shall be placed at 12-inch intervals along the top of a slope and in staggered courses along the face of the slope to achieve a minimum of 3 staples per square yard, or at manufacturer's recommendations for the given site conditions.

Contractor shall reseed all trenched and otherwise disturbed areas with specified seed mix. The Contractor shall maintain the jute netting and make satisfactory repairs of any areas damaged until acceptance of seed establishment.

METHOD OF MEASUREMENT

Jute Mesh will be measured by the number of SQUARE YARDS complete in place, including anchoring, as measured across the surface of grade and does not include buried or overlapped portions. The quantity measured for payment shall not exceed that shown on the plans or as required by the Engineer.

Mesh that becomes loose or that is not otherwise functioning to stabilize soil shall be repaired and new or additional jute matting installed as required at the Contractor's expense. Soil erosion shall be repaired, and area shall be raked and reseeded with the original specified mix as required by the Engineer at the Contractors expense.

BASIS OF PAYMENT

Item 767.9 will be paid for at the Contract unit price per SQUARE YARD, which price shall include all labor, materials, equipment, trenching, placing, and stapling of jute fabric, reseeding of trenched and disturbed areas, and all incidental costs required to complete the work.

ITEM 816.81 TEMPORARY TRAFFIC CONTROL SIGNAL LUMP SUM

Work included under this Item consist of furnishing all required labor, materials, and equipment required to install, complete in place, ready for operation, operate, and remove temporary traffic control signals and related work at the location shown on the plan, in accordance with the plans, Section 800 and Subsection 801 of the Standard Specifications, the 2009 Manual on Uniform Traffic Control Devices (MUTCD) as amended, and the following:

This Item is required for the temporary installation of traffic signal systems. The work shall include the furnishing and installation of part or all of the following items: local traffic signal controllers; cabinets, mountings, and risers; wood strain poles; span wire assemblies; guy wires; signal heads; pull boxes; all cable and wiring; ground rods, equipment grounding and bonding; service connections; microwave detection system; non-metallic conduit; metallic conduit; and all other equipment, materials and incidental costs required to provide a complete, fully operational temporary traffic control signal system as specific herein and as shown on the plans. The work under this Item shall also include project restoration.

Shop Drawings
Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for signal supports, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Subsection 815.20 of the Standard Specifications.

The Contractor shall not begin work until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Design Consultant shall return the shop drawings within 15 days from the date of receipt from the Engineer.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

Conduit Mounting to Temporary Bridge
The Contractor shall submit a plan for mounting the 2 inch electrical conduit type RM – galvanized steel to the temporary bridge structure. The plan shall meet the requirements for attachment in the National Electric Code (NEC) and any enclosures used shall be NEMA 4X rated.

The Contractor shall not begin work until approval of the plan has been received in writing from the Engineer. Approval of the plan will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Design Consultant shall return the plan within 15 days from the date of receipt from the Engineer.

ITEM 816.81 (Continued)

Wood Strain Poles and Span Wire Assemblies

The wood strain poles, and span wire assemblies shall be fabricated and constructed as shown on the plans and in the MassDOT Overhead Signal Structure & Foundation Standard Drawings, December 2015.

The work shall consist of furnishing and installing wood poles, guys, anchor, and incidentals as described herein and on the project plans.

Poles shall not have more than 180 degrees twist in grain over the full length. Tops of poles shall be beveled.

Poles shall be smoothly trimmed either by hand or by machine. The depth of cut shall be kept to a practical minimum on the surface and in no case be more than ¼ inch except at knot holes. The circumference at any point between knot holes shall not be reduced by more than 1 inch.

Excessive splitting shall not be acceptable and shall be defined as:

a. A check or split which will permit a number 10 B & S wire to be extended 3 inches into the body of the pole.
b. Checking and splitting of such size that at any point along the pole, two checks or splits occur into which a number 10 wire may be inserted for a depth of more than 7/8 inches.

Tops and butts of poles shall be free of pith holes.

The depth of a trimmed scar shall not be greater than 1 inch or $1/10^{th}$ of the pole diameter at that location.

Any deviation from straightness shall not exceed 2 inches in a 5 foot section. A pole may sweep in one plane and in one direction provided a straight line joining the midpoint of the pole at the butt and the midpoint of the pole at the top does not at any intermediate point pass through the external surface of the pole. No poles with sweeps in two planes will be accepted.

Before treatment, poles shall be sufficiently air-seasoned or kiln dried to reduce checking after treatment to a minimum and to permit maximum penetration and retention of the preservative. Prior to treatment, the moisture content of the sapwood, based on the oven dried weight, shall not exceed 25%. The moisture content shall be determined by an electrical resistance type moisture meter having insulated needles. The needles shall be driven 2¼ inches deep into the wood.

The Contractor shall be responsible for the structural design of all wooden poles, temp foundations, and anchors, as well as overhead wires. The Contractor shall submit a design stamped by a Structural Engineer registered in the Commonwealth of Massachusetts for review by the Engineer for approval purposes.

The Contractor shall clearly indicate on the design the proposed locations of all wooden strain poles to be used to support proposed span assemblies including but not limited to signal heads and signal cables.

ITEM 816.81 (Continued)

Traffic Signal Equipment
The traffic signal controller units (CU) malfunction management units (MMU), cabinet power supplies, bus interface units (BIU), and all other ancillary traffic signal control components included in the traffic control cabinet shall comply with the National Electrical Manufacturers Association (NEMA) Standard No. TS 2-1998, Traffic Controller Assemblies with National Transportation Communications for ITS Protocol (NTCIP) Requirements.

MassDOT maintains The Qualified Traffic Control Equipment (QTCE) list, which is a catalogue of traffic control devices, traffic signal components, and other roadway safety products that are prequalified for use on State Highways and MassDOT projects.

The Contractor shall not order any temporary traffic control signal equipment until the Engineer has granted authorization to proceed with the work.

Traffic Signal Controller
The temporary signal system shall use a NEMA TS2 Type 1 controller on the MassDOT QTCE.

Note: The controller unit supplied shall have the capability of delaying the onset of the green interval by the amount of time shown on the plans, "Delay Green," for either a phase or overlap output without the need to include a pedestrian phase. This can be accomplished using standard parameters or custom logic.

Vehicle Signal Heads
Signal heads attached to span wires shall be rigidly attached to the span wire, with the bottom of all signals at the same height, 5-inch black louvered backplates with reflective border shall be provided on all signal heads.

Microwave (Radar) Detection System
The Microwave (Radar) Detection System consists of Radar Presence Detector Units RPD, a Cabinet Interface Device (CID), and all other associated items to supply a complete operating Microwave (Radar) Detection System.

Radar Presence Detector Unit RPD shall be able to detect and report presence in lanes with boundaries as close as 6 feet from the base of the pole on which the RPD is mounted. The RPD shall be able to detect and report presence in lanes located within the 100 feet arc from the base of the pole on which the RPD is mounted. The RPD shall be able to detect and report presence for vehicles within a 90 degree field of view. The RPD shall not exceed 4.2 lbs. in weight. The RPD shall not exceed 13.2 inches by 10.6 inches by 3.3 inches in its physical dimensions. All external parts of the RPD shall be ultraviolet-resistant, corrosion-resistant, and protected from fungus growth and moisture deterioration. The RPD shall be manufactured and assembled in the U.S.A.

ITEM 816.81 (Continued)

The RPD shall be designed with a matrix of 16 radars. The circuitry shall be void of any manual tuning elements that could lead to human error and degraded performance over time. All transmit modulated signals shall be generated by means of digital circuitry, such as a direct digital synthesizer, that is referenced to a frequency source that is at least 50 parts per million (ppm) stable over the specified temperature range, and ages less than 6 ppm per year. Any up-conversion of a digitally generated modulated signal shall preserve the phase stability and frequency stability inherent in the digitally generated signal. The RPD shall not rely on temperature compensation circuitry to maintain transmit frequency stability. The bandwidth of the transmit signal of the RPD shall not vary by more than 1% under all specified operating conditions and over the expected life of the RPD. The RPD antennas shall be designed on printed circuit boards. The vertical beam width of the RPD at the 6dB points of the two-way pattern shall be 65 degrees or greater. The sidelobes in the RPD two-way antenna pattern shall be -40dB or less.

The RPD shall have a method for automatically defining traffic lanes, stop bars and zones without requiring user intervention. This auto-configuration process shall execute on a processor internal to the RPD and shall not require an external PC or other processor. The auto configuration process shall work under normal intersection operation and may require several cycles to complete. The auto-configuration method shall not prohibit the ability of the user to manually adjust the RPD configuration. The RPD shall support the configuring of lanes, stop bars and detection zones in 1-foot increments. The RPD shall provide at least 8 RF channels so that multiple units can be mounted in the same vicinity without causing interference between them The RPD shall have a self-test that is used to verify correct hardware functionality. The RPD shall have a diagnostics mode to verify correct system functionality.

The RPD shall include graphical user interface software that displays all configured lanes and the current traffic pattern using a graphical traffic representation. The graphical interface shall operate on Windows Mobile, Windows XP and Windows Vista in the .NET framework.

The software shall support the following functionality:

- Operate over a TCP/IP connection
- Give the operator the ability to save/back up the RPD configuration to a file or
- load/restore the RPD configuration from a file
- Allow the backed-up sensor configurations to be viewed and edited
- Provide zone and channel actuation display
- Provide a virtual connection option so that the software can be used without connecting
- to an actual sensor
- Local or remote sensor firmware upgradability

The RPD shall be supplied with all needed wiring, junction boxes, and support mounts.

ITEM 816.81 (Continued)

One Cabinet Interface Device CID shall be supplied with the detection system. The CID shall provide sensor detection data directly to controller through a Synchronous Data Link Control SDLC port and associated cabling. The CID shall provide DC power and surge suppression for up to 4 RPD units. The CID shall have a power switch for each RPD to turn them on and off individually. The CID shall have multiple connections for communicating from a computer and the connected RPD, including USB, RJ-11 jacks for RS-485 serial communications, DB-9 connectors for RS-232 serial communications, and a T-bus port.

The RPD manufacturer shall provide both training and technical support services. An authorized representative shall provide on-site training sufficient to instruct installers and operators in the installation, configuration, and use of the RPD to ensure accurate RPD performance. An authorized representative shall be available to provide technical support shall be available to assist with the physical installation, alignment, and auto-configuration of each supplied RPD. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of RPDs should such services be required.

Operation and Programming
Each programmable local hardware component (i.e., controller, malfunction management unit, and detector system) shall be initially programmed by the Contractor based on information contained on the plans. Operation of temporary traffic control signals shall be initiated only in the Engineer's presence. The Contractor shall provide all equipment and program all timing in accordance with the plans. The Contractor shall coordinate schedules of all required personnel and MassDOT to assure their mutual presence on the site.

Temporary Signal Maintenance
After the Contractor has finished installing the controller and all other associated signal equipment and after the Contractor has set the signal equipment to operate as specified in the Contract Documents, the maintenance of the temporary signal shall begin and continue for the duration of the construction contract. During this period, the Contractor, as required by the Engineer, will make required adjustments and tests to ensure safe and efficient operation of the equipment.

The Contractor, as required by the Engineer, shall make all required adjustments to signal heads and signal timing to accommodate the construction staging as shown in the Contract plans.

In the event of failure during this period, the Contractor shall repair or replace the malfunctioning parts or equipment, or faulty workmanship, regardless of the cause, within twenty-four (24) hours after having been notified. Failures caused by defective equipment, materials or faulty workmanship shall be corrected to the satisfaction of the Engineer.

The Contractor shall provide the Engineer with the name and telephone number of the person to be notified in the event of failures or malfunctions during the test period.

The cost of the electric energy and telephone charges consumed by the operation of the temporary traffic signal shall be borne by the Contractor. This Item also includes the removal of the temporary traffic signal system and restoration of the site.

ITEM 816.81 (Continued)

Projection Restoration
Upon completion of the project or as required by the Engineer, the temporary traffic signal equipment shall become the property of the Contractor unless otherwise noted on the plans and shall be disposed of offsite by the Contractor at no additional cost to the Department.

BASIS OF PAYMENT

Item 816.81 will be paid for at the Contract unit price per LUMP SUM, which price shall be full compensation for all labor, materials, and equipment required including any associated engineering, the positioning and repositioning during construction phases are incidental to the installation of a temporary traffic control system, its maintenance during the prosecution of the work on the project, and its subsequent removal upon completion of the project. Included in this Item is all required items needed to complete the installation, operation, and removal at each required location. In the event of any malfunction, all costs associated with signal repairs shall be included in the lump sum bid for Item 816.81, with no additional cost to the Project.

The service connection shall be paid for under Item 813.80 – Service Connection (Overhead).

ITEM 853.33 TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3) FOOT

DESCRIPTION

Work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications and 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 combined working width of 32.8 inches which includes the width of the barrier plus the dynamic deflection; and shall be used in areas where the available clear area behind the barrier systems to obstructions or vertical drop-offs is greater than the anticipated barrier deflection. Where temporary barrier is abutting proposed support of excavation, support of excavation design shall include impact load. Incidental to this Item shall be the cost of designing, furnishing, and installing connections from the limited deflection barrier to the bridge rail located on the temporary bridge.

MATERIALS

The Contractor shall use a temporary barrier system that is listed on the Qualified Traffic Control Equipment List that meets the specified working width indicated above and the minimum requirements of the AASHTO Manual on Assessing Safety Hardware (MASH) at Test Level (TL) 3 or higher.

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 3-11during 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 Subsection 850.69 of the Standard Specifications 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 3-11with 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 required by the Engineer at the Contractor's expense

Limited deflection temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Subsection 850.70 of the Standard Specifications, including the restoration of roadway surfaces and bridge decks. Where barrier is anchored to the bridge deck, the anchor holes shall be filled with non-shrink grout upon removal of the barrier. Where barrier is pinned to the roadway, the pin holes shall be filled with a sand mortar mix upon removal of the barrier.

METHOD OF MEASUREMENT

Item 853.33 will be measured by the FOOT, in place.

BASIS OF PAYMENT

Payment for work under this Item will be made at the Contract price per FOOT for Temporary Barrier - Limited Deflection (TL-3) 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 or attachment systems, the cost of furnishing and installing the anchorage/attachment and hardware and the restoration of bridge deck, pavement surfaces or adjacent permanent barrier systems to facilitate anchorage/attachment shall be considered incidental to the cost of the Item.

Limited deflection temporary barrier removed and reset for the purpose of gaining access to the construction workzone, for the convenience of the Contractor, and any other reasons shall be considered incidental to Item 853.33 and shall not be measured for payment.

ITEM 874.7 MISCELLANEOUS SIGNS REMOVED AND STACKED EACH

Work under this Item shall include the dismantling, removal, transporting and stacking of the existing roadside traffic signs and street signs as shown on the Plans and required by the Engineer including the removal and disposal of the sign supports and their foundations.

The work under this Item shall include removing the supports, excavating the existing foundation, the disposal of the concrete and supports, the backfilling with compacted gravel of the holes resulting from the excavation and removal of the supports and the replacement, in kind, of any surface material disturbed.

The Contractor is responsible for the signs, and shall replace or repair any damage due to his/her operation with no additional compensation.

The existing signs shall not be removed until the new signs and structures replacing them are ready for installation or until the Engineer orders their removal.

All signs owned by the Town of Charlemont shall be removed and stacked on-site for pick-up by the Town. The Contractor is responsible for notifying the Town representative when the signs will be available. If the Town decides to abandon the property, then the Contractor shall dispose of the signs at his/her expense.

METHOD OF MEASUREMENT

Item 874.7 will be measured for payment by the EACH Sign removed and stacked.

BASIS OF PAYMENT

Item 874.7 will be paid for at the Contract unit price per EACH, which price shall include all labor, material, and all incidental costs required to complete the work.

ITEM 945.10	**DRILLED MICROPILES**	**FOOT**
ITEM 948.60	**MICROPILE VERIFICATION LOAD TEST**	**EACH**
ITEM 948.61	**MICROPILE PROOF LOAD TEST**	**EACH**

GENERAL

These Items shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications.

This work shall consist of constructing micropiles as shown on the plans, approved working drawings, and as specified herein. The Contractor is responsible for furnishing all materials, equipment, labor, services, and supervision; and for selecting means and methods for the installation and testing of micropiles for this project.

Micropiles shall consist of permanent casing sections and fully reinforced grout sections bonded with bedrock. Permanent casings shall be included as part of the micropiles and shall remain in place after grouting is complete. Temporary casings shall be installed if necessary to facilitate micropile construction and shall be removed during or after grouting. The Contractor is responsible for drilling through obstructions encountered during pile installation.

Piezometric pressures at the site have been recorded as high as 12 feet above the ground surface between May 2020 and August 2022. The artesian pressures at the site are believed to be contained within the bedrock and are confined by the cohesive glacial till overburden. However, the Contractor should plan to encounter artesian pressures throughout the full height of overburden. Refer to the Artesian Pressure specification for additional information and potential remedial measure to control artesian conditions if encountered. In addition, the artesian pressure conditions are also described in the geotechnical report prepared by Nobis Group, dated March 9, 2023, which is attached to these specifications as Document A00822 Appendix A.

The micropiles load capacities shall be confirmed by verification and proof load testing. Testing must meet the test acceptance criteria specified herein. The bond length of the micropile may be modified by the Engineer, pending results of load testing performed as an initial part of the work.

MATERIALS

The materials for micropiles shall meet the following requirements:

Permanent/Drill Steel Casing used as Reinforcement: Permanent steel casing/pipe used as reinforcement shall be new "Prime" steel meeting the requirements of any API 5L PSL1 pipe with a yield strength of 80 ksi with SR15 supplemental requirements. The grade of the prime steel casing shall conform to the properties shown on the Plans. For steel pipe that is to be welded, the Carbon Equivalency, as defined in AWS D1.1 Section XI.1, shall be less than or equal to 0.45, as demonstrated by mill certificates. The sulfur content shall not exceed 0.05%, as demonstrated by mill certificates.

ITEMS 945.10, 948.60, and 948.61 (Continued)

Permanent steel casing shall consist of ERW (Electric Resistance Welded) and/or seamless steel casing and shall be designed to withstand the design loadings determined by the Engineer or shown on the Plans and the verification/proof test loading described in this specification. Joints shall develop the full vertical capacity, and at least 60% of the moment capacity of the casing. As installed, there shall be no joints within three feet or as shown on the plans from the bottom of the pile cap.

The steel casing shall have certified mill test reports and shall be submitted for record purposes as the materials are delivered. The steel shall be traceable back to the mill certifications, and be free from defects (dents, cracks, tears, etc.).

New "mill secondary" steel pipe/casing will not be accepted regardless if they are accompanied by coupon test results.

Permanent steel casing shall be installed a minimum of 12 inches into intact bedrock.

Reinforcing Bars: Central reinforcing steel shall be full-length, continuously threaded bars. The bars shall conform to AASHTO M 31 Grade 60 or Grade 75, or AASHTO M 275 Grade 150 as shown on the Contract Documents. The grade and size of the central reinforcement shall conform to any minimum and/or maximum properties shown on the Plans.

Commercial grade hallow bars are also permitted for use as a means to reduce the potential for artesian pressure impacts to the site. Acceptance of hollow bar anchors shall be approved by the Engineer.

Reinforcing Bar Couplings: Reinforcing bar couplers shall be in accordance with Subsection M8.01.9 but are not required to be listed on the Qualified Construction Materials List (QCML). Where reinforcing bars are not specified with corrosion protection, bar couplers shall not be required to be epoxy coated or galvanized.

Independent testing shall be performed by a nationally recognized testing laboratory, approved by the Engineer, which shall provide certified test results showing that the reinforcing bar coupler meets the requirements of Subsection M8.01.9. Acceptance of the couplers shall be approved by the Engineer.

Centralizers and Spacers: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, or material non-detrimental to the reinforcing steel. Wood shall not be used.

They shall be securely attached to the reinforcement; sized to position the reinforcement to provide the grout cover specified in the table below; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and sized to allow grout to freely flow up the drill hole and casing.

ITEMS 945.10, 948.60, and 948.61 (Continued)

Table 1 - Minimum Grout Cover for Steel Reinforcement

Condition	Minimum Cover on Bar (in.)	Minimum Cover on Coupler (in.)
Micropiles in Soil	1	¼
Micropiles in Rock	½	¼
Coated or Encapsulated Bars	½	¼

Admixtures for Grout: Admixtures shall conform to the requirements of AASHTO M 194 and shall be selected from the QCML where applicable. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations or micropile top connections. Accelerators are not permitted. Admixtures containing intentionally added chlorides are not permitted. Admixtures shall be from the same Manufacturer and shall be compatible with the grout and mixed in accordance with the Manufacturer's recommendations.

Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout subject to review and acceptance by the Engineer.

Additives to the grout for the purpose of increasing its weight may be utilized as approved by the Engineer.

Cement: All cement shall conform to AASHTO M 85 Type I, Type II, Type III, or Type V and shall be the product of one Manufacturer.

Grout: Neat cement mixture with a minimum 3-day compressive strength of 2,000 psi which is 50 percent of the required 28-day unconfined compressive strength of 4,000 psi. The grout shall be proportioned and mixed as to provide a fluid grout capable of maintaining the solids in suspension without appreciable bleed. Preparation and placement of grout shall be in accordance with the recommendations of "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," ACI 304.

A minimum of 60 calendar days prior to the start of micropile construction the grout mix design shall be submitted to the Engineer and a trial batch shall be performed. The trial batch shall take place at a location approved by the Engineer and be performed in the presence of Department personnel. It shall be representative of the production grout placement and shall consist of the same materials, equipment, methods of mixing, and sample preparation and curing methods.

Trial batch samples will be tested to verify that the material meets all grout criteria specified in Table 2. The quantity of material batched shall be sufficient to perform all required tests specified.

ITEMS 945.10, 948.60, and 948.61 (Continued)

Table 2 – Grout Material Acceptance Criteria for Trial Batch Testing

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 Or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 4000 psi
Consistency	API RP-13B-1	± 10% of the density specified in the mix design

Plates and Shapes: Structural steel plates and shapes for pile top attachments shall conform to M8.05.0, AASHTO M 270, and have minimum yield strength of 50 ksi.

Water: Water for mixing grout shall be potable, clean, and free from substances that may be injurious to cement and steel.

Fillers: Inert fillers such as sand (conforming to AASHTO M 45) may be used in the grout in special situations, such as presence of large voids in the ground or when grout take and travel are to be limited, with prior written approval by the Engineer.

CONSTRUCTION METHODS

QUALIFICATIONS

The Micropile Contractor must be experienced in the construction and load testing of micropiles and have successfully constructed at least 5 projects in the last 5 years involving construction totaling at least 100 micropiles with similar capacity and requirements specified in these plans and specifications. The Micropile Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions and shall have available and be thoroughly familiar with the specialized type of equipment needed to perform work of this type.

The on-site foremen and drill rig operators shall also have experience on at least 3 projects over the past 5 years installing micropiles of equal or greater capacity than required in these plans and specifications.

Prior to the Pre-construction Meeting, the Micropile Contractor shall submit the following information to verify the firm's experience and the qualifications of personnel scheduled to perform the micropile design (load test frame) and construction:

1. Submit a list of at least five micropile projects successfully completed in the last five years. Include construction details, structural details, load test reports, and client contact for each project listed.
2. Submit a list of the equipment and resources the Micropile Contractor plans to mobilize and utilize for the performance of the project.
3. Provide the names and detail the experience of the micropile designer, on-site supervisor, foremen, and drill rig operators for this project.

ITEMS 945.10, 948.60, and 948.61 (Continued)

4. A signed statement that the Micropile Contractor has inspected both the project site and all the subsurface information including any soil or rock samples made available in the Contract Documents.

Work on any micropiles shall not be started, nor materials ordered until the qualifications and submittals have been accepted by the Engineer. The Engineer may suspend the micropile construction if the Micropile Contractor substitutes unapproved personnel during construction. Requests for substitution of field personnel shall be submitted to the Engineer for acceptance. Additional costs resulting from the suspension of work will be the Micropile Contractor's responsibility, and no extension in contract completion date resulting from the suspension of work will be allowed.

The Micropile Contractor shall have, on site during all micropile construction activity, a minimum of one Quality Control (QC) inspector. This person shall be responsible for quality control of the micropiles during all phases of construction and will monitor and document all QC inspection and testing activities required by the specifications and outlined in the accepted procedures and Working Drawings. The QC person shall be a certified NETTCP Concrete Technician.

MICROPILE PRE-CONSTRUCTION SUBMITTALS

The Contractor shall prepare and submit to the Engineer: shop drawings, a micropile installation plan, construction procedures, load testing procedures, and equipment calibrations for review and acceptance. The Contractor shall verify the limits of the micropile structure before preparing the detailed working drawings and allow the Engineer four (4) weeks to review the submittal after a complete set has been received. Work shall not begin, nor materials ordered until all submittals have been received, reviewed, and accepted in writing by the Engineer.

The micropile submittals shall include:

A. Plans

1. A plan view of the micropile layout identifying the locations of micropiles, numbering system for records, and verification test and proof test micropile locations.

2. An elevation view of the test micropile(s) showing:
    i. A typical detail of test micropiles defining the micropile length, reinforcement, inclination, and load test bonded and unbonded test lengths.
    ii. Permanent casing length and diameter, casing plunge length, and grout bond zone length.
    iii. Estimated soil/bedrock strata.
    iv. Instrumentation to be installed.
    v. Minimum drill hole diameter.
    vi. Splice type and locations.
    vii. Centralizers and spacers.
    viii. Corrosion protection details.
    ix. Grout design strength.

ITEMS 945.10, 948.60, and 948.61 (Continued)

3. Details for constructing micropile structures around utilities, as applicable.

B. Construction Procedures

1. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing, and equipment to assure quality control. This step-by-step procedure shall be shown in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles. Include methods of drilling the holes, advancing the casing, drilling through or removing obstructions, flushing drilled holes, installing reinforcement, and grout pressures.

2. Detailed procedures on how the artesian water pressure conditions will be addressed if they are encountered. The Contractor shall address measures taken during installation of the micropiles and upon completion of the micropiles. The Contractor shall also address what remedial measures will be taken if artesian pressures become too high or there is water seepage/flow outside of the casing.

3. If welding of casing is proposed, submit the welding procedure. All welding shall be done in accordance with the current AWS Structural Welding Code.

4. Information on space requirements for installation equipment that verify the proposed equipment can perform at the site.

5. Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.

6. Certified mill test reports for the central reinforcing steel. The ultimate strength, yield strength, elongation, and material properties composition shall be included.

7. Certified mill test reports for the permanent casing. Certification that the permanent casing meets the supplemental requirements of SR15 shall be included.

8. Quality Control Plan. The QC Plan should sufficiently document the QC processes of all Contractor parties (i.e. Prime Contractor and Subcontractors) performing work required under this specification. The QC Plan shall be structured to follow the format and section headings outlined in the MassDOT Model QC Plan. It shall be submitted to the Engineer for review and approval a minimum of 30 days prior to the start of work.

ITEMS 945.10, 948.60, and 948.61 (Continued)

The QC Plan shall include complete descriptions, and details for the following:

i. Micropile installation including drilling method and grouting procedure including the potential use of pressure grouting to account for the presence of artesian conditions.
ii. Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports. The Micropile Contractor shall also provide specific gravity and density of the wet mix design and also incorporate any modifications to account for resisting artesian pressures.
iii. Methods and equipment for accurately monitoring and recording the grout depth and grout volume as the grout is being placed.
iv. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance, and start of production work. During production, grout shall be tested in accordance with the Grout Testing Requirement specified herein.
v. Procedure and equipment for Micropile Contractor monitoring of grout quality. At a minimum, the Micropile Contractor shall verify the specific gravity of the mixed grout prior to placement of the grout into each drilled micropile.
vi. Procedure to verify that artesian pressure is not impacting the micropile grout and is not and will not flow/seep into the excavation.

C. Load Testing Procedures

Detailed plans and procedures for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with the Micropile Load Testing section of this specification.

D. Equipment Calibration

Calibration reports and data for each test jack, pressure gauge, master pressure gauge, and electronic load cell to be used. The calibration tests shall have been performed by a certified testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge, and electronic load cell calibration data.

ITEMS 945.10, 948.60, and 948.61 (Continued)

PRE-CONSTRUCTION MEETING

A mandatory pre-construction meeting will be scheduled by the Engineer and held prior to the start of micropile construction. The Design Consultant, MassDOT Resident Engineer, MassDOT District Materials Engineer, Prime Contractor, and Micropile Contractor, including QC personnel, shall attend the meeting. The preconstruction meeting will be conducted to clarify the construction and QC requirements for the work, to coordinate the construction schedule and activities, specifically those pertaining to excavation for micropile structures, installation of temporary sheeting, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control, site drainage control and artesian pressure controls.

SITE DRAINAGE CONTROL

The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accordance with related specifications within the Contract Documents, and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost. Upon substantial completion of the work, remove surface water control pipes or conduits from the site.

EXCAVATION

Coordinate the work and the excavation so the micropile structures are safely constructed and remain stable at all times. Perform the micropile construction and related excavation in accordance with the plans and accepted submittals. No excavation deeper than those specified herein or shown on the plans will be made above or below the micropile structure locations without written acceptance of the Engineer.

MICROPILE INSTALLATION

A. General

The Micropile Contractor shall select the drilling method, the grouting procedure, and the grout pressure used for installation of the micropiles. The construction method shall incorporate any special construction requirements specified on the plans. The production micropiles and its construction method shall be identical to the accepted verification test piles.

When the plans require uncased drilling of the micropile into bedrock, the permanent and/or temporary casing shall be drilled a minimum 12 inches into intact bedrock or to a depth within the bedrock so as to prevent subsidence of over burden into the uncased and/or bond zone portion of the drill hole (i.e. the rock socket).

Piles shall be installed only in the presence of the Engineer’s or MassDOT’s Representative.

ITEMS 945.10, 948.60, and 948.61 (Continued)

B. Location and Survey

Micropiles shall be located and marked using survey and a template by the Contractor who shall maintain and be responsible for all location and elevation stakes.

C. Drilling

The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to overlying or adjacent structures, buried structures, or utilities.

Temporary casing or other accepted method of pile drill hole support is required, when drilling within 10 feet of an existing foundation, or utility, and/or in caving or unstable ground, to permit the pile shaft to be formed to the minimum design drill hole diameter. The casing shall be of the type and thickness that can be installed without distortion. Casings that fail, fracture, or otherwise distort during drilling or after drilling shall, unless otherwise required, be withdrawn, or replaced at the Contractor's expense. The drill hole must be open along its full length to at least the design minimum drill hole diameter prior to placing grout and reinforcement. The Contractor's proposed method(s) to provide drill hole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures, in order to maintain site conditions as determined by the Engineer. Do not progress a new hole, pressure-grout, or post-grout, within a radius of 5 pile diameters or 5 feet, whichever is greater, of a micropile until the grout for that micropile has set 24 hours or longer. Do not allow vibration or excessive wheel loads to influence piles during installation and construction.

Use of drilling fluid containing bentonite or any other non-reverting drilling fluid is not permitted. Use of polymer slurry to remove cuttings from the cased hole shall be approved by the Engineer.

Piles shall be installed using equipment capable of penetrating boulders, cobbles, bedrock, dense till material, granite blocks, timber, concrete, or other man-placed materials that hinder the advance of the pile.

Use of drop-type impact hammers and blasting are not permitted. Prior to the use of down the hole air drilling methods the Contractor shall provide temporary fencing or barriers as necessary to prevent cuttings from leaving the work area and entering the adjacent traffic lanes.

Micropiles shall not be installed using auger cast methods.

Permanent casing must be installed in a manner which will not loosen the adjacent soils and will result in intimate contact between the casing and the soil. Driving of casing will not be allowed. Drilling shall be performed such that cuttings and/or wash fluid return through the inside of the casing. External flush will not be allowed. The method of drilling used shall prevent the upward flow of artesian pressures into the excavation and loss of ground due to erosion, jetting, or blow-in at the bottom of the casing. No open-hole drilling will be allowed unless accepted by the Engineer.

ITEMS 945.10, 948.60, and 948.61 (Continued)

D. Ground Heave or Subsidence

During construction, the Contractor shall observe the ground conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. The Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/accepted construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor.

E. Pipe Casing and Reinforcing Bars Placement and Splicing

Reinforcement shall be placed prior to grouting the drill hole. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease, or oil that might contaminate the grout or coat the reinforcement and impair bond. Reinforcement in the bond zone [i.e. rock socket] shall extend the minimum required length.

The Contractor shall install all micropiles to the planned elevations.

Centralizers and spacers shall be provided at a maximum spacing of 10 feet on center. The upper- and lower-most centralizers shall be located a maximum of 5 feet from the top and bottom of the micropile, respectively. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. The Contractor shall re-drill and reinsert reinforcing steel when necessary to facilitate insertion.

Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splices and threaded joints shall meet the requirements of the Material section. Threaded pipe casing joints shall be located at least two casing outside diameters (O.D.) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 1 foot.

ITEMS 945.10, 948.60, and 948.61 (Continued)

F. Grouting

Micropiles shall be grouted the same day the load transfer bond length is drilled, or the bond length shall be flushed prior to grouting procedures commence. The grouting equipment shall produce a grout free of lumps and undispersed cement. Admixtures, if used, shall be mixed in accordance with Manufacturer's recommendations. The Contractor shall have means and methods of measuring the grout quantity and pumping pressures during the grouting operations. The grout pump shall be a positive displacement pump equipped with a pressure gauge to monitor grout pressure. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauge shall be capable of measuring pressures of at least 145 psi or twice the actual grout pressure used, whichever is greater. The grout shall be kept in agitation prior to pumping. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout volume being pumped shall be measured to an accuracy of 10 percent.

The hole shall be flushed with clean water immediately prior to grouting, to remove all contaminated water and cuttings unless a hollow bar anchor system is approved and utilized. If a hollow bar system is not utilized, the hole shall be flushed through the grout pipe fully extended to the bottom of the hole with the temporary casing (if any) in place. The water shall be pumped at a high velocity until the wash water at the top of the casing is clear. After flushing, the depth of the hole shall be measured to confirm that the hole is clean and no sediment exists at the bottom of the drilled rock-socket/bond length. Installation of the steel reinforcing and grouting shall be done immediately after flushing. In case of delay, the hole shall be re-flushed and rechecked prior to grouting as required by the Engineer.

The grout shall be injected from the lowest point of the drill hole, and injection shall continue until uncontaminated grout flows from the top of the pile. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed, the grout level is brought back up to the proposed level before the next length is removed. The use of compressed air to directly pressurize the fluid grout takes is not permissible. The tremie pipe or casing shall always extend below the level of the existing grout in the drill hole during grouting procedures. The grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. The entire micropile shall be grouted to the design cut-off level. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

If the Contractor elects to use a post-grouting system, Working Drawings and relevant details including grouting pressure, volume, location and mix design, shall be submitted to the Engineer for review.

ITEMS 945.10, 948.60, and 948.61 (Continued)

G. Construction Tolerance

Unless otherwise stated on the Plans, the following shall be the maximum construction tolerances for micropiles:

1. Centerline of piling shall not be more than 3 inches from indicated plan location.
2. Pile shall be plumb within 2 percent of total-length design plan alignment.
3. Battered piles inclined up to 1:6 shall be within 4 percent of design plan alignment.
4. Battered piles inclined greater than 1:6 shall be within 7 percent of design plan alignment.
5. Top elevation of pile shall be plus 1 inch or minus 2 inch maximum from vertical design elevation indicated.
6. Centerline of reinforcing steel shall not be more than 3/4 inches from indicated center of pile.
7. Minimum volume of grout placed shall be the 110% of the theoretical volume of the whole micropile length from bottom to top at time of grouting.

H. Micropile Installation Records

The Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on a micropile installation log. A separate log shall be provided for each micropile. The log for each micropile shall contain the following minimum information:

1. Project name, structure name, micropile number, and contract number.
2. Date and time of drilling, grouting, and completion.
3. Bottom elevation of the proposed footing and final top elevation of the micropile, to the nearest 0.1 feet.
4. Plumbness and deviation from design location and batter.
5. Micropile as-built information such as pile inclination, casing diameter and wall thickness, reinforcement size and length, casing length below bottom of footing, taped measurement inside casing to check cleanout, plunge length (cased bond length), bond length below casing, total pile length below and above bottom of footing, All dimensions shall be provided to the nearest 0.1 feet.
6. Drilling method, drill bit type and size, and drill operator’s name.
7. Table showing the descriptions and approximate top and bottom elevation of each soil or rock layer encountered during pile drilling.
8. Grout mix, density, and quantity used, for initial grout and post-grout (if any) including cement type and admixtures.
9. Maximum and average grout pressure used during installation.

ITEMS 945.10, 948.60, and 948.61 (Continued)

10. Damage (if any) to pile, description of any deviations from the design location and batter or from the approved pile design and installation procedures, and description of any unusual occurrences during drilling (including obstructions), installation, and grouting.
11. The presence of any artesian conditions encountered during micropile installation or within the excavation.

The example micropile installation log in the "Micropile Design and Construction Guidelines Manual," Report No. FHWA-NHI-05-039 or FHWA-SA-97-070 can be used as a reference in developing the micropile installation log.

The Contractor shall also submit within 2 weeks after installation of all piles, an as-built plan, certified by a surveyor, showing the as-installed location of all piles to the nearest ½ inch.

CONSTRUCTION QUALITY ASSURANCE

Contractor Quality Control

The Contractor's QC personnel will perform Quality Control inspection, sampling, and testing to ensure that the processes are providing work conforming to the contract requirements. Inspection, sampling, and testing shall be documented on appropriate forms and provided to the Engineer. The Engineer will not sample or test for Quality Control or assist in controlling the Contractor's operations.

A. Testing

1. Grout consistency: As measured by grout density shall be determined by the Contractor per API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be within ±10% of the density specified in the grout mix design submittal.

2. Compressive Strength: Grout within the micropiles shall be tested by the Contractor's Quality Control Inspector to ensure that it attains the minimum required compressive strength.

ITEMS 945.10, 948.60, and 948.61 (Continued)

Micropile grout shall be sampled and cured in accordance with AASHTO R 64 (for 2 inch by 2 inch cubes) or T 23 (for 3 inch by 6 inch cylinders) and tested for compressive strength in accordance with AASHTO T 106 (for cubes) or T 22 (for cylinders). Grout samples shall be taken directly from the grout plant (on-site mixer and pump).

The QC Technician will take the following sets of grout samples for QC testing:

i. Verification Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.

ii. Proof Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.

iii. Production Piles – one (1) set of three (3) cubes or cylinders for 28-day strength testing for every two (2) micropiles or one set from each grout plant on each day of operation; whichever occurs more frequently.

The Contractor shall provide grout cube compressive strength, grout density, can grout volume results to the Engineer within 24 hours of testing.

Table 3 – Grout Material Acceptance Criteria

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 4000 psi
Consistency	API RP-13B-1	± 10% of the density specified in the mix design
Volume		≥ Theoretical volume of hole

MassDOT Acceptance

The Engineer is responsible for performing all Acceptance activities and making the final Acceptance determination. The Engineer's Acceptance system will include monitoring the Contractor's QC activity, performing Acceptance inspection, and utilizing available sampling and testing data.

A. Inspection

The Engineer will perform Acceptance inspection of all work items to ensure that all materials and completed work are in conformance with the Contract requirements.

ITEMS 945.10, 948.60, and 948.61 (Continued)

B. Testing

MassDOT will determine whether it will test 2-inch cubes or 3-inch by 6-inch cylinders for its Acceptance testing. The Contractor will be required to provide to MassDOT a sufficient amount of approved 2-inch cube molds or 3-inch cylinders. If it is determined that MassDOT will test 3-inch cylinders then a correlation between the 2-inch cube results and the 3-inch cylinders shall be determined by MassDOT.

MassDOT will take the following sets of grout samples for Acceptance testing:

i. Verification Test Piles – 3 sets of cubes or cylinders for 3-, 7-, and 28-day strength testing.

ii. Proof Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.

iii. Production Piles – one (1) set of three (3) cubes or cylinders for 28-day strength testing for every two (2) micropiles or one set from each grout plant on each day of operation; whichever occurs more frequently.

Pile verification or proof load testing shall not be performed until MassDOT has confirmed the grout has reached the minimum 3-day design strength specified in Table 4.

Table 4 – Grout Material Acceptance Criteria

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 4000 psi

MICROPILE LOAD TESTING

A. General

The Contractor shall perform pre-production verification pile load testing on one sacrificial pile at each abutment per bond zone bearing stratum. The number and location of the verification test(s) shall be as specified on the Plans. In general, the location of the verification test(s) shall be within 10 feet of the footprint of a substructure unit, but at least 5 feet from any production pile as selected by the Contractor and accepted by the Engineer.

ITEMS 945.10, 948.60, and 948.61 (Continued)

Pile proof load testing shall be performed on actual production micropiles and shall be performed on one pile per substructure unit or five percent of the total number of piles, whichever is greater, in conformance with the approved working drawings and testing procedures. The production proof test pile(s) shall be at a location selected by the Contractor and accepted by the Engineer.

The load tests shall conform to the requirements of ASTM D1143 (vertical compression load testing) or ASTM D3689 (vertical tension load testing) except as modified herein. The maximum test loads shall be 150% of the Factored Design Load (FDL) for the micropile verification test and 100% of the FDL for Micropile Proof Test. The Factored Design Load is defined as the Factored Axial Design Load (compression and/or tension) as shown on the Plans. The maximum test loads shall be as specified above but not more than 80% of the structural capacity of the micropile elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. The structural elements of the verification test micropile may be modified for testing the FDL of the micropile as accepted by the Engineer. The Alignment Load (AL) should not be more than 0.04 FDL.

Before starting the work, the Contractor shall submit to the Engineer for acceptance, a pile load test plan including a written description of the equipment and methods which are intended to be used. The methods must be of an accepted type and shall be altered as necessary to meet the acceptance of the Engineer. The pile load test plan and description shall be prepared and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

Grout within the micropile verification test pile shall attain the minimum required 3-day compressive strength prior to load testing. The top elevation of the test pile shall be determined immediately before the load testing. The head of each micropile shall be cut-off level or capped to produce a level horizontal bearing surface.

The Contractor shall provide all personnel and equipment needed to perform the test, measure loads and movements, and record test data. A representative of the Department or the Engineer may observe and witness the test and record data independently. No testing is to be performed unless all the agreed representatives are present.

Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The Contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the submittals Section.

Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Provide a reaction frame capable of safely supporting 125 percent of the maximum test load. Align the jack, bearing plates and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.

ITEMS 945.10, 948.60, and 948.61 (Continued)

Apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 100 psi increments or less. The jack pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required.

Calibrate the test load jacking system including the hydraulic jack couplings, gas pump, pressure gauge, and hydraulic load cell prior to the test so that the load applied is controlled to within 3 percent of the total applied load. Submit calibration reports prior to the start of the pile load test. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test.

Readings of settlement and rebound shall be referred to a fixed benchmark and shall be made using at least three dial gauges (micrometer dial extensometers) graduated to 0.001 inches and located 120 degree intervals around the micropile. The gauges shall be mounted on a reference beam supported at each end by reliable supports located at least 10 feet from the center of the test pile and independent from the jack, pile, or reaction frame.

The dial gauges shall have a travel sufficient to allow the test to be done without having to reset the gauges. Visually align the gauges to be parallel with the axis of the micropile. Readings shall be taken at intervals specified in the Verification Test and Proof Test section.

The Contractor shall establish a survey reference point on the test pile and another reference point at the center of the reference beam. The reference points shall consist of graduated scales machine-divided into 0.02 inch and attached securely to the pile and reference beam. The reference points shall be monitored using survey equipment during the pile load test.

Protect the settlement measuring system against rain, wind, frost, and any other disturbances that could affect the reliability of the settlement observations. Provide sun shading for the measuring system for the duration of the test and for a minimum of 1 hour prior to the start of the test.

B. Micropile Verification Test

The Contractor shall perform pre-production verification pile load testing on sacrificial piles at a location selected by the Contractor and accepted by the Engineer. The location of the verification tests shall be within 10 feet of footprint of a substructure unit but at least 5 feet away from any production pile. Testing shall be performed in compression or tension in accordance with ASTM D1143 or ASTM D3689, respectively, except as modified herein.

Verification load tests shall be performed to verify that the Contractor installed micropiles will meet the required FDL and load test acceptance criteria and to verify that the length of the micropile bond zone is adequate. The drilling-and-grouting method and casing outside diameter shall be identical to those specified for the production piles as indicated on the Plans.

ITEMS 945.10, 948.60, and 948.61 (Continued)

Verification test piles shall be installed at the location accepted by the Engineer. The steel core may need to have a higher strength or a larger diameter than for the production piles to accommodate the test load.

Verification test piles shall include at least two, ¾-inch diameter PVC Schedule 40 pipes cast into the test pile to allow telltales to be installed for load testing. The pipes shall be securely fastened in straight alignment to prevent displacement during grouting and from artesian pressures. The pipes shall be sealed at the bottom with threaded steel caps and at the top with threaded PVC plugs. The pipes shall extend within one foot of the top and bottom of the bearing stratum (i.e. unbonded zone of the pile) at the test pile location. Strain gages may be substituted for telltales.

The micropile verification load test results must verify the micropile design and installation methods, and be reviewed and accepted by the Engineer prior to beginning installation of production micropiles. The verification test pile and reaction piles shall not be used as production piles.

Test verification pile to a maximum Test Load of 150% of the Factored Design Load (FDL) defined above, as indicated on the Plans. The verification pile load test shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule:

ITEMS 945.10, 948.60, and 948.61 (Continued)

Step	Loading	Applied Load	Hold Time (min.)
1	Cycle 1	AL 0.075 FDL 0.15 FDL 0.225 FDL 0.30 FDL 0.375 FDL	- 4 4 4 4 4
2	Cycle 2	AL 0.15 FDL 0.30 FDL 0.375 FDL 0.45 FDL 0.525 FDL 0.60 FDL 0.675 FDL 0.75 FDL	1 1 1 1 4 4 4 4 4
3	Cycle 3	AL 0.30 FDL 0.60 FDL 0.675 FDL 0.75 FDL 0.875 FDL 0.90 FDL 0.975 FDL	1 1 1 1 1 4 4 10 or 60 (Creep Test)
4	Cycle 4	AL 0.30 FDL 0.60 FDL 0.90 FDL 0.975 FDL 1.05 FDL 1.125 FDL 1.20 FDL 1.275 FDL 1.35 FDL 1.425 FDL 1.50 FDL 1.20 FDL 0.90 FDL 0.60 FDL 0.30 FDL AL	1 1 1 1 1 4 4 4 4 4 4 4 4 4 4 15

ITEMS 945.10, 948.60, and 948.61 (Continued)

Creep Test: Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The verification test pile shall be monitored for creep at the 0.975 FDL. Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 0.975 FDL test load where movements shall be recorded at 1, 2, 3, 5, 6, and 10 minutes. When the pile top movement between 1 and 10 minutes exceeds 0.04 inches, the 0.975 FDL test load shall be maintained an additional 50 minutes. Movements shall be recorded at 20, 30, 50, and 60 minutes. Dial gauges shall be reset to zero after the initial AL is applied.

The Acceptance criteria for micropile verification load tests are:

1. If the pile is tested in compression, acceptance will be based on the Davisson criteria. For this criterion, the ultimate load is defined as the load at which settlement measured relative to the top of the pile prior to the start of testing exceeds the sum of:
    I. The theoretical elastic compression of the pile assuming the load applied at the top of the pile act over the full length of the pile, and
    II. 0.15 inches plus 1 percent of the pile tip diameter.
2. If the pile is tested in tension, the ultimate load is defined as the load that produces an upward movement under load of 0.5 inch at the pile tip. The movement at the pile tip is:
    I. Measured directly by tell-tale, or
    II. Computed by deducting the theoretical elastic elongation of the pile from the upward movement measured relative to the top of the pile prior to the start of testing.
3. At the end of the 0.975 FDL increment, the test pile shall have a creep rate not exceeding 0.04 inch/log cycle time (1 to 10 minutes) or 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer). The creep rate shall be linear or decreasing throughout the creep load hold period.
4. Failure does not occur at any load increment up to and including the maximum test load, 1.50 FDL. Failure is defined as load where the slope of the load versus head settlement curve first exceeds 0.025 in/kip.

At the completion of verification testing, test piles shall be removed down to the elevation specified on the plans or by the Engineer.

ITEMS 945.10, 948.60, and 948.61 (Continued)

For the verification load tests, reports must be written and submitted to the Engineer within 3 working days of the load test completion. This report will either confirm the micropiles' resistance and bond lengths specified on the plans or reject the piles based upon the test results. This report shall be reviewed and acceptance by the Engineer prior to beginning installation of production micropiles. The contents of the verification load test report shall include:

1. Brief project description.
2. Description of site and subsurface conditions including information on the ground conditions at the location of the load test and a comparison to actual conditions encountered.
3. Key personnel including the drill rig operator, the superintendent, the grout plant operator, and any other personnel involved in the installation and testing of the micropile.
4. Micropile installation data including information such as length of the micropile (cased and uncased), number of bags of cement used to construct the micropile, size and type of casing and reinforcement, geology encountered (e.g. soil material, rock material, and water levels) during drilling, grouting record, and grout testing results.
5. Results of load test including load-movement curves/figures and filled-out data sheets.
6. Statement of load test requirements and acceptance criteria.
7. Comparison of load test requirements and acceptance criteria.
8. Summary statement on the load test results.

If a tested micropile fails to meet the Acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include but not limited to modifying the installation methods, increasing the bond length, regrouting the pile via preplaced regrout tubes or changing the micropile type. Any modification that necessitates changes to the structure design shall be submitted as a revision to the Working Drawings and require the Engineer's review and acceptance. Additional load testing may be required until an acceptable pile load test meets the designated load test requirements.

ITEMS 945.10, 948.60, and 948.61 (Continued)

C. Micropile Proof Test

Proof test piles to a maximum test load of 1.00 FDL as defined above. Proof tests shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule:

Step	Loading	Applied Load	Hold Time (min.)
1	Cycle 1	AL	-
		0.10 FDL	4
		0.20 FDL	4
		0.30 FDL	4
		0.40 FDL	4
		0.50 FDL	4
		0.60 FDL	4
		0.70 FDL	4
		0.80FDL	4
		0.90 FDL	4
		1.00 FDL	10 or 60 (Creep Test)
		0.75 FDL	4
		0.50 FDL	4
		0.25 FDL	4
		AL	4

Creep Test: Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The proof test pile shall be monitored for creep at the 1.00 FDL. Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 1.00 FDL test load where movements shall be recorded at 1, 2, 3, 5, 6, and 10 minutes. When the pile top movement between 1 and 10 minutes exceeds 0.04 inches, the 1.00 FDL test load shall be maintained an additional 50 minutes. Movements shall be recorded at 20, 30, 50, and 60 minutes. Dial gauges shall be reset to zero after the initial AL is applied.

The Acceptance criteria for Micropile Proof Load Test are the same as those for the Micropile Verification Load Test, except as modified below:

1. The creep test shall be held at the end of the 1.00 FDL increment.
2. Failure does not occur at any load increment up to and including the maximum test load, 1.00 FDL

Within 3 days of the completion of each proof load, the Contractor shall submit a report confirming the micropiles' capacities and bond lengths specified on the plans or reject the piles based upon the test results. The contents of the proof load test report shall be the same as those in the report for the Micropile Verification Load Test.

ITEMS 945.10, 948.60, and 948.61 (Continued)

If a proof-tested micropile fails to meet the Acceptance criteria, the Contractor shall immediately proof test another micropile within that substructure. For failed piles and further construction of other piles, the Contractor shall modify the construction procedure. Failed micropiles shall be replaced at the Contractor's expense. Any modification that necessitates changes to the structure design shall require the Engineer's prior review and acceptance. Verification and proof tests will be re-performed if the micropile type is changed.

NON-CONFORMING PILES

Non-conforming piles include piles that are installed out of tolerance, are damaged, the volume of grout placed is less than the theoretical volume of the hole, the grout tests do not indicate the specified strength has been achieved or have been adversely affected by artesian pressure flow. The Contractor shall submit a written remedial action plan to the Engineer for approval. The remedial action plan shall indicate how to correct the problem and prevent its reoccurrence. To mitigate or remediate non-conforming piles, the Contractor may be required to provide additional piles or supplement piles to meet specified requirements at no additional cost to the Owner.

METHOD OF MEASUREMENT

Item 945.10 will be measured for payment by the Foot of drilled micropile.

Item 948.60 will be measured for payment by the Each micropile verification load test, complete in place.

Item 948.61 will be measured for payment by the Each micropile proof load test, complete in place.

BASIS OF PAYMENT

Drilled Micropiles shall be paid at the Contract unit price per Foot, complete in place and accepted. Payment for drilled micropiles shall be considered complete compensation for providing all materials, labor, equipment, proper disposal of drilling spoil, and incidentals to complete the work.

There will be no separate measurement for mobilization and demobilization associated with this item. Any difference in the required length of permanent casing and micropile installed and accepted by the Engineer from the estimated lengths shall be measured for payment and/or credit. There will be no payment for differences in required length of temporary casing. The Micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.

The Contractor shall anticipate encountering obstructions as noted herein and shall utilize equipment and methods necessary to advance through or remove the obstructions. The presence of obstructions, any lost production, replacement piles, and the removal of obstructions, if necessary, shall not be measured or paid for separately. Any costs associated with the presence of obstructions shall be considered incidental to the Drilled Micropiles Items.

ITEMS 945.10, 948.60, and 948.61 (Continued)

The Contractor shall anticipate encountering flowing artesian conditions as noted herein and shall utilize equipment and methods necessary to successfully install micropiles in a way that eliminates impact from artesian conditions. Any lost production or installation of replacement piles, as required due to the artesian conditions, shall not be measured or paid for separately. Costs associated with remedial measures that are required to install the micropiles in artesian conditions will be compensated based on a Time and Materials basis as required and approved by MassDOT. Any costs associated with the presence of obstructions shall be considered incidental to the Drilled Micropiles Items.

Drilling tools that are lost during the drilling shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. If removal will degrade the hole, the hole shall be abandoned with a new hole located by the Engineer. All costs due to lost tool removal, drilling a new hole and filling the abandoned hole shall be borne by the Contractor.

Micropile Verification Load Test and Micropile Proof Load Test shall be paid at the Contract unit price per EACH completed and accepted test, for which payment shall be considered complete compensation for providing all design, materials, labor, equipment, load test report, and incidentals to complete the work including the installation and materials of the test pile and reaction piles, if used. This payment shall also include full compensation for cutting the pile to the elevation necessary to properly incorporate the pile in the structure. If a pile is not to be incorporate in the structure, this payment item includes cutting the pile to the grade necessary to avoid its interference with the proposed construction. Payment for Micropile Verification Load Tests shall also include full compensation for installing the test pile. Micropiles installed as test piles for Proof Load Tests, if incorporated in the final structures, the length of pile installed in place shall be paid for at Contract unit price of Drilled Micropiles.

ITEM 953.1 TEMPORARY SUPPORT OF EXCAVATION LUMP SUM

The work to be done under this Item shall conform to the applicable provisions of Subsections 140 and 950 of the Standard Specifications, except where specifically amended herein.

Temporary support of excavation (SOE), designed and supplied by the Contractor, shall be installed as required to install the temporary roadway and bridge, to support the temporary roadway, to remove the existing structure, to act as control of water, and to construct the proposed bridge. Approximate SOE locations are shown on the Contract Plans. Actual layout and location of the SOE may be altered as required, within the provided easements, to accommodate specific site conditions and Contractor operations with approval from the Engineer.

The Contractor shall furnish, install, maintain, and remove the SOE as required based on the actual site conditions for the construction of the proposed abutments and adjoining wingwalls. The selection of the support of excavation should take the bedrock elevations, artesian conditions, and geotechnical report recommendations (see Document A00822) into account. The Contractor shall accurately locate all utilities and structures to ensure that the proposed support of excavation will not interfere with any utilities or structures, either existing or proposed.

The design of the SOE shall adequately resist all loads applied to the systems for the duration of construction until the excavation is safely backfilled. Loads acting on SOE include, but are not limited to, earth and/or water pressure, construction live loads, loads from the adjacent temporary roadway, impact loads on temporary barrier, temporary abutment surcharge loads, and adjacent bridge structure loads. The design shall be in accordance with the AASHTO Bridge Design Specifications and the AASHTO Guide Design Specification for Bridge Temporary Works.

The Contractor shall submit calculations and detailed drawings of the proposed SOE to the Engineer for approval. These calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. Prior to any excavation, the Engineer must approve the complete design submittal (calculations, plans, and detail drawings) for the SOE in writing. Any work done or materials ordered for the work involved prior to the approval of the design calculations, plans, and detail drawings shall be at the Contractor's own risk.

All SOE that protrudes into the soil that supports the bridge structure shall be left in place. 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 45º from the horizontal. Any part of the support system that protrudes into the supporting soil below the bridge structure shall be cut off a minimum of 2 feet below final grade and left in place and no additional payment will be made for this part.

All SOE materials removed after completion of the proposed construction shall become the property of the Contractor and shall be disposed of properly offsite.

BASIS OF PAYMENT

Item 953.1 will be paid for at the Contract unit price LUMP SUM, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 983.101 STREAMBED RESTORATION CUBIC YARD

DESCRIPTION

This work under this Item shall consist of removing, stockpiling, and replacing streambed 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, roughness, shape, profile, and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel, as illustrated by photo-documentation herein (Figures A and B).

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.

RELATED ITEMS:

Crushed Stone shall conform to the requirements of Item 156.

Riprap shall conform to the requirements of Item 983.1

The Geomorphologist will periodically be on site during construction to assist the Contractor and Resident Engineer on installation of the natural streambed material in accordance with the environmental permits.

ITEM 983.101 (Continued)

MATERIAL

Streambed restoration is to be installed as depicted on the plans and as required by the Engineer.

Any stone excavated from the existing streambed during bridge removal and riprap installation shall be stockpiled and reused for streambed restoration, provided the excavated stone is characteristic of the existing stream material upstream and downstream of the work area, or meets the below criteria. The elevations and conditions of the existing streambed shall be maintained to the maximum extent practicable.

If the excavated material is not suitable or there is not enough material, the streambed restoration shall be locally sourced, rounded river stone, that matches the composition of the native river bed (see Figures A and B). The following gradation may be used as a guide.

Component 1: 36" natural, rounded, locally sourced boulders.

Component 2: Streambed Material Gradation

Stone/Sieve Size	% Finer
12 inches	30-75
No. 4	4-30
No. 200	4-6

The streambed restoration material shall be approved by the Resident Engineer and Geomorphologist prior to use.

CONSTRUCTION

For restoration areas underneath the bridge, a 12" thick layer of streambed material is to be placed over the layer of riprap (Item 983.1), as depicted on the plans. Component 1 type boulders shall not be placed directly below the bridge, but may be used for restoration upstream or downstream. The streambed material, Component 2, shall be spread over riprap or existing ground as shown on the plans to a minimum depth of 12". Component 2 streambed material shall be tamped down in order to fill / choke the voids in the underlying riprap. The riprap shall be choked with finer streambed material, and shall consist of a well-graded mix of gravel, sand and silt that represents the local streambed. Fill voids by hand tamping with metal tamping rods, by shaking stone with the teeth of an excavator bucket, and/or by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose for filling the voids is to prevent subsurface flow where water disappears into the large voids in the stone fill below the channel bed surface. Riprap and streambed material shall be installed to achieve the full depth of streambed restoration as shown on the Plans.

The streambed material shall be installed during dewatered conditions behind cofferdams in accordance with the environmental permits. Larger material shall also be installed in the channel to maintain a natural level of hydraulic roughness and re-establish fish habitat (Figures A and B).

ITEM 983.101 (Continued)

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 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 look like a natural river, shall match nearby river reaches, and there shall be minimal to no subsurface flow upon final inspection by the Project Engineer and Geomorphologist.

The Contractor shall submit to the Resident Engineer for approval prior to the start of operations, a placement plan and method of placement.

METHOD OF MEASUREMENT

Item 983.101 will be measured for payment by the CUBI YARD of Streambed Restoration material installed and accepted, measured within the limits shown on the Plans or as required by the Engineer.

BASIS OF PAYMENT

Item 983.101 will be paid for at the Contract unit price per CUBIC YARD, complete in place. Payment will be full compensation for furnishing, transporting, and placing the material specified and for furnishing all labor, materials, tools, equipment, transportation, and incidentals required to complete the work.

Excavation required for streambed restoration, including stockpiling of on-site materials, shall be considered as included under the work for this Item.

Crushed stone will be paid fr under Item 156.

Riprap will be paid for under Item 983.1.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

ITEM 983.101 (Continued)

Figure A: East Elevation (Upstream Side)

Figure B: Downstream of the Bridge

ITEM 991.1 **CONTROL OF WATER – STRUCTURE NO. C-05-042** **LUMP SUM**

The work to be performed under this Item shall include all temporary water diversion dams, pumping, and other measures required for sufficient water control to accomplish demolition and construction of the proposed substructure in the dry. Furthermore, all water control operations shall be in compliance with the approved environmental permits included in these bid documents. Also, this Item includes all water pollution prevention, including sediment control and flood prevention of the excavated areas at the structure for demolition, reconstruction, and riprap placement, required to complete the bridge replacement.

Temporary water diversion dam type and location shall be determined by the Contractor or as required by the Engineer. All work areas shall be within the existing right of way and acquired easements. The minimum temporary hydraulic opening shown on the plans shall be maintained throughout construction. The top of the water diversion dam shall be at least one foot above the temporary design flood elevation shown on the plans. Dewatering shall be conducted to ensure that all concrete is placed and satisfactorily cured in the dry.

It is the responsibility of the Contractor to determine the need and extent of dewatering required based on his/her proposed construction methods. Furthermore, the Contractor shall submit methods and materials he proposes to use for the Engineer's approval.

CONSTRUCTION METHODS

Plans and calculations (if applicable) for all water control measures shall be developed by the Contractor for this Item. These plans and calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts and shall be submitted for the approval of the Engineer prior to the start of construction.

The Contractor shall use such equipment and shall perform his operations in such a manner that disturbances of the soil in the foundation area will be prevented. The Contractor shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the adjacent existing structures or supporting soils.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway. The pumping discharge shall not be allowed to enter directly into the waterway. The water from the work areas shall be pumped to a dewatering basin. This basin shall be constructed so as to allow for the pumped water to pass through the basin with sediments settling out before outletting. At a minimum, the basin shall be constructed of an earthen berm lined with geotextile fabric and surrounded by staked straw bales. The basin shall meet or exceed the following criteria:

A. The size and location of the basin shall be determined based on the size of the Contractors pump and the anticipated flows for the construction of the substructures in the dry.
B. The outlet/weir of the dewatering basin shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the basin.

ITEM 991.1 (Continued)

The Contractor shall maintain the dewatering operations in working condition, including periodic removal of accumulated sediment within the basin, to the satisfaction of the Engineer. The water pump and hoses for dewatering shall be in good working condition and of adequate power and size for the operation. At no time shall said discharge be directly released into adjacent resource areas.

The Contractor shall inspect straw bales that surround the outlet daily and shall immediately replace any that are damaged. Additional erosion control shall be employed, as required, to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the Contract.

Placement of the basin will be as required by the Engineer due to specific site conditions and staging operations of the Contractor and the time at which the actual excavation work is being performed. The Engineer has the right to order the Contractor to stop all excavation operations when, in his/her judgement, the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment.

Pumping shall be conducted in a manner which will not adversely affect the freshly placed concrete within the excavation. The work zone may be flooded provided the concrete has reached initial set and the flooding of the temporary water diversion dam does not produce a water velocity that damages the work.

BASIS OF PAYMENT

Item 991.1 will be paid for at the Contract unit price LUMP SUM, which price shall include all labor, materials, tools, equipment, accessories, and incidental costs to complete the work as described under this Item. Work consists of, but is not limited to, design for flood prevention of excavated areas, water pollution prevention, dewatering operations, and the installation, removal, and satisfactory disposal of the water control system from the project site at the completion of construction. The removal and disposal of the sediment material collected from the dewatering system shall also be included under this Item.

ITEM 993.1 TEMPORARY BRIDGE NO. C-05-042T LUMP SUM

Work under this Item shall conform to the general provisions of Subsection 995 of the Standard Specifications and to the specific requirements stipulated for component parts of the items. Where no specific requirement is required for a component part of an item, the Standard Specification shall apply, except for payment. Payment for components shall be included under the Lump Sum price for Item 993.1.

The primary use of the Temporary Bridge shall be for local traffic and vehicles. This bridge may be used by, but is not intended for, pedestrians and bicyclists. A 12'-0" minimum horizontal clearance is required to accommodate plow trucks used for snow removal operations along East Oxbow Road. The curb-to-curb width of the temporary bridge and roadway allows for one travel lane. Alternating traffic requires utilizing temporary traffic control signals, see Item 816.81.

The work under this Item shall include the design, furnishing, and installation of a prefabricated panelized steel bridge system supporting decking with bituminous concrete pavement, bridge railings/barriers, associated hardware, bridge excavation, and reinforced concrete temporary abutments. All materials required for the assembly and erection of the temporary panel bridge shall be the responsibility of the Contractor to lease or purchase from the temporary bridge supplier so that the temporary bridge is installed complete in place in accordance with guidelines of the manufacturer's requirements and recommendations. Dimensions for temporary abutments presented in the plans are only conceptual and shall be modified to accommodate the temporary panelized bridge with approval from the Designer.

Additional work under this Item shall include the following: Completely dismantling the temporary panelized bridge, transporting the temporary superstructure off site, demolition and total removal of the concrete substructure, and all related excavations required to grade the area to proposed end state condition after completion of the permanent structure. Removing the fill material required to construct the temporary roadway and abutments to restore embankments as close as possible to original conditions with modifications shown on the Contract plans shall also be included under this Item. Side slopes shall be protected from erosion until such time as the riprap is placed or final proposed grades are provided.

4000 PSI, ¾", 585 HP Cement Concrete

The work to be done hereunder shall include construction of the temporary reinforced concrete abutments for the bridge and shall conform to the relevant provisions of the Standard Specifications, Subsection 901 of the Standard Specifications, and the following:

All materials complete in place and all other work considered incidental to the work involved in furnishing and placing the concrete, including work not covered in the schedule of basis for partial payments or for which payments are not provided elsewhere in the Contract, shall be considered as included in the unit price per cubic yard of concrete, as stated by the Contractor and approved by the Engineer, in the respective "Basis for Partial Payments".

All concrete shall be placed in the dry. Bearing seat elevations shown on the abutments including base plate configuration and installation shall be verified by the Contractor prior to forming concrete.

ITEM 993.1 (Continued)

Lease/Purchase, Assemble And Erection of Temporary Panelized Bridge

Work under this heading shall consist of the lease or purchase of required parts from the supplier and the assembly and erection of the new panelized bridge components and accessories, including expansion bearing assemblies as shown on the plans or approved equal.

The pre-engineered panelized temporary bridge system shall be as manufactured by the following or approved equal:

Acrow Corporation of America, 181 New Road – Suite 202, Parsippany, NJ 07054
Telephone: (973) 244-0080
www.acrow.com

Bailey Bridges, Inc., 201 63rd St. NE, Fort Payne, AL 35967
Telephone: (256) 845-7575
www.baileybridge.com

Contech Engineered Solutions LLC, 9100 Centre Pointe Drive, West Chester, OH 45069
Telephone: (800) 338-1122
www.conteches.com

All components of the Temporary Panelized Bridge shall be galvanized in accordance with ASTM 123. Each component of the Temporary Panelized Bridge (except pins, threaded components, and other fastener parts) shall individually bear a marking that includes the part identification number, name of manufacturer and model number of the panelized bridge. The markings are intended as a method for the Department to easily and readily identify all components of the panelized bridge.

Technical Advisor
The Contractor shall hire a technical representative to advise and assist the Contractor during the transport, assembly, erection, and dismantling phases of the temporary panel bridge.

The Contractor shall be completely responsible for the expense of the services of the required technical advisor and the bid Contract price shall include full compensation for all costs in connection therewith. The services of the technical representative are in addition to the Contractor's staff.

The technical advisor shall be present during the erection and dismantling of the temporary panel bridge.

Inspection and Maintenance
The Contractor shall be responsible for the inspection and maintenance of the bridge for the duration of the project use ensuring its safe serviceability.

Any material that accidentally falls into the river shall be removed immediately at the Contractor's expense. The Contractor shall ensure the stability of the structure during placement operations.

ITEM 993.1 (Continued)

Submittals

The structural plans and details are presented for illustrative purposes only to indicate the concept and to define the bridge geometry. Other temporary bridges are acceptable and alternate designs, including modifications to substructure details, shall be submitted to the Engineer for approval.

Prior to commencing the erection, the Contractor shall prepare and submit to the Engineer for review a complete set of design calculations, complete assembly and erection plans, elevations, details, part lists, erection sequence and installation procedures. All submittals shall be stamped by a Professional Structural Engineer registered in the Commonwealth of Massachusetts. Erection may not commence until assembly and erection plans have been approved by the Engineer. The temporary bridge shall be designed in accordance with the latest AASHTO LRFD Bridge Design Specifications.

Launching the bridge using conventional methods may not be possible due to site conditions. The Contractor should visit the site prior to submitting his bid and include in his bid his proposed method of installing the bridge that is acceptable with the supplier. The Contractor shall submit his/her proposed erection procedures and methods to be used, including crane capacity and location, equipment, tools, devices etc., to the Engineer for approval.

The requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61 of the Standard Specifications, Steel Erection of the Standard Specifications. Erection procedures and any necessary calculations and drawings shall be stamped by a Professional Structural Engineer registered in Massachusetts certifying that all existing structural members are suitably braced and supported throughout the erection process. Work under this Item may not commence until Engineer has given written approval.

Dismantling And Removal of The Superstructure

The work to be done under this heading shall conform to the relevant provisions of Subsection 112 of the Standard Specifications, and the following:

The Contractor may remove the temporary bridge when approved by the Engineer.

It is expected that the Contractor shall proceed in accordance with the recommendations of the manufacturer’s representative. All components of the temporary bridge shall be completely disassembled and removed off site.

Submittals

Before any dismantling work of the temporary bridge is started, the Contractor shall provide the Engineer, with a written description of the procedures and methods to be used, including a time schedule. The procedure shall be submitted as stamped by a Professional Structural Engineer registered in the Commonwealth of Massachusetts. The Engineer will either approve, give appropriate recommendations, or may disapprove entirely these procedures. Only with the Engineer's written approval will the Contractor be permitted to proceed with the dismantling process.

ITEM 993.1 (Continued)

Removal of Panelized Bridge Components

All parts are considered the property of the Contractor, and shall be removed off site to the satisfaction of the Engineer.

Payment for this work will not be made until the bridge site is graded to the proposed end state condition.

Removal of Substructure

The work under this heading includes the removal and satisfactory disposal of the concrete abutments. Care shall be taken when excavating around the abutments such that damage to the adjacent bridge located near the abutments does not occur. Any damage to the proposed Bridge No. C-05-042 shall be repaired at the Contractor's expense.

All material shall become the property of the Contractor and shall be disposed of away from the work site. No payment will be made for materials removed beyond that which is required by the Engineer.

The Temporary Bridge site shall be graded to proposed end state condition.

BASIS OF PAYMENT

Item 993.1 will be paid for at the Contract unit price LUMP SUM, which price shall include all labor, materials, equipment, design, submittals, installation, and removal of temporary bridge, including all substructure components, grading the site to final proposed condition, and all incidental costs required to complete the work.

SCHEDULE OF BASIS FOR PARTIAL PAYMENTS

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 temporary bridge structure as listed below. The temporary bridge structure Lump Sum 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 993.1 and no further compensation will be allowed. All excavation and backfill will be paid for separately under respective Contract items..

The schedule below applies only to the Temporary Bridge No. C-05-042T. Payment for similar materials and construction at locations other than this Temporary Bridge shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with the MassDOT Standard Nomenclature.

ITEM 993.1 (Continued)

TEMPORARY BRIDGE NO. C-05-042T

SUB-ITEM	DESCRIPTION	QTY	UNIT	PRICE	UNIT TOTAL
904.4	4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE	30	CY		
910.	STEEL REINFORCEMENT FOR STRUCTURES	4,400	LB		
993.01	LEASE, ASSEMBLY, ERECTION, AND REMOVAL OF TEMPORARY BRIDGE	1	LS		
				TOTAL LUMP SUM FOR ITEM 993.1 =	

ITEM 994.01 TEMPORARY PROTECTIVE SHIELDING LUMP SUM
BRIDGE NO. C-05-042 (0G1)

GENERAL

Work done under this Item consists of designing, furnishing, installing, maintaining, and removing a temporary protective shielding system on, adjacent to, and under the bridge. The work shall include removing and disposing of the protective shield after work is completed.

This Item covers the shielding required for the proposed demolition of portions or all of the existing superstructure as applicable. The proposed shielding system shall prevent debris from falling into the water during the demolition process.

Work platforms, containment systems and debris shields for construction activities other than superstructure demolition are not included under this Temporary Protective Shielding item and shall be considered incidental to the work unless specifically stated otherwise within the Contract documents.

The Contractor shall submit calculations and detailed drawings of the proposed shielding to the Engineer for approval. These calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. Acceptance of the shielding design by the Engineer is required prior to installation of the shielding system.

MATERIALS

All materials used to construct the temporary protective shielding shall be new.

All materials used in the shielding system shall become the property of the Contractor and shall be removed from the site at the completion of the Project.

DESIGN

The shielding shall conform to the following:

1. The intent is for the Contractor to shield all existing spans of the existing bridge prior to any demolition.
2. The protective shield may be constructed of tongue and groove or ship lap timbers with 6 mil polyethylene overlaid to seal the shielding or the Contractor may propose an alternate shielding system approved by the Engineer and accepted by the Department.
3. Shielding shall have all spaces along the perimeter and at the seams sealed to prevent dust and debris from escaping and falling below the bridge. The protective shield shall be sufficiently tight to prevent leakage of slurry from cutting tools, dust, chips or other small debris to the surface below.
4. Shielding used at or adjacent to demolition and shall be designed to safely withstand all loads that it will be subjected to, including all construction and dead loads, but not less than 100 pounds per square foot; to be stiff enough to limit deflection to l/2 inch under maximum loads; and to be sealed tightly at all joints. The allowable design stresses shall be in accordance with AASHTO Standard Specifications for Highway Bridges. The Contractor

   shall be responsible for developing the loads to which the shielding is anticipated to be subject to based on the Contractor's means and methods of construction.

ITEM 994.01 (Continued)

5. The shielding shall be positively attached to the existing and/or proposed bridge such that it cannot be dislodged or shifted during construction. The attachment methods shall be designed for all intended and errant loads anticipated by the Contractor based on the Contractor's means and methods of construction, and shall be included in the design submittal.
6. The Design of the shielding shall also include a complete description of the equipment and construction methods proposed for the superstructure demolition, including deck removal and the maximum size of debris anticipated during excavation of the deck area (i.e. 1 ft. x 1 ft. hammered sections or 2 ft. x 4 ft. wet sawcut sections). Shielding beneath areas to be excavated or beneath the path used to remove demolition debris shall be designed to withstand the maximum size of debris that could fall during excavation or removal.
7. Shielding shall be installed or removed only upon approval of the Engineer.

The Contractor may utilize the bottom flanges of the existing steel beams as supports for the temporary protective shielding where feasible. However, the Contractor will not be permitted to weld onto, drill into, or cut any existing structural members without receiving approval of the Engineer. For any proposed shielding systems that include installation of brackets along the lengths of the substructure units, the Contractor may drill and anchor into the existing substructure units as approved by the Engineer.

SUBMITTALS

A minimum of thirty (30) days prior to the start of any demolition and/or installation of protective shielding, the Contractor shall submit for review and approval a detailed temporary protective shield plan which shall include, a description of demolition and erection equipment, methods of operation, locations and sequence of sections to be removed, as well as data relative to the protective shield. The plan shall also indicate the type, size and dimensions of the materials to be used for the protective shield and the proposed methods for installation of the protective shield including connections, fasteners, erection procedures and maintenance in accordance with the information provided in this specification.

CONSTRUCTION METHODS

The Contractor shall periodically remove all accumulations of concrete and/or debris on the protective shielding so as not to exceed the design loads in the assumptions used for the design of the temporary protective shielding, or as required by the Department.

BASIS OF PAYMENT

Item 994.01 will be paid for at the Contract unit price LUMP SUM, which price shall include full compensation for the Contractor's design and plans as approved submittals, as well as for all material, labor, equipment, and incidentals required to furnish, install, remove, and reinstall the temporary shielding, if applicable, and all other work required for the proper completion of the work .

ITEM 995.01 BRIDGE STRUCTURE, BRIDGE NO. C-05-042 (CBF) LUMP SUM

The work under this Item shall conform to the applicable provisions of Subsection 995 of the Standard Specifications and the specific requirements stipulated below for component parts of the subject 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:

- Steel beams
- Concrete integral abutments and wingwalls
- Concrete bridge deck slab
- Concrete approach slabs
- Pavement sawcut bridge joints
- CT-MTL2 barriers
- Precast highway guardrail transitions

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 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.

SAWING & SEALING JOINTS IN ASPHALT PAVEMENT AT BRIDGES

The work to be done under this Item consists of making a sealed kerf across the full width of the finished asphalt pavement at bridge abutments where called for on the Plans. The shape, width, and depth of the kerf shall be as shown on the Plans.

Prior to the start of the asphalt pavement operation, the Contractor shall place a mark on each curb or barrier on either side of the paved roadway. These marks shall be aligned with the actual end of the bridge deck and shall be placed so that they will not be covered or otherwise obscured by the asphalt pavement.

After the completion of the paving operation, the Contractor shall snap a straight chalk line on the pavement between these two marks. The Contractor shall then saw cut the pavement along this line to the depth, width and shape as shown on the Plans. The equipment shall be approved by the Engineer prior to commencing work.

After completing the saw cutting, the Contractor shall clean the saw groove of any dust and debris with an oil free air blast. If the groove was wet sawn, the groove shall be cleaned with a water blast to remove any remaining slurry and debris, vacuumed with a Wet-or-Dry vacuum to remove any standing water, and then dried with an air blast from a Hot-Air-Lance.

ITEM 995.01 (Continued)

Once the groove is clean and dry, the Contractor shall fill it completely with a hot-applied bituminous crack sealer meeting the requirements of M3.05.4 in accordance with the manufacturer's application instructions and restrictions regarding ambient and material temperatures. The crack sealer shall be thoroughly cured prior to opening the road to traffic. To reduce tackiness, only boiler slag aggregate (black beauty) shall be scattered over the sealer when required by the Engineer. Conventional sand shall not be used for this purpose.

4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE

Concrete shall conform to the relevant provisions of Subsection 901 of the Standard Specifications. This material shall be used for the cast-in-place deck slab, integral abutments, wingwalls, and approach slabs.

5000 PSI, 3/8 INCH, 710 HP CEMENT CONCRETE

Concrete shall conform to the relevant provisions of Subsection 901 of the Standard Specifications. This material shall be used for the CT-MTL2 barriers.

STEEL REINFORCEMENT FOR STRUCTURES

Steel reinforcement for the cast-in-place approach slabs does need to be coated, but shall conform to Subsections 901.62 and M8.01.0 of the Standard Specifications. The Contractor may choose to use coated reinforcement, but not additional compensation will be provided. Reinforcing supports shall be considered incidental to this Sub-Item.

STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED

All steel reinforcement not listed under the "Steel Reinforcement for Structures" Sub-Item shall be epoxy coated, in accordance with Subsections 901.62 and M8.01.7 of the Standard Specifications, unless noted otherwise on the Plans. All coated bars are included under this Sub-Item. If coated bars are galvanized in accordance with Subsections 901.62 and M8.01.8 of the Standard Specifications, no additional compensation will be provided. Reinforcing supports shall be considered incidental to this Sub-Item.

ITEM 995.01 (Continued)

PRECAST HIGHWAY GUARDRAIL TRANSITIONS

A. General.

The work under this Heading consists of fabricating, transporting and installing the 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), 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.

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.

ITEM 995.01 (Continued)

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.

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 specified herein.

ITEM 995.01 (Continued)

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 $T_i \geq 50°F$.
(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.

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.

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.

ITEM 995.01 (Continued)

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.

1. Inspection.

A 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.

ITEM 995.01 (Continued)

(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 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).

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	$5\% \leq AC \leq 8\%$	Quality Control
Temperature (°F)	AASHTO T 309	Per AASHTO	$50°F \leq °F \leq 90°F$	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.

ITEM 995.01 (Continued)

(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.

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.

ITEM 995.01 (Continued)

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 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.

ITEM 995.01 (Continued)

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 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.

ITEM 995.01 (Continued)

F. Reinforcement.

The reinforcing bars shall be installed in accordance with Section 901.62 of the Standard 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.

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.

ITEM 995.01 (Continued)

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.

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 required 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 sandpaper. 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 required 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.

ITEM 995.01 (Continued)

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 sandpaper.

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:

(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).

ITEM 995.01 (Continued)

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.

ITEM 995.01 (Continued)

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.

(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.

ITEM 995.01 (Continued)

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.

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.

ITEM 995.01 (Continued)

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.

(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.

ITEM 995.01 (Continued)

(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

(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.

ITEM 995.01 (Continued)

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

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.

ITEM 995.01 (Continued)

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.

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.

ITEM 995.01 (Continued)

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:

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.

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. 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 required 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.

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)

SHEAR CONNECTORS

Work under this Heading shall consist of furnishing and installing Stud Shear Connectors as detailed and at the locations shown on the Plans. All work shall be performed in accordance with Subsections 960 and M8.04.1 of the Standard Specifications.

STRUCTURAL STEEL – COATED STEEL

The work under this Heading shall conform to the applicable provisions of Subsection 960 of the Standard Specifications. All structural steel shall be AASHTO M 270 Grade 50, hot-dip galvanized, unpainted.

HOT DIP GALVANIZED COATING FOR NEW STRUCTURAL STEEL

A. GENERAL

Fabricated steel shall be galvanized as indicated on the plans. All fabrication shall be completed prior to surface preparation and the application of any coating.

The faying surfaces of all field bolted connections shall be coated based on the design of the connection. Class B connections shall be masked prior to galvanizing to allow for application of an approved class B slip coefficient primer. After galvanizing the masked surface will be cleaned in accordance with SSPC-SP11 and coated with the approved zinc rich primer. A galvanized connection will result in a faying surface meeting a class C slip coefficient.

When grinding, drilling or any other operation produces steel turnings, filings, shavings, etc. the Contractor shall completely clean all areas of all accumulation prior to the end of the work shift.

Locations of field applied studs shall require masking or removal of galvanizing and paint prior to welding.

The Engineer shall provisionally accept the shop coated items before shipment to the jobsite but final acceptance of the coating system will occur after erection of the coated items, and after all required repairs and coating application has been completed.

The Contractor shall be responsible for failure and damage of all applied coating. Failures include but are not limited to, visible corrosion, blistering, checking, cracking, or delamination (peeling) and loss of gloss and color of the coating system. Damage includes but is not limited to damage from installation or from external agents, such as scraping, vandalism, debris impacts, and collisions. The extent and method of repair must be approved by the Engineer.

ITEM 995.01 (Continued)

B. GALVANIZING

The following shall be hot dipped galvanized in accordance with Section M7 of the Standard Specifications:

1. All structural steel members identified on the Contract documents, including beams, stiffeners, and diaphragms.

Galvanized members requiring shop fabrication and assembly shall be cut, welded, and/or drilled prior to galvanizing. Bearing members to be milled shall be galvanized prior to milling. A thin layer of a rust inhibitor shall be applied to the milled surface. Material to be painted shall not be quenched after galvanizing.

Where material is required to be welded after galvanizing, the steel shall be masked 3 inches on each side of the weld center line. Prior to field welding the masked surface shall be cleaned in accordance with SSPC-SP11. After welding the area shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2, "Paints Containing Zinc Dust" and Annex 2. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

Damaged galvanized surfaces shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2 Paints Containing Zinc Dust "High Zinc Dust Content". The paint shall be applied to achieve a minimum dry film thickness of 3 mils and not more than 5 mils. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

The Contractor shall provide protection of the adjacent coating in areas that will be field welded. After welding, the weld areas shall be prepared in accordance with SSPC-SP-11.

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

Within ten (10) days after the date of the Notice to Proceed, the Contractor shall submit on his/her proposal form a schedule of unit prices for the major component Sub-Items that make up Item 995.01 as well as his/her total bridge structure Lump Sum cost for Bridge Structure No. C-05-042 (CBF). The bridge structure Lump Sum breakdown quantities provided in the proposal form 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 of 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 995.01 and no further compensation will be allowed.

The schedule on the proposal form applies only to Bridge Structure No. C-05-042 (CBF). 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.

ITEM 995.01 (Continued)

BRIDGE STRUCTURE NO. C-05-042 (CBF)

SUB-ITEM	DESCRIPTION	QTY	UNIT	PRICE	UNIT TOTAL
482.31	SAWING & SEALING JOINTS IN ASPHALT PAVEMENT AT BRIDGES	50	FT		
904.31	PRECAST HIGHWAY GUARDRAIL TRANSITIONS	4	EA		
904.4	4000 PSI, 3/4 INCH, 585 HP CEMENT CONCRETE	200	CY		
905.2	5000 PSI, 3/8 INCH, 710 HP CEMENT CONCRETE	19	CY		
910.	STEEL REINFORCEMENT FOR STRUCTURES	6,000	LB		
910.1	STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	60,000	LB		
911.1	SHEAR CONNECTORS	1,400	EA		
960.1	STRUCTURAL STEEL – COATED STEEL	71,000	LB		
965.	MEMBRANE WATERPROOFING FOR BRIDGE DECKS	1,500	SF		
970.	DAMP-PROOFING	700	SF		
				TOTAL LUMP SUM FOR ITEM 995.01 =	

ITEM 995.012 INSTRUMENTATION FOR BRIDGE NO. C-05-042 (CBF) LUMP SUM

GENERAL

MassDOT is leading efforts to instrument Bridge C-05-042 (CBF) for the purpose of monitoring the performance during the first three years of service life. For the successful completion of this plan, participation on the part of the Contractor will be necessary.

This special provision outlines the work required to instrument the bridge and the associated responsibility of all parties involved. Work required by the Contractor in the installation of instrumentation is to install the survey posts and foundation, displacement transducer post and foundation, solar panel support system, buried conduit to solar panels including trenching and backfilling, and instrumentation conduit including couplers, junction boxes and sealant. Care to avoid damage to the instruments and cable is required for all parties. Time delays to the project due to the negligent damage of the instruments by the Contractor's construction activities will be the responsibility of the Contractor.

The intent of the instrumentation program is to monitor the micropiles supporting the integral abutments during construction activities, not limited to, after instrumentation installation, construction of abutments, backfilling of abutments, placement of the beams, and placement of the deck as well as through the first three years of service. Instrumentation intended for monitoring the abutments, including survey monitoring posts, cable conduits, and the solar panel system must be installed and operational prior to casting of end diaphragm. Coordination between the Contractor and MassDOT is required to minimize disruption to the overall construction process of the bridge. An instrumentation coordination meeting held immediately following the Pre-Construction Meeting shall be coordinated by the Contractor to make sure all the program stakeholders are aware of and understand the responsibilities of each member and to reinforce the importance of the success of the monitoring program. MassDOT will require a minimum of 48 hours notice, unless noted otherwise, to be on site for the activities summarized in the instrumentation responsibilities schedule, shown below in Table 1. MassDOT will be ultimately responsible for installation of the instrumentation system; however, the Contractor will be required to provide suitable access, temporary electric power, and occasionally provide labor assistance as directed by MassDOT representatives in the management of cables and the placement of instruments.

Coordination of MassDOT and Contractor responsibilities shall be conducted through the Engineer. However, additional information regarding the program is available from the following personnel:

Michael Sullivan (CHA)
MSullivan@chasolutions.com
(339) 364-1855

ITEM 995.012 (Continued)

Table 1 – Instrumentation Responsibilities Schedule

Equipment / Activity	Responsibility	
	Provided By	Installed By
Pre Instrumentation Meeting	Contractor	N/A
Install Strain Gauging on Micropile Casing	MassDOT	MassDOT
Management of Protection of Cables for Strain Gauges	N/A	MassDOT and Contractor
Survey Post Concrete Foundations	Contractor	Contractor
Survey Posts	Contractor	Contractor
Displacement Transducer Concrete Foundation and Posts	Contractor	Contractor
Earth Pressure Cells Behind Abutments	MassDOT	MassDOT
Inclinometers Behind Abutments	MassDOT	MassDOT
Management of Protection of Cables for Pressure Cells and Inclinometers	N/A	MassDOT and Contractor
In-Place Displacement Sensors	MassDOT	MassDOT
Survey Targets with Mounting Hardware on Integral Abutments	MassDOT	MassDOT Surveyor
Data Acquisition Systems (Dataloggers) and Cables in Temporary Locations	MassDOT	MassDOT
Placement of Beams and Construction of End Diaphragm: Cast 2 inch diameter Schedule 40 PVC conduit through end diaphragm.	Contractor	Contractor
Surface Mounted Girder Strain Gauges	MassDOT	MassDOT
Surface Mounted Thermocouples	MassDOT	MassDOT
Solar Panel Support System	Contractor	Contractor
Solar Panel with Mounting Hardware	MassDOT	MassDOT
Solar Panel 2 inch Schedule 40 PVC Conduit and Mounting system	Contractor	Contractor
Cable for Solar Panels	MassDOT	MassDOT
Datalogger Enclosures, including Mounting Hardware	MassDOT	MassDOT
Dataloggers including Placement of Cables inside Conduits	MassDOT	MassDOT
Coordination with Instrumentation Program	MassDOT and Contractor	N/A

ITEM 995.012 (Continued)

INSTRUMENTATION PLAN

The locations and types of instrumentation and preliminary locations of conduits are shown on the contract drawings. Final layouts may be adjusted in the field.

The instrumentation plan consists of the following instruments and equipment:

A. Strain Gauges for Micropiles to Monitor Moment Distribution

24 strain gauges (12 at each abutment) will be used to measure the moment distribution in the top 3 ft of the micropile due to thermal forces transferred through the integral abutment. Two sets of gauges shall be installed on the exterior and center micropiles, at two heights shown in the plans. Two strain gauges shall be installed on the front and back side of the micropile in line with the beams to capture the maximum moment. Gauges are to be installed after driving and grouting of the piles, but before casting of the pile cap. Initial readings of all gauges should be taken to verify functionality and determine initial readings.

B. Pressure Cells to Monitor Lateral Earth Pressure

12 electronic pressure cells (six for each abutment) will be used to measure the lateral pressure between the integral abutment and the backfill. The earth pressure cells will have a pressure range of 25 psi. Cells will be mounted on the back face of the abutment following casting of the abutments and before backfilling.

C. In-Place Inclinometers

Four in-place inclinometers (two for each abutment) will be used to measure lateral movements foundation settlement and wall movement. They will be positioned immediately behind the back wall of the abutment. Inclinometers will be mounted on the back face of the abutment following casting of the abutments and before backfilling. Initial readings of all inclinometers should be taken to verify functionality and determine initial readings.

D. Survey Targets

20 survey targets (10 for each abutment) will be used to measure foundation settlement and wall movement. Survey targets will be mounted on the abutment face. Survey targets are to provide verification of the displacement and rotation sensors. Two survey posts will be constructed to provide a consistent location for taking readings from the two abutments. These will serve as a verification of the displacement of the abutment.

E. Strain Gauges to Monitor Thermal Beam Strain

Six strain gauges (three for each abutment) will be used to measure the amount of thermal strain present in the beams. These should be installed on the beams following casting of the deck. Gauges shall be positioned at the anticipated composite neutral axis of the beam. Gauge readings should be taken at the time of installation.

ITEM 995.012 (Continued)

F. Thermocouples to Monitor Beam Temperature

Six surface RTD thermocouples (three at each abutment) shall be installed adjacent to the locations of the strain gauges measuring thermal strain to record the temperature. Gauges should not be positioned in direct sunlight.

G. Displacement Transducers for Abutment Displacement

Four string displacement potentiometers (two at each abutment) are to be installed measuring displacements off the back face of the abutment and installed before backfilling the abutment. Initial readings of all transducers should be taken to verify functionality and determine initial readings. Additional readings can be taken following backfilling the abutment, placement of the beams, casting of the deck, and paving the approaches.

H. Data Acquisition System

The data acquisition systems will be mounted to the solar panel mounting bracket as shown in the plans. The data is then uploaded via cellular modem for use.

CONSTRUCTION METHODS AND RESPONSIBILITIES

Specific construction requirements and responsibilities for the Contractor for certain activities are explained in more detail below. For all instrumentation-related activities, the Contractor shall cooperate with MassDOT and their Surveyor, as well as CHA personnel, and permit access as needed for installation and maintenance of the instruments. It is the Contractor's responsibility to incorporate these installation activities into their Baseline Schedule.

The Contractor shall protect from damage all monitoring instruments and equipment described in this special provision from his/her construction operations. Any damage to the monitoring instruments and equipment caused by the Contractor's negligence shall be repaired or replaced at his/her expense to the satisfaction of MassDOT.

A. Survey Post Concrete Foundations

The Contractor shall construct two total station monitoring posts according to the Post Details on the contract drawings. The Contractor shall excavate and pour concrete footings for survey post embedment. The two survey posts shall be at the locations indicated on the contract drawings or as directed by MassDOT. MassDOT will provide two posts, each consisting of a 10-foot-long, 2-inch diameter steel pipe with a total station base bracket. The Contractor is responsible for the installation of the post into a 12-inch-diameter hole backfilled with 4000 HP concrete. The final height of the post shall be approximately 4-feet above grade. The pipe shall be centered in the foundation and placed and supported so that it remains vertical, true, and level during concrete curing. The Contractor shall protect the survey posts from his/her construction operations. Any movement or damage to the posts caused by the Contractor's negligence after installation shall be repaired or replaced at his/her expense to the satisfaction of MassDOT.

ITEM 995.012 (Continued)

B. Survey Targets with Mounting Hardware

MassDOT will provide 20 survey targets with mounting hardware for their Survey Contractor to install on the face of the cast-in-place abutment. The Surveyor will collect initial readings on three occasions: after construction of the abutment walls, after placement of the beams, and after placement of the bridge deck. The Contractor shall provide at least five days' notice before the scheduled installation, so that MassDOT can schedule their Survey Contractor to be on site.

C. Solar Panel Support Systems (Posts)

The Contractor will provide all materials needed for the support systems, including foundations and posts. MassDOT will provide all mounting hardware for the solar panels, including clamps and related hardware. The proposed locations of the solar panels are as shown on the contract drawings. The Contractor shall install two solar panel support systems within the integral abutment area as directed by MassDOT. The Contractor is responsible for the installation of the post into a 12-inch-diameter hole backfilled with 4000 HP concrete. Solar panel support system shall be a 6x6 pressure treated post extending a minimum of 12 feet above finished grade. The post shall be centered in the foundation and placed and supported so that it remains vertical, true, and level during concrete curing. The Contractor shall protect the survey posts from his/her construction operations. Any movement or damage to the posts caused by the Contractor's negligence after installation shall be repaired or replaced at his/her expense to the satisfaction of MassDOT.

D. Conduit for Instrumentation Cables

The Contractor shall provide 2-inch diameter Schedule 40 PVC conduit that will serve as a sheath for the purpose of protecting the instrumentation cables. The Contractor shall install the conduit after placement of the beams and before casting of the end diaphragm. Contractor to coordinate with MassDOT to accommodate cable layout and installation sequencing. Conduit not attached to the sub structure shall be approximately 2 feet below the ground line to avoid incidental damage from construction activities such as final grading, installation of guard rail, etc. The conduit will be fitted with couplers to join the conduit sections together. The conduit shall be installed from the abutment to the data collection enclosure on the solar panel supports at the locations shown on the contract drawings or as directed by MassDOT.

E. Solar Panels with Mounting Hardware

MassDOT will provide and install the solar panels on the solar panel support systems.

F. Solar Panel Cable

MassDOT will provide and install the solar panel cable. Solar panel cable will be placed within the protective conduit.

G. Micropile Strain Gauges

MassDOT will provide and install 24 strain gauges on the micropiles at the locations shown on the contract drawings. MassDOT will install these gauges after installation of the micropiles and before the grouting of the piles. For installation of the cells, MassDOT will need access for approximately sixteen hours to install the strain gauges on the micropiles. The

ITEM 995.012 (Continued)

Contractor shall provide MassDOT a time window of at least eight hours per abutment for this work and at least five days' notice to MassDOT before the time window begins. Readings should be taken at five occasions: after installation, after construction of the abutment, after backfilling the abutment, after placement of the beams, and after placement of the deck.

H. Lateral Earth Pressure Sensors

MassDOT will provide and install 12 pressure cells at the locations shown on the contract drawings. MassDOT will install these cells after the surface has been prepared for construction of the pile cap but before placement of the concrete for the end diaphragm. For installation of the cells, MassDOT will need access for approximately sixteen hours to install the pressure cells. The Contractor shall provide MassDOT a time window of at least eight hours per abutment for this work and at least five days' notice to MassDOT before the time window begins. Readings should be taken at four occasions: after installation, after backfilling the abutment, after placement of the beams, and after placement of the deck.

I. In-Place Inclinometers

MassDOT will provide and install four inclinometers at the locations shown on the contract drawings. The in-place inclinometer casing will be installed by a securing it to the back face of the abutment before the abutment is backfilled. For installation, MassDOT will need access for approximately 4 hours to install the inclinometers. The Contractor shall provide MassDOT a time window of at least 2 hours per abutment for this work and at least five days' notice to MassDOT before the time window begins. MassDOT can install these inclinometers during the placement of the Lateral Earth Pressure Sensors. Readings should be taken at four occasions: after installation, after backfilling the abutment, after placement of the beams, and after placement of the deck.

J. Displacement Potentiometers

MassDOT will provide and install four string potentiometers at the locations shown on the contract drawings. The string potentiometers will be installed by a securing it to the mounting pole installed by the Contractor, measuring off the front face of the abutment before the abutment is backfilled. For installation, MassDOT will need access for approximately 8 hours to install the potentiometers. The Contractor shall provide MassDOT a time window of at least 4 hours per abutment for this work and at least five days' notice to MassDOT before the time window begins. MassDOT can install these potentiometers during the placement of the Lateral Earth Pressure Sensors. Readings should be taken at four occasions: after installation, after backfilling the abutment, after placement of the beams, and after placement of the deck.

K. Management and Protection of Cables

For initial monitoring of the pressure cells and inclinometers, MassDOT will utilize dataloggers in temporary locations that are out of the way of the Contractor's immediate work activities and shall connect to a temporary power source. The Contractor shall coordinate with MassDOT in the selection of secure locations for equipment, assist MassDOT in management of the instrumentation cables, and protect the cables from damage.

ITEM 995.012 (Continued)

L. Cast 2-inch Conduit through End Diaphragms

To connect the instruments to the datalogger, it is necessary for the cables to pass through the end diaphragm. The Contractor shall coordinate with MassDOT and provide a 2-inch-diameter Schedule 40 PVC conduit through the end diaphragm at the location shown on the contract drawings. The conduit shall be cast flush with the back and front vertical faces of the pile cap.

M. Instrumentation Conduit

The Contractor shall provide and install the 2-inch diameter conduit, couplers, junction boxes and sealant that will serve as a sheath for the purpose of protecting the instrumentation cables/wires. The conduit pipe will be fitted with couplers and junction boxes to join the conduit sections together. All instrumentation wiring will be run in the same conduit. The approximate locations of the conduit and junction boxes are shown on the contract drawings.

N. Thermal Expansion Gages

MassDOT will provide and install six strain gauges on the beams (two gauges on three of the five beams) to measure the thermal expansion of the beams. The strain gauges shall be adhered to the beams at the theoretical composite neutral axis. MassDOT will install these gauges after erection of beams. For installation of the gauges, MassDOT will need access for approximately 12 hours to install the strain gauges on the beams. The Contractor shall coordinate with the Fabricator to ensure MassDOT is provided a time window of at least 4 hours per beam for this work and at least five days' notice to MassDOT before the time window begins. Work can be done concurrently with installation of the thermocouples. Damage to the wiring during transportation and placement of the beams shall be the responsibility of the Contractor. Strain gauge measurements shall be taken after installation.

O. Thermocouples

MassDOT will provide and install six thermocouples on the beam to measure the thermal expansion of the beams with changing temperatures. The thermocouples shall be installed onto the face of the beam webs out of direct sunlight near the locations of the strain gauges. The thermocouples placed on facia beams should be placed on the interior face of the web to minimize errant readings from direct sunlight. For installation, MassDOT will need access for approximately 8 hours to install the thermocouples. The Contractor shall provide MassDOT a time window of at least 8 hours for this work and at least five days' notice to MassDOT before the time window begins. Thermocouples can be installed concurrently with the thermal expansion gauges.

P. Datalogger Enclosures and Dataloggers

MassDOT will provide and install the data logger enclosures including the mounting hardware. The data logger enclosure will be mounted to the solar panel mounting pole as shown on the contract drawings. Datalogger will be capable of making and transmitting data readings remotely.

ITEM 995.012 (Continued)

Q. Instrumentation Cables/Wires

MassDOT will provide and install the instrumentation cables/wires in the 2-inch diameter conduit.

R. Coordination with Instrumentation Program

As part of the Lump Sum cost for this item, the Contractor shall allow for access by MassDOT personnel to the project and structures to install and monitor the instrumentation as indicated herein, including any construction delay time associated with the activities above. In addition, the Contractor shall include 8 hours of laborer time for assistance to MassDOT. The 8 hours may not be all in one day. The data collection system will be activated after construction of the superstructure deck. In the event of damage caused by the Contractor, MassDOT reserves the right to stop construction in order to make the necessary repairs at no cost to MassDOT in time, labor, and materials.

S. Summary of Required Site Access for Instrumentation Installation:

- After installation of micropiles and prior to forming of pile cap (for installation of strain gages on micropiles).
- After pile cap forms have been removed and prior to backfilling (for installation of earth pressure sensors, in place inclinometers, and displacement potentiometers).
- After beams have been placed and prior to casting of end diaphragm (for installation of surface-mounted thermocouples and strain gauges at beam ends).

BASIS OF PAYMENT

Item 995.012 will be paid for at the Contract unit price LUMP SUM, which price shall include all coordination, labor, materials, equipment, and all other incidental costs required to complete the work.

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DETAIL SHEETS

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THE COMMONWEALTH OF MASSACHUSETTS
MassDOT HIGHWAY DIVISION
10 PARK PLAZA – BOSTON, MA

- DETAIL SHEET -

CITY/TOWN:	Charlemont	ROAD:	East Oxbow Road Over Oxbow Brook
STA:	11+50 To 16+50	YEAR:	2023
		CLASS:	Rural Local
PROJECT:	Bridge Replacement	DATE:	12/14/2023

Earth Excavation:	950 CY	Gravel Borrow for Bridge Foundation:	230 CY
Reinforced Concrete Excavation:	35 CY	Controlled Density Fill:	2 CY
Bridge Excavation:	130 CY	Crushed Stone:	130 TON
Class A Trench Excavation:	80 CY	Crushed Stone for Bridge Foundations:	30 TON
Class B Rock Excavation	12 CY	Dense Graded Crushed Stone for Sub-base:	100 CY
Gravel Borrow - Type C	500 CY	Loam for Roadsides:	100 CY

PROPOSED FULL DEPTH PAVEMENT: **AREA = 864 SY**

Surface:	1 ½”	Superpave Bridge Surface Course 9.5 (SSC-B-9.5) Over
		Asphalt Emulsion for Tack Coat Over
Intermediate:	2 ½”	Superpave Intermediate Course 12.5 (SIC-12.5) Over
		Asphalt Emulsion for Tack Coat Over
Base:	4 ½”	Superpave Base Course 37.5 (SBC-37.5) Over
Subbase:	4”	Dense Graded Crushed Stone for Sub-base Over
	8”	Gravel Borrow – Type C

PROPOSED PAVEMENT OVER BRIDGE: **AREA= 177 SY**

Surface:	1 ½”	Superpave Bridge Surface Course 9.5 (SSC-B-9.5) Over
	1 ½”	Superpave Bridge Protective Course 9.5 (SPC-B-9.5) Over
		Spray Applied Membrane Waterproofing

PROPOSED PAVEMENT MILLING AND OVERLAY: **AREA = 260 SY**

Surface:	1 ½”	Superpave Bridge Surface Course 9.5 (SSC-B-9.5) Over
		Asphalt Emulsion for Tack Coat Over
	1 ½”	Pavement Micro milling

ITEM 101. CLEARING AND GRUBBING

Sta. 11+60 to Sta. 15+85 LT

Sta. 11+60 to Sta. 14+21 RT
Sta. 14+48 to Sta. 15+85 RT

Under bridge:
Sta. 13+80 to Sta. 14+21
Sta. 14+25 to Sta. 14+48

ITEM 102. SELECTIVE CLEARING AND THINNING

Sta. 11+10 to Sta. 12+26 LT
Sta. 12+61 to Sta. 13+06 LT
Sta. 13+60 to Sta. 15+85 LT

ITEM 102.1 TREE TRIMMING

Sta. 11+10 to Sta. 12+26 LT
Sta. 12+61 to Sta. 13+06 LT
Sta. 13+69 to Sta. 14+00 LT
Sta. 13+60 to Sta. 15+82 LT

ITEM 120. EARTH EXCAVATION

East Oxbow Road:
Sta. 11+60 to Sta. 15+85

Temporary East Oxbow Road:
Sta. 50+50 to Sta. 53+42

ITEM 141. CLASS A TRENCH EXCAVATION

For riprap at substructure and foundation

ITEM 144. CLASS B ROCK EXCAVATION

For excavation at north and south abutments

ITEM 151.01 GRAVEL BORROW – TYPE C

Full Depth:
Sta. 11+60 to Sta. 15+85

Temporary East Oxbow Road:
Sta. 50+50 to Sta. 53+42

Utility Pole Access Installation/Removal:
Sta. 14+05 to Sta. 14+77 LT
Sta. 15+00 to Sta. 15+15 LT

ITEM 156. CRUSHED STONE

Rockfill Swale:
Sta. 14+25 to Sta. 15+86 LT

Temporary Swale:
Sta. 52+25 to Sta. 53+42

Below riprap and as shown on the Bridge Plans or as required by the Engineer

ITEM 156.1 CRUSHED STONE FOR BRIDGE FOUNDATIONS

For foundations as shown on the Bridge Plans or as required by the Engineer

ITEM 157. STONE FOR DRAINAGE END

Rockfill Swale:
Sta. 14+20 to Sta. 14+25 LT
Temp Swale:
Sta. 52+21 to Sta. 52+25 LT

ITEM 170. FINE GRADING AND COMPACTING – SUBGRADE AREA

Full Depth:
Sta. 11+60 to Sta. 13+76
Sta. 14+49 to Sta. 15+85

Temporary Pavement:
Sta. 50+49 to Sta. 51+61
Sta. 52+25 to Sta. 53+42

ITEM 402. DENSE GRADED CRUSHED STONE FOR SUB-BASE

Full Depth Pavement:
Sta. 11+60 to Sta. 13+76
Sta. 14+49 to Sta. 15+85

ITEM 415.3 PAVEMENT MICRO MILLING

Sta. 11+50 to Sta. 11+60
Sta. 15+85 to Sta. 16+50

ITEM 450.23 SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5)

Temporary Pavement:
Sta. 50+49 to Sta. 51+61
Sta. 52+25 to Sta. 53+42

ITEM 450.31 SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC – 12.5)

Full Depth Pavement:
Sta. 11+60 to Sta. 13+76
Sta. 14+49 to Sta. 15+85

ITEM 450.32 SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC – 19.0)

See Item 450.23 for locations

ITEM 450.42 SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5)

Full Depth Pavement:
Sta. 11+60 to Sta. 13+76
Sta. 14+49 to Sta. 15+85

ITEM 450.60 SUPERPAVE BRIDGE SURFACE COURSE – 9.5 (SSC–B – 9.5)

Full Depth Pavement:
Sta. 11+60 to Sta. 13+76
Sta. 14+49 to Sta. 15+85

Overlay:
Sta. 11+50 to Sta. 11+60
Sta. 15+85 to Sta. 16+50

Pavement over the bridge

ITEM 451. HMA FOR PATCHING

Permanent patching.

ITEM 453. HMA JOINT ADHESIVE

Sta. 11+50 to Sta. 16+50 (Longitudinal)

Begin/End Project
Sta. 11+50
Sta. 11+60

Begin/End Full Depth Pavement
Sta. 11+60
Sta. 15+85

Begin/End Temp Pavement:
Sta. 50+48 to Sta. 50+96
Sta. 53+42 to Sta. 53+42

ITEM 472. TEMPORARY ASPHALT PATCHING

As required by the Engineer

ITEM 504. GRANITE CURB TYPE VA4 – STRAIGHT

Sta. 13+50 to Sta. 13+61 LT
Sta. 13+63 to Sta. 13+74 RT
Sta. 14+50 to Sta. 14+61 LT
Sta. 14+71 to Sta. 14+83 RT
Sta. 15+29 to Sta. 15+40

ITEM 509. GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS – STRAIGHT

Sta. 13+44 to Sta. 13+50 LT
Sta. 13+57 to Sta. 13+63 RT
Sta. 14+61 to Sta. 14+67 LT
Sta. 14+83 to Sta. 14+89 RT
Sta. 15+26 to Sta. 15+29 LT
Sta. 15+40 to Sta. 15+50 LT

ITEM 620.12 GUARDRAIL, TL-2 (SINGLE FACED)

Sta. 11+77 to Sta. 12+29 LT
Sta. 12+80 to Sta. 13+32 LT

ITEM 620.13 GUARDRAIL, TL-3 (SINGLE FACED)

Sta. 12+71 to Sta. 13+44 RT

ITEM 620.131 GUARDRAIL, DEEP POST (SINGLE FACED)

Sta. 12+28 to Sta. 12+80 LT

ITEM 627.1 TRAILING ANCHORAGE

Sta. 11+67 to Sta. 11+77 LT
Sta. 15+02 to Sta. 15+11 RT

ITEM 627.82 GUARDRAIL TANGENT END TREATMENT, TL-2

Sta. 14+79 LT
Sta. 12+50 RT

ITEM 628.24 TRANSITION TO BRIDGE RAIL

Sta. 13+31 to Sta. 13+63 LT
Sta. 13+44 to Sta. 13+76 RT
Sta. 14+48 to Sta. 14+79 LT
Sta. 14+67 to Sta. 15+01 RT

ITEM 628.304 TEMPORARY IMPACT ATTENUATOR, NON-REDIRECTIVE, TL-2

Sta. 11+25 LT
Sta. 15+56 LT
Sta. 12+10 LT
Sta. 50+50 RT

ITEM 630.2 HIGHWAY GUARD REMOVED AND DISCARDED

Sta. 13+30 to 14+57 LT
Sta. 13+47 to Sta. 14+99 RT

ITEM 698.3 GEOTEXTILE FABRIC FOR SEPARATION

Rockfill Swale:
Sta. 14+25 to Sta. 15+86 LT

Temporary Swale:
Sta. 52+25 to Sta. 53+42 LT

ITEM 698.4 GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL

Under riprap – See Bridge Plans for Locations

ITEM 751. LOAM FOR ROADSIDES

Sta. 11+60 to Sta. 13+70 LT
Sta. 11+60 to Sta. 13+76 RT
Sta. 14+20 to Sta. 15+25 LT
Sta. 14+66 to Sta. 15+85 RT

ITEM 751.7 COMPOST BLANKET

See Item 751. for locations

ITEM 765. SEEDING

See Item 751. for locations

ITEM 767.121 SEDIMENT CONTROL BARRIER

Sta. 11+08 to Sta. 11+75 LT
Sta. 11+50 to Sta. 13+83 LT
Sta. 13+63 to Sta. 14+26 LT
Sta. 12+00 to Sta. 13+79 RT
Sta. 14+64 to Sta. 15+85 RT

ITEM 767.9 JUTE MESH

See Item 751. for locations

ITEM 769. PAVEMENT MILLING MULCH UNDER GUARD RAIL

Sta. 11+67 to Sta. 13+63 LT
Sta. 14+48 to Sta. 15+01 LT
Sta. 12+50 to Sta. 13+76 RT
Sta. 14+67 to Sta. 15+11 RT

ITEM 833.7 DELINEATION FOR GUARD RAIL TERMINI

Sta. 11+67 LT
Sta. 15+00 LT
Sta. 12+50 RT
Sta. 15+11 RT

ITEM 847.1 SIGN SUP (N/GUIDE) +RTE MKR W/1 BRKWAY POST ASSEMBLY – STEEL

Sta. 16+07 LT

ITEM 848.1 SIGN SUP (N/GUIDE) +RTE MKR W/2 BRKWAY POST ASSEMBLIES – STEEL

Sta. 16+43 LT

ITEM 853.33 TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3)

Temporary East Oxbow Road:
Sta. 50+20 to Sta. 51+63 LT
Sta. 52+23 to Sta. 53+62 LT
Sta. 50+56 to Sta. 51+63 RT
Sta. 52+23 to Sta. 53+14 RT

ITEM 860.112 12 INCH REFLECTORIZED WHITE LINE (PAINTED)

For permanent stop bar at Hawk Hill Road Sta. 16+07 to 16+26 LT

ITEM 874. STREET NAME SIGN

Hawk Hill Road:
Sta. 16+43 LT

ITEM 874.7 MISCELLANEOUS SIGNS REMOVED AND STACKED

Sta. 13+06 RT Weight Limit / One Lane Bridge
Sta. 15+62 LT Weight Limit / One Lane Bridge
Sta. 16+04 LT Stop Sign
Sta. 16+45 LT Hawk Hill Road

ITEM 983.101 STREAMBED RESTORATION

On top of proposed riprap at North and South bridge abutments.

ITEM 986 MODIFIED ROCKFILL

Rockfill Swale:
Sta. 14+25 to Sta. 15+86 LT
Temp Swale:
Sta. 52+25 to Sta. 53+42 LT

END OF DOCUMENT

DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

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Project Utilities Coordination (PUC) Form

CONTACTS AND GENERAL UTILITY INFORMATION

Printed: 3/7/2023

City/Town:	Project File #:	PUC Completed by:	Utility Pole Set:	
Charlemont	608858	Justin Daigle, EIT	National Grid	
Route/Street:	**Resident Engineer:**	**Mass DOT PM:**	**Scheduled Ad Date:**	**Total Poles Relocated:**
East Oxbow Road	*TBD*	Shahpar Negah	12/2/2023	5

Consultant:	Contact:	Cell #	Office #	Email
CHA Companies	Carol L. Rogers, P.E.	(860) 367-7636	(860) 595-3383	crogers@chacompanies.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
National Grid	Sandra Annis		(413) 531-8982	sandra.annis@nationalgrid.com	X		X				X		X		X
Westfield Gas & Electric	Christopher LaVertu	(413) 572-0219		Clavertu@wgeld.org	X		X				X		X		X
Verizon	Paul Styspeck	(413) 787-1845	(413) 575-7058	paul.m.styspeck@verizon.com	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:

It should be noted that due to supply chain issues, National Grid has requested an advanced lead time of 90 days instead of the usual 30 days.

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 Charlemont. The information provided is the best available information prior to project advertisement.

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

3/7/2023
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)
Phase 1			Enabling' work by the Contractor -**Note 90 day lead time due to supply shortages** Site clearing (Contractor to provide access for line trucks to install and remove the utility poles. Minimum 15 foot wide with a maximum cross slope of 4%. Surface of access to be acceptable to the utilities with a minimum 8" of temporary gravel) and pole locations surveyed. (DOT will stake pole locations within 5 days of being notified clearing has been completed. Ngrid will need 5 days after the staking for the poles to clear their DIG-SAFE).							
			UTILITY OPERATIONS - Pole Set / Overhead Relocation							
Task: 1			***Utility Co. - National Grid***							
			Install 5 poles and 7 anchors	8	X		X		Yes	
			Install approximately 500ft of primary 1/0 tree wire and remove approximately 500ft of primary 1/0 bare	5	X		X		Yes	
			Install approximately 600 ft of 1/0 triplex and remove approximately 500 ft of 1/0 neutral and 200 ft of 1/0 triplex	3	X		X		Yes	
			Install/Remove 10kVA Transformer	1	X		X		Yes	
			Sub-Total	**17**						
Task: 2			***Utility Co. - Westfield Gas & Electric***							
			Moblize to site, release existing slack point at P.#12, release lashing and slack, cut in 100ft. section of strand. Prep temporary Utility Poles at STA 12+21.97, STA 14+04.13 (may require climbing), and STA 15+06.29. Relocate existing strand and fiber to Utility Poles at STA 12+21.97 and STA 15+06.29. Lash the100ft section of strand and fiber between Utility Pole STA 15+06.29 and P.#12. Reslack excess cabling from existing slack point (approx. 50ft.) at P.#12	1	X		X		Yes	
			Moblize to site, remove existing connection to strand at P.#11 and relocate existing fiber cable and strand as a whole piece across existing bridge and river to new temporary Pole at STA 14+04.13. Relocate MST and Strand slack to existing P.#11-1 and secure to stub pole for future relocate to permanent.	1	X		X		Yes	
			Mobilize to site, resag strand and fiber between Utility Poles STA 12+19.87 and STA 14+04.13 and also between STA 14+04.13 and STA 15+06.29 and also between STA 15+06.29 and P.#12. Resag strand and fiber to mid span between Utility Poles STA 14+04.13 and STA 15+06.29.	1	X		X		Yes	
			Sub-Total	**3**						
Task: 3			***Utility Co. - Verizon***							
			Verizon Line - Place Guywires, solely owned VZ Anchors	3	X		X		Yes	
			Verizon Contract Work - Place Handhole @ base of Pole 12.	2	X		X		Yes	
			Verizon Splice - Place Aerial Cable	3	X		X		Yes	
			Verizon Line - Place Aerial Terminal & Dropwire.	1	X		X		Yes	
			Verizon Splice - Splice/Test/Trimout Aerial Cable.	9	X		X		Yes	
			Verizon Line - Remove Aerial Cable.	3	X		X		Yes	
			Verizon Line - Remove Dropwire, Guywire, and Anchor.	1	X		X		Yes	
			Sub-Total	**22**						

	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)
Phase 2			Enabling' work by the Contractor - Contractor to complete bridge construction. Utility companies should complete their phase 2 relocation to permanent location prior to contractor installing guardrail where it would cut off access to either temporary or permanent poles.							
			UTILITY OPERATIONS - Pole Set / Overhead Relocation							
Task: 1			***Utility Co. - National Grid***							
			Install/Remove approximately 500 ft of primary tree wire	5	X		X		Yes	
			Install approximately 700 ft 1/0 triplex and remove approximately 600 ft 1/0 triplex	3	X		X		Yes	
			Sub-Total	**8**						
Task: 2			***Utility Co. - Westfield Gas & Electric***							
			2 Crews Required for relocation to permanent overhead to minimize traffic impedences along new bridge. 1 Crew - Mobilize to site, release MST and Strand slack at existing P.#11-1. 1 Crew - Mobilize to site, release temporary connection to strand and fiber at Utility Poles at STA 12+19.87. 2 Crews - Release temporary connection to Utility Pole at STA 14+04.03 and relocate fiber and strand across new bridge and river to Utility Pole #11 for permanent overhead path. 1 Crew - Resag strand and fiber between Utility Poles #11 and #11-1, resag strand and fiber between Utility Poles #11 and #10.	1	X		X		Yes	
			1 Crew - Release temporary connection of strand and fiber at Utility Pole STA 15+06.29. Hold fiber at temporary pole for removal of 100ft of slack by second crew. 2 Crews - Remove extra 100ft of strand and lashing added between Utility Pole STA 15+06.29 and #12. Reslack excess cable and resag strand and fiber between Utility Pole #11 and #12.	1	X		X		Yes	
			Sub-Total	**2**						
Task: 3			***Utility Co. - Verizon***							
			Verizon Line - Place Cable Strand	1	X		X		Yes	
			Verizon Line - Transfer, Relocate, and Relash Cable	2	X		X		Yes	
			Verizon Splice - Trimout, Resplice, Test Aerial Cable if necessary	3	X		X		Yes	
			Verizon Line - Remove Cable Stub if necessary	3	X		X		Yes	
			Verizon Line - Remove Guywires & Anchors	1	X		X		Yes	
			Verizon Line - Remove Poles	2	X		X		Yes	
			Sub-Total	**12**						

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 and underground conduit installations however, typically have 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. Any costs associated with these tasks are deemed to be incidental to the project.
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.
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.

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Temporary Traffic Control

Typical Details and
Massachusetts Guidelines
for MassDOT, Municipalities,
Utilities, and Contractors

SHEET INDEX (1 OF 3)

SHEET INDEX (2 OF 3)

STATIONARY OPERATIONS (CONT.) **PAGE**

MOBILE OPERATIONS

SHEET INDEX (3 OF 3)

INTRODUCTION

This guide has been prepared to assist in the planning and installing of temporary traffic controls in maintenance, utility, or short-term construction work areas (work lasting 10 hours or less). This guide serves to assist with the many decisions that must be made for each work site. Special planning for traffic control is necessary on a case by case basis because conditions can vary widely among work locations. **Since this guide cannot cover every situation, representative illustrations covering typical short-term construction, maintenance, and utility operations are presented**.

All typical traffic control device setups illustrated should be considered as guides. The traffic control devices that are shown, the arrangement or position of the devices, and the distances prescribed in the tables are based on the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) and the Massachusetts Amendments to the MUTCD (MA Amendments), but these illustrations only present minimum standards. The provision of safe work zones for all roadway users and roadway workers affected by these activities is paramount. Traffic controls may be expanded or improved upon whenever deemed necessary. Traffic movement through the work site all traffic control devices shall be periodically observed and inspected at all locations.

If necessary, Part 6 of the MUTCD and the MA Amendments, Chapter 17 (Work Zone Management) of MassDOT's Project Development & Design Guide, and the “Traffic Engineering and Safety Section” of the MassDOT web site: (https://www.massdot.state.ma.us/highway/Departments/TrafficandSafetyEngineering.aspx), as well as MassDOT District offices can provide additional guidance, information, and suggestions for work zone setups.

RESPONSIBILITIES FOR TRAFFIC CONTROL

Short-term construction, maintenance, and utility work on or near the roadway creates a potentially hazardous situation, typically requiring the use of temporary traffic controls. These controls are important to protect both work crews and the road users. It is the responsibility of each maintenance foreman to establish and maintain safe and effective controls.

Usually the supervisor, working with the crew, plans the traffic control procedures for proposed work sites. The foreman is responsible for re-questing, storing, and maintaining all traffic control devices necessary for their crews.

The foreman is responsible for placing the devices according to these guidelines. They must inspect each installation and observe traffic flow through the area. The foreman is generally authorized to make adjustments to the original installations that, in their judgment, are necessary to improve the control of traffic and establish greater safety.

All necessary traffic control devices must be installed before work begins and properly maintained during the work period. They must also be removed as soon as they are no longer relevant to the roadway conditions.

In situations such as night time road or lane closures, detours, or other unusual conditions on state highways, the District Traffic Maintenance Engineer (DTME) should be advised. If the DTME is absent, the section foreman shall follow the instructions of the District Maintenance Engineer.

TRAFFIC CONTROL DEVICES

Traffic control devices regulate the movement of road users, warn of unexpected or unusual roadway conditions, and inform them how to maneuver safely through or around the work area. All signs, channelizing devices, barricades, and other miscellaneous traffic control devices should work together to guide traffic safely and efficiently. Common temporary traffic control devices are outlined and described below.

Signs

Temporary traffic control zone (TTCZ) signs are the primary means of providing information and directions to roadway users. All signs must be retroreflective per MassDOT's latest standard.

Warning signs call attention to unexpected conditions and to situations that might not be readily apparent to road users on or adjacent to a roadway. Warning signs alert road users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations. Nearly all warning signs for construction and work areas have black legends and borders on a fluorescent orange background.

Regulatory signs shall be used to inform road users of selected traffic laws or regulations and indicate the applicability of the legal requirements. Regulatory signs typically have black legends and borders on a white background.

Channelizing Devices

When used properly, traffic cones, reflectorized plastic drums, and barricades guide traffic through the work area along an appropriate travel path. It takes roadway users a certain distance along the roadway to safely move away from the upcoming active work site. These transition distances are based on the following taper length (L) formulas:

$L = WS^2/60$ for speeds of 40 mph or less; or

$L = WS$ for speeds of 45 mph or more; where

- L = minimum length of taper in feet,
- S = posted speed limit or typical travel speed in miles per hour prior to the work, and
- W = width of lane closure in feet.

The spacing of channelizing devices (in feet) is approximately equal to the existing speed of traffic (in mph).

Warning Lights

Rotating beacons and other flashing lights mounted on work vehicles, signs, or channelizing devices help alert roadway users to the work area. They may also be used to warn roadway users of hazards within the work area. The first 10 drums in any taper shall be equipped with sequential flashing lights.

Arrow Boards

Arrow boards are a special type of sign that are highly visible work zone warning devices. They are particularly effective on highways, where both speed and volume are high. Arrow boards in the non-directional, CAUTION, mode (four corner flashing) may be used to indicate that a shoulder is closed. Arrow boards in the arrow mode shall only be used when a travel lane is dropped on a multi-lane road and one lane of traffic must merge with another. All arrow boards should be located at the beginning of each lane or shoulder closure taper without extending outside of it. Arrow boards shall flash at a rate of 25 to 40 flashes per minute. Arrow boards shall not be used to indicate a lane shift.

BASIC REQUIREMENTS

In every work situation, the temporary traffic control setup must: Give roadway users sufficient advance warning of the work area; advise roadway users of the proper actions to take and travel paths to follow; and provide protection to roadway users, workers, and the work area. These three general requirements can be met as outlined below.

Provide Advance Warning

Warning devices along the approaches to a work area alert roadway Users to changes to road and operating conditions. Roadway users are usually alerted to these dangers via a sign or series of signs installed in the same order as the roadway user generally would expect to see them on long-term construction projects.

The initial project limit sign is usually a general warning such as “ROAD WORK 1500 FT”. Other operational warning signs then provide the roadway user with more specific information about the situation. A minimum of three advance warning signs (the initial project limit sign and two operational warning signs) is recommended when work is located on the traveled way. Warning lights and flags can be used to attract attention to the signs. A highly visible work area helps reinforce the advance warnings.

Advise and Direct Travelers

Operational warning signs provide information to the road-way user such as the type of work being performed, special conditions to watch for, or actions to take. These include signs such as, SHOULDER WORK, RIGHT LANE CLOSED, DETOUR 500 FT, ROAD CLOSED to THRU TRAFFIC, POLICE OFFICER AHEAD, etc. All of these signs must be located far enough in advance of the work area that the roadway user has sufficient time to react to them appropriately. For projects in Urban Areas, see detail: Typical Device Spacing for minimum sign spacing.

Protect Travelers, Workers, and the Work Area

The primary protection of any work area is its own visibility. Traffic cones, reflectorized plastic drums, portable breakaway barricades, etc. are used to make the work area visible and separate workers from traffic.

Other devices, such as flashing lights, flags, delineators, temporary lighting, and portable changeable message signs (PCMS) can be used to provide additional emphasis and visibility.

Workers must protect themselves by being alert to their work situation, wearing safety vests and hard hats, and by facing traffic whenever possible.

Work vehicles can also add protection when they are equipped with truck mounted attenuators, rotating beacons, flashing lights, flashing arrow boards, etc. and are parked between workers and oncoming traffic. However, workers should not position themselves between two closely parked vehicles. No private personal vehicles are allowed within the work site.

PLANNING GUIDELINES

Decisions regarding selection of work area traffic control devices require a knowledge and understanding of the specifics of each work zone. As there may be vast differences between situations, three main variables need to be considered prior to determining the need for, or the selection of, traffic control devices: 1) location of work, 2) type of roadway, and 3) speed of traffic.

Compiling information about these variables will help with planning a safe work area control. Each of these variables is explained below.

Location of Work

The choice of traffic controls needed for a short-term construction, maintenance, or utility operation depends upon the work zone's location. As a general rule, the closer the active work site is to the roadway, the more control devices are needed. Work can take place:

- Away from the shoulder or edge of pavement. No special devices are needed if work is confined to an area 15 or more feet from the edge of the shoulder. A general warning sign, such as ROAD WORK AHEAD, should be used if workers and equipment must occasionally move closer to the roadway.
- On or near the shoulder/ edge of pavement. This area should be signed as if work were on the road itself, since it is part of the roadway users' recovery area. Advance warning and operational signs are needed, as well as channelization devices to direct traffic and keep the work area visible to roadway users.
- On the median of a divided highway. Work in this location may require traffic control in both directions of traffic. Advance warning and channelization devices should be used if the median is narrow.
- On the roadway. This condition requires detailed protection for workers and sufficient warning to roadway users. Advance warning must provide a general message that work is taking place as well as information about specific hazards and specific actions the roadway user must take.

TYPE OF ROADWAY

The characteristics of the roadway also have an important influence on the selection of work area traffic control. The roadway, itself, may present special hazards. You should plan for maximum protection, using the worst hazard present as your guide to signing the work area. Some general considerations are described below for road conditions.

One-way roads: A one-way road requires signage on both sides of the road if it carries two or more lanes in one direction, ensuring roadway users in all lanes are alerted and informed.

Two-way roads:

- **Undivided:** Two-way, undivided roads will usually require controls for both directions of traffic. When the active work site is well off the roadway, controls for the opposite lane may be eliminated.
- **Divided:** Work on divided multi-lane roadways can often be handled as work along a one-way road (i.e. signs are provided along both sides of the roadway along the direction affected). If the work is in the median, both directions of traffic must be controlled, and both approaches should be double signed (i.e. have all 3 advance warning signs on both sides of each direction).

EFFECTS OF SPEED ON WORK ZONES

Speed is an important consideration in the use of work area traffic control devices. As a general rule, the greater the speed of traffic approaching a work area, the greater the size, number, and spacing of control devices.

Size. The standard size for most warning signs is 36 x 36 inches on conventional roadways and 48 x 48 inches on freeways and expressways. Signs larger than the standard 36 x 36 inches may be desirable on high-speed conventional roads.

Position. Install signs far enough in advance of the work area so the roadway users have time to react to them (see charts associated with diagrams for spacing).

OTHER FACTORS

Sight Obstructions. To ensure safety, work areas must be visible. Assess the placement of the temporary traffic control devices by driving through the area, and determine if the devices can be easily seen and provide sufficient time for roadway users to react in a safe manner. Extra precaution should be enacted in areas where horizontal or vertical curves may obstruct a roadway user's clear view of road activities ahead.

Police/Flaggers. It should be noted that the MUTCD does not require police/flaggers for stationary setups. If police/flaggers are used, a police/flagger ahead sign should be used in advance of any point where the police/flagger is stationed to control road users.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL

1. PLAN YOUR WORK

Inspect location of work area and its surroundings.

Analyze:

- Location of work in relation to the traveled way, intersecting road-ways, driveways, and sight distances;
- Type of roadway and traffic involved; and
- Volume and speed of traffic.

Meet and discuss the work and necessary traffic control with the crew.

Study representative illustrations in this guide to develop a temporary traffic control plan (TTCP).

Other Considerations:

- Base your traffic control plan on the premise that all roadway users are unfamiliar with the area.
- The closer the work area location is to traffic, the more controls are needed.
- Plan for maximum protection.
- Select and inspect the temporary control devices needed (including all warning signs), if they are not in good condition, REPLACE THEM!
- Then collect and transport them to the work site.
- Determine their proper placement.
- Install signs and other traffic control devices prior to allowing personnel or equipment onto the roadway.
- Make sure signs are reflective, accurate, clean, and meet specifications. Completely cover any existing permanent signs that will conflict with the messages of the new work area control signs.

2. INSTALLING/REMOVING TEMP. TRAFFIC CONTROL DEVICES

Care must be exercised when installing and removing temporary traffic control (TTC) devices. The traffic control needed to perform the operation safely is dictated by the location on the roadway the operation will occur: in a shoulder or a lane, in the left lane or right, etc. In all cases, installing TTC begins and ends as a mobile operation.

A shadow vehicle with a truck mounted attenuator (TMA) shall be used to protect workers installing and removing TTC devices on all roadways with a posted speed limit of 45 MPH or greater as directed by the engineer. TTC devices shall not be installed or removed from a shadow vehicle with a TMA. TTC devices shall be installed or removed from a work operation vehicle only and a shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

3. INSTALL TRAFFIC CONTROL DEVICES AT WORK SITE

FOR LOWER SPEED (≤ 40 MPH) ROADWAYS:

1) All devices shall be installed in order with the flow of traffic.

2) Where one direction of traffic is being affected, the first sign installed should be the sign farthest from the work site, and on the same side as the work.

3) Where two directions of traffic are affected, install signs for opposing traffic first, starting with the sign farthest from the work area. When signs for opposing traffic have been installed, install signs on the same side as the work area, again beginning with the sign farthest from the active work site.

4) Once signs are in place, other traffic control devices shall be installed in the same manner as the signs.

FOR HIGHER SPEED (≥ 45 MPH) ROADWAYS:

1) All devices shall be installed in order with the flow of traffic.

2) Install all advance warning signs, beginning with the ROAD WORK XXX (W20-1) sign and ending with the END ROAD WORK/DOUBLE FINES END (MA-R2-10E) sign.

3) Install all signs beginning with the opposite side which will be closed (for a right lane closure; first, install all signs on the left side (shoulder) and then install all signs on the right side (shoulder). No signs shall be erected on the roadway unless delineated by traffic control devices.

4) If required, install shoulder taper as the mobile operation advances.

5) Install arrow board on the shoulder prior to the merging taper or as close to the beginning of the merging taper as possible.

6) Install channelizing devices to form a merging taper. Use of a shadow vehicle with a TMA during installation is required on roads with speed limits of 45 MPH or greater or as directed by the Engineer.

7) Install traffic control devices along the buffer space at the appropriate spacing.

8) Continue placing devices along the work space at the appropriate spacing.

9) Install devices for the termination area as necessary.

10) Place the shadow vehicle with a TMA in advance of the first work crew or hazard approached by motorists. Multiple shadow vehicles may be required based on the number of lane and shoulder closures implemented.

4. INSPECT WORK AREA SIGNING AND CONTROL DEVICES

1) Assess the placement of the temporary traffic control devices by driving through the work area. All approaches to the work zone should be checked.

2) Ensure roadway users will have sufficient time to read signs and react in a safe manner.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

3) Check visibility of entire work area. If approaching roadway users can't see the work area well, or if they can't see ahead to traffic that may already be queued on the approach because of the work, additional traffic control devices should be deployed.

4) Check to ensure the proper temporary traffic control devices are positioned to protect workers from traffic (where possible).

5) Ensure all workers wear safety vests, hard hats, and all other necessary safety equipment. All worker safety gear should be in good condition. All reflective gear should be clean and highly visible in the dark.

6) Record in the log book the number and location of all signs and devices.

Considerations:

- Work area signs should never be blocked from view or obscured by vegetation, existing signs, or other obstructions.
- Flags, flashing lights, and edge line traffic cones can be used to improve visibility.

5. REMOVE TRAFFIC CONTROL DEVICES AT WORK SITE

All workers and equipment should be clear from work site BEFORE removing signs and other devices.

FOR LOWER SPEED (≤ 40 MPH) ROADWAYS:

1) Remove signs and other devices within the delineated area when work is complete.

2) Remove other traffic control devices in the reverse order in which they were installed

3) Remove signs in the reverse order in which they were installed (i.e. sign closest to the work area to be removed first).

4) When the operation is complete, uncover any existing permanent signs covered in Step 2.

5) Record in the log book the time at which the signs were removed.

FOR HIGHER SPEED (≥ 45 MPH) ROADWAYS:

All TTC devices for a stationary lane closure on a multi-lane roadway, except advance warning signs, should be removed against the flow of traffic in the following sequence:

1) Remove the channelizing devices starting from the end of the activity area working back to the widest part of the merging taper.

2) A shadow vehicle with TMA shall be positioned to protect workers removing devices and work backwards as the setup is removed from the roadway.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

3) Place the removal vehicle on the shoulder, and remove the channelizing devices from the merging taper by hand onto the work vehicle.

4) Remove the arrow board once traffic is clear and it is safe to do so.

5) Circle back and moving with the flow of traffic, remove the advance warning signs starting with the opposite side from previous lane closure first.

6) At no time shall workers run across the multilane roadway to remove signs on both sides of the road simultaneously.

7) Record in the log book the time at which the signs were removed

RAMP FACILITIES

At all times it is necessary to control the on and off-ramp traffic during the installation and breakdown of traffic control devices. Use of temporary traffic slow-downs or rolling roadblocks is recommended to allow for the safety of workers handing temporary traffic control devices on ramp facilities. A shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices. At no time shall the work operation vehicle be used as the shadow vehicle with the TMA.

USE OF THIS GUIDE

Illustrations showing minimum standards for short-term construction, maintenance, and utility operations are arranged in this guide by type of operation. The users of this guide should compare all illustrated examples and examine their differences. After gathering information about the work zones using the general guidelines as outlined, proceed as follows:

1) Turn to the Index. Consider the type of operations and the type of roadway upon which work will occur.

2) Select the figure that most closely matches the conditions where you plan to work. Remember that all diagrams represent minimum standards.

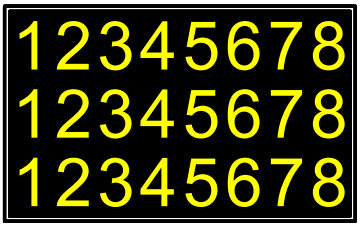
3) Read the title of the illustration to ensure that it is appropriate to your location. Study the layout of traffic control devices and read all notes.

4) Consult the appropriate tables, as directed on each illustration to determine taper length and proper spacing of signs. Notice that distances change when speeds change. Also note that these are guidelines, only, and they must be adapted to your specific work area.

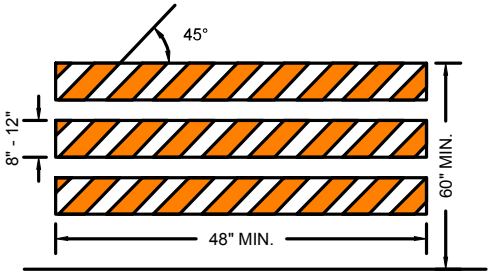
5) Use the **"PROCEDURES FOR WORK AREA TRAFFIC CONTROL"** for assistance in completing all necessary steps to provide effective and safe work area traffic control.

massDOT Massachusetts Department of Transportation Highway Division PAGE 10	Work Zone Safety Standard Details and Drawings	FIGURE 1 TYPICAL TRAFFIC CONTROL DEVICES NOT TO SCALE

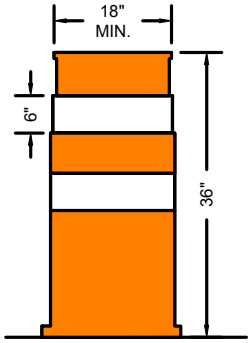
SIGN



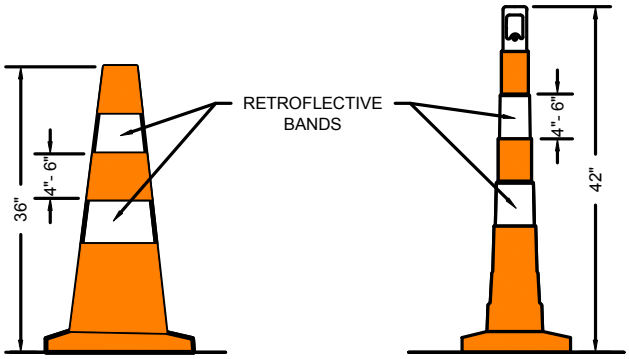
PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)



TYPE III BARRICADE

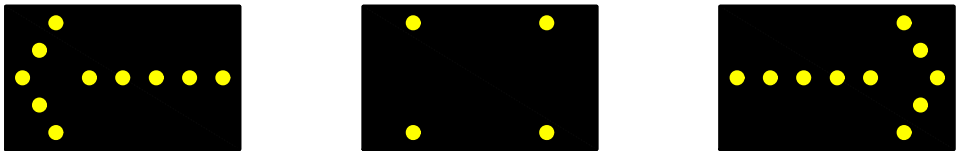


DRUM



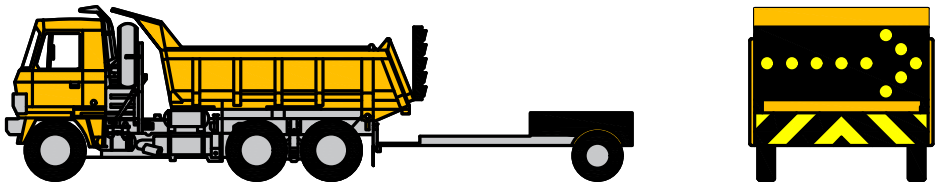
CONES

Cones may be used for all daytime operations. For night work, drums should be used to form the taper(s) and cones can be used along the tangent section of the work setup.



LEFT CAUTION RIGHT

ARROW BOARD (WITH MODE)



TRUCK MOUNTED ATTENUATORS

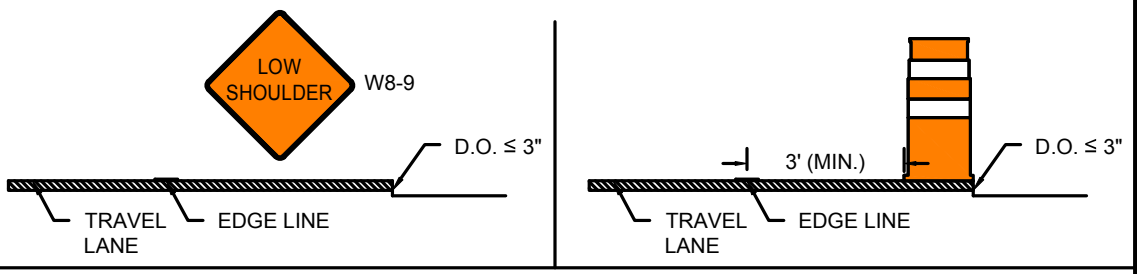
Truck Mounted Attenuators (TMA) shall be positioned between the start of the work area and the end of the designated buffer zone. The TMAs are to be positioned in each temporarily closed lane. This includes shoulders (≥8 feet) whether combined with a travel lane closure or being closed alone. These TMA conditions are required on roadways with speeds of 45 MPH or greater. TMAs can be used on other roadways at the discretion of the engineer. TMAs shall be used for the deployment and removal of all traffic control devices, including all advance warning signs.

SHORT-TERM PAVEMENT EDGE DROP-OFFS

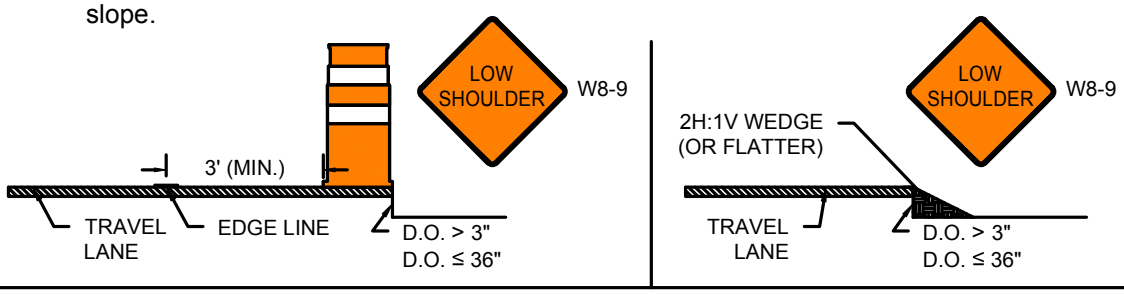
Note that this guidance is adopted from the Roadside Design Guide*, 4th Edition.*

Pavement drop-offs may occur during paving, excavation, and other construction activities. Drop-offs create hazards for vehicles if not properly mitigated. The following applies for all roads with speed limits greater than 30 mph; for roads with speed limits of 30 mph or less, treatments for pavement edge drop-offs are at the discretion of the Engineer. Drop-offs between adjacent, open travel lanes should not exceed 2", and any drop-off in excess of 3" should not be left unattended without one of these mitigation measures applied.

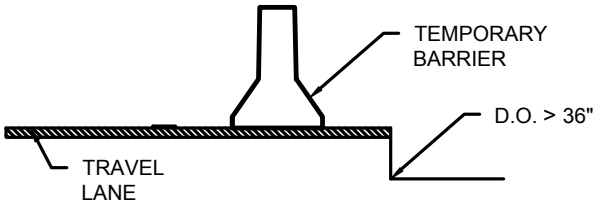
- Shoulder drop-offs 3" or less adjacent to a shoulder or active travel lane should be mitigated by:
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment; or
  - ✓ The placement of drums on the traffic side of the drop-off.



- Shoulder drop-offs greater than 3" but less than or equal to 36" should be mitigated by:
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of drums on the traffic side off the drop-off, offset at least 3' from the travel lane; or
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of a temporary wedge of material along the face of the drop-off. The wedge should consist of stable material placed on a 2H:1V or flatter slope.



- Shoulder drop-offs greater than 36" must be protected by temporary barrier.



massDOT Massachusetts Department of Transportation Highway Division

PAGE 11

Work Zone Safety Standard Details and Drawings

FIGURE 2
PAVEMENT EDGE
DROP-OFF GUIDANCE
NOT TO SCALE

massDOT Massachusetts Department of Transportation Highway Division PAGE 12	Work Zone Safety Standard Details and Drawings	TYPICAL DEVICE SPACING

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	55
45-55	500 / 1000 / 1000	660	495	40	40
60-65	1000 / 1600 / 2600	780	645	40	50

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

MINIMUM SPACING OF ADVANCE WARNING SIGNS FOR URBAN ROADWAYS	
ROAD TYPE	DISTANCE BETWEEN SIGNS
URBAN (LOW SPEED)	100 FT
URBAN (HIGH SPEED)	350 FT

NOTES

1. 40 FT = 10 FT PAVEMENT MARKING + 30 FT SKIP

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

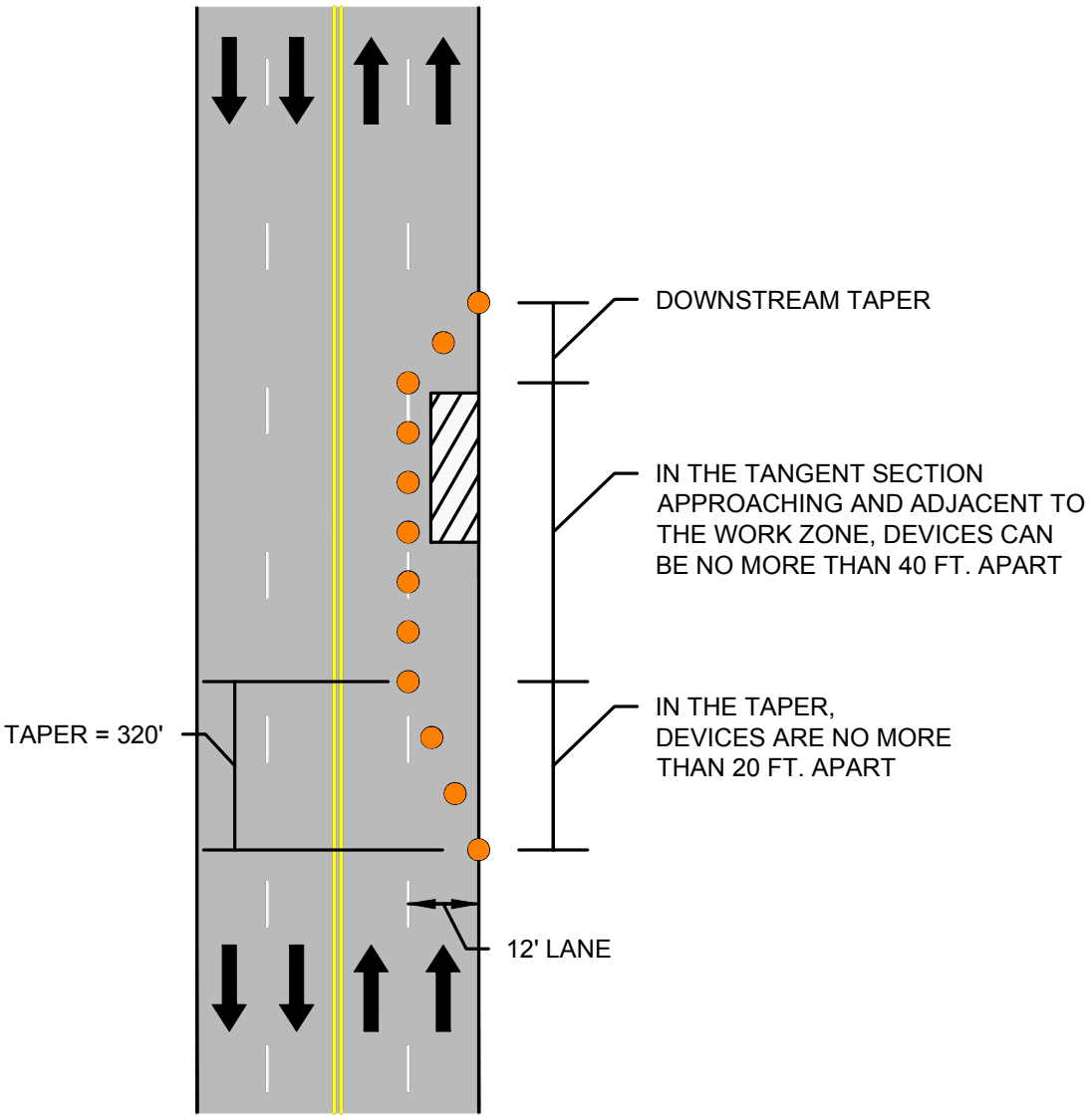
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 13	Work Zone Safety Standard Details and Drawings	FIGURE 3 TYPICAL DEVICE SPACING (AT 30 MPH)

Guidance for Flagging Operations

NOTE:
A flagger shall always be aware of their surroundings and have a good escape route. A flagger shall never be positioned directly beside or against construction equipment. When a flagger is required to direct traffic in an area where the escape route is partially blocked by a traversable obstruction such as a guardrail, the flagger shall be physically capable of traversing that obstruction. Prior to commencing a project, the supervisor in charge shall review the project, including guardrail areas, for safe flagging stations. The supervisor in charge shall clearly communicate with the flagger(s), indicating any locations where they cannot safely perform their duties.

Each flagger shall be equipped with the following high visibility clothing, signaling, and safety devices:

1) A white protective hard hat with a minimum level of reflectivity per the requirements of ANSI, Type I, Class E&G;
2) A clean, unfaded, untorn lime/yellow reflective safety vest and pants meeting the requirements of ANSI 107 Class 3 with the words "Traffic Control" on the front and rear panels in minimum two (2) inch (50 millimeter) high letters;
3) A 24 inch "STOP/SLOW" traffic paddle conforming to the requirements of Part 6E.03 of the Manual on Uniform Traffic Control Devices (MUTCD), a weighted, reflectorized red flag, flagger station advance warning signage, and two-way radios capable of providing clear communication within the work zone between flaggers, the Contractor, and the Engineer. The traffic paddle shall be mounted on a pole of sufficient length to be seven feet above the ground as measured from the bottom of the paddle;
4) A working flashlight with a minimum of 15,000 candlepower and a six inch red attachable wand, a whistle with a working lanyard, and a First Aid kit that complies with the requirements of ANSI Z308.1; and
5) An industrial/safety type portable air horn that complies with the requirements of the U.S. Coast Guard.

A "STOP/SLOW" paddle should be the primary hand-signaling device. It shall have an octagonal shape on a rigid handle. Flag use should be limited to emergency situations.

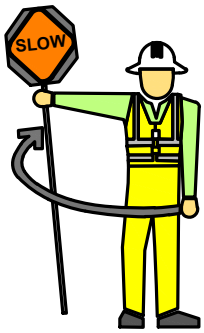
TO STOP TRAFFIC

Properly Trained Flaggers

- Give clear messages to drivers.
- Allow distance for drivers to react.
- Coordinate with other flaggers.
- Use standard signaling methods.

Properly Equipped Flaggers

- Use approved stop/slow paddles.
- Use approved safety apparel.
- Use retroreflective equipment.
- Use hand held radios, as needed.
- All flaggers shall wear safety apparel that meets ANSI Class 3 requirements. The combination of vest and pants is required.



TO LET TRAFFIC PROCEED

Proper Flagging Stations

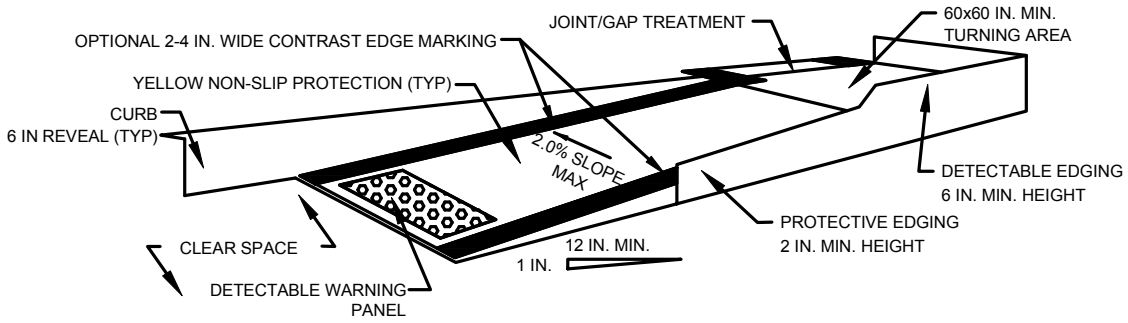
- Good approach sight distance.
- Highly visible to traffic.
- Stand alone away from other machinery and people.
- Stand on right edge of pavement or shoulder- proceed to centerline only when first vehicle has come to stop.
- Have a good escape route.

TO ALERT AND SLOW TRAFFIC

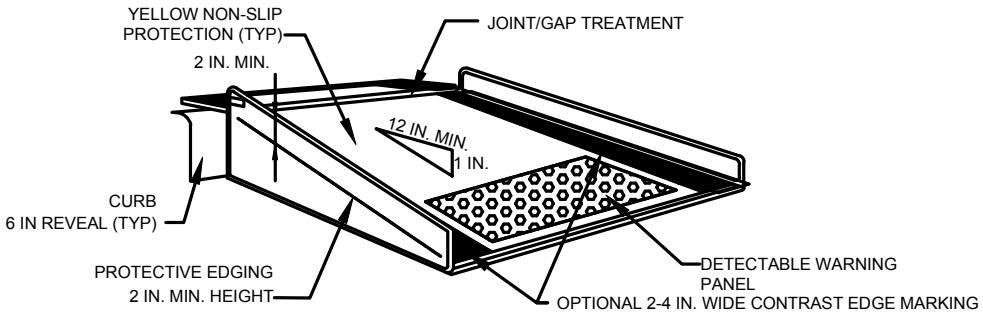
Proper Advance Warning Signs

- Always use warning signs.
- Allow for reaction distance from signs.
- Remove signs if no longer necessary or not flagging.
- Use free hand in up-and-down motion to help slow traffic.

massDOT Massachusetts Department of Transportation Highway Division PAGE 16	Work Zone Safety Standard Details and Drawings	FIGURE 4 TYPICAL PEDESTRIAN DEVICES (1 OF 2) NOT TO SCALE



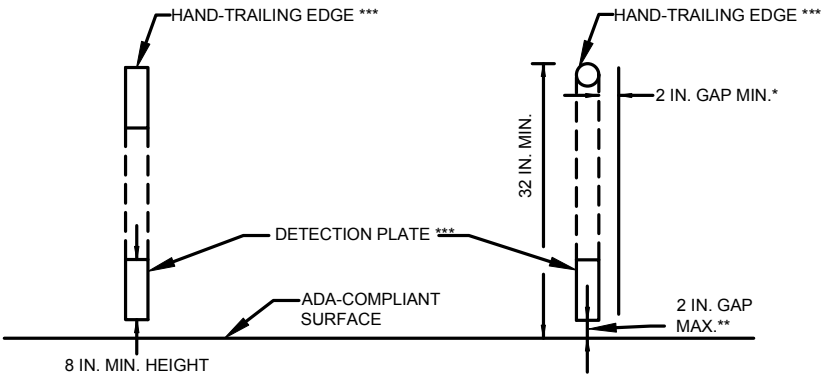
TEMPORARY CURB RAMP-PARALLEL TO CURB



TEMPORARY CURB RAMP-PERPENDICULAR TO CURB

NOTES:

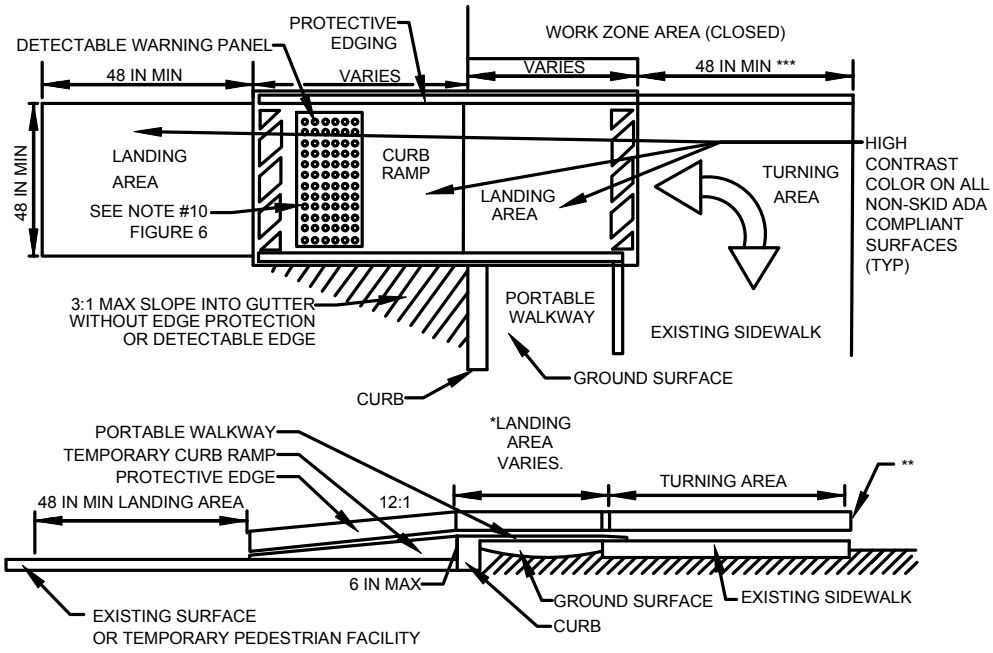
1. CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE, AND NON-SLIP SURFACE.
2. PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOP STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
3. PROTECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
4. THE CURB RAMP WALKWAY AND LANDING AREA SURFACE SHALL BE OF A SOLID CONTINUOUS CONTRASTING COLOR ABUTTING UP TO THE EXISTING SIDEWALK.
5. CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
6. CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
7. WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
8. LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
9. CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.
10. IF A TEMPORARY PEDESTRIAN RAMP LEADS TO A CROSSWALK, THEN A DETECTABLE WARNING PAD MUST BE ADHERED TO THE BASE OF THE RAMP. IF IT LEADS TO A PROTECTED PEDESTRIAN BYPASS THAT DOES NOT CONFLICT WITH VEHICULAR TRAFFIC, THEN A PAD SHALL NOT BE INSTALLED ON THE RAMP.



CROSS SECTION VIEW

PEDESTRIAN CHANNELIZING DEVICE

* THERE SHALL BE A 2 INCH GAP BETWEEN THE HAND-TRAILING EDGE AND ITS SUPPORT.
** A MAXIMUM 2 INCH GAP BETWEEN THE BOTTOM OF THE BOTTOM RAIL AND THE SURFACE MAY BE USED TO PROVIDE DRAINAGE.
*** THE HAND-TRAILING EDGE AND DETECTION PLATE SHALL BE CONTINUOUS THROUGHOUT THE LENGTH OF THE PATH SUCH THAT A PEDESTRIAN USER WITH A LONG CANE CAN FOLLOW IT.



TEMPORARY CURB RAMP

* LANDING AREA USED TO OVERLAP NON-ADA COMPLIANT SURFACES.
** DETECTABLE EDGE REMOVED IF A CONTINUOUS SIDEWALK.
*** 60 IN. IF AN OBSTRUCTION IS AT BACK OF SIDEWALK.

massDOT Massachusetts Department of Transportation Highway Division

PAGE 17

Work Zone Safety Standard Details and Drawings

FIGURE 5
TYPICAL PEDESTRIAN DEVICES
(2 OF 2)
NOT TO SCALE

massDOT Massachusetts Department of Transportation Highway Division PAGE 18	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED WORK NEAR CURVE

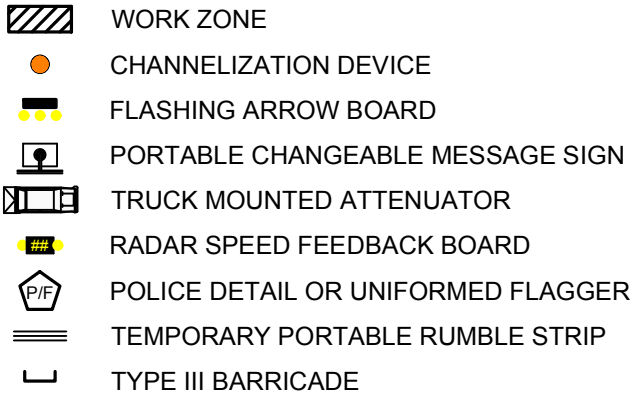
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

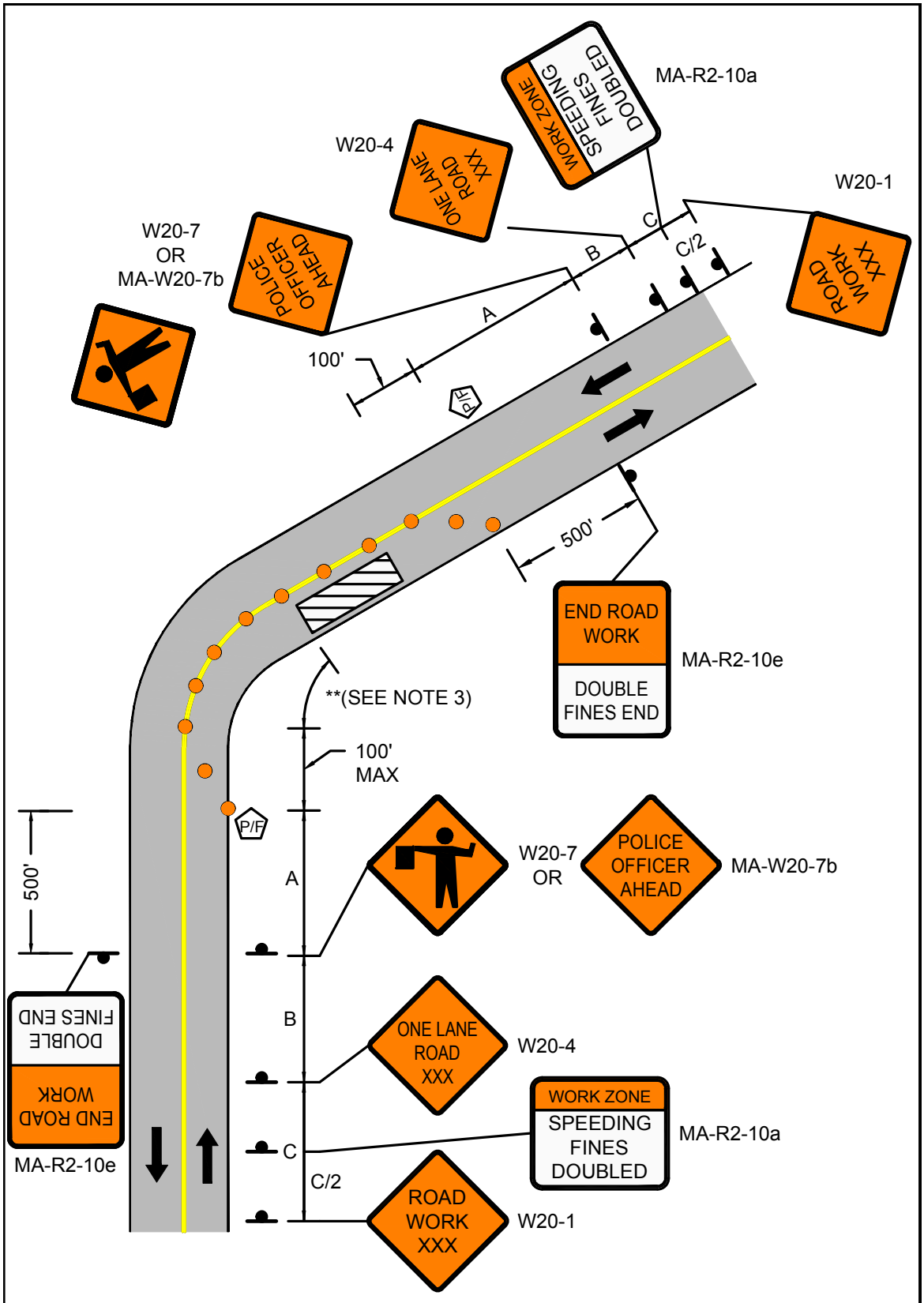
NOTES

1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. ** = EXTEND ENOUGH SO TAPER IS BEFORE CURVE

LEGEND



NOT TO SCALE



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PAGE 19

Work Zone Safety Standard Details and Drawings

FIGURE 6
STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
HALF OF ROADWAY CLOSED
WORK NEAR CURVE

massDOT Massachusetts Department of Transportation Highway Division PAGE 20	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
36-mph to 55-mph	15-feet
35-mph and under	10-feet

NOTES

1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
4. *** SHALL BE DEPLOYED IF RUMBLE STRIPS ARE PRESENT.

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

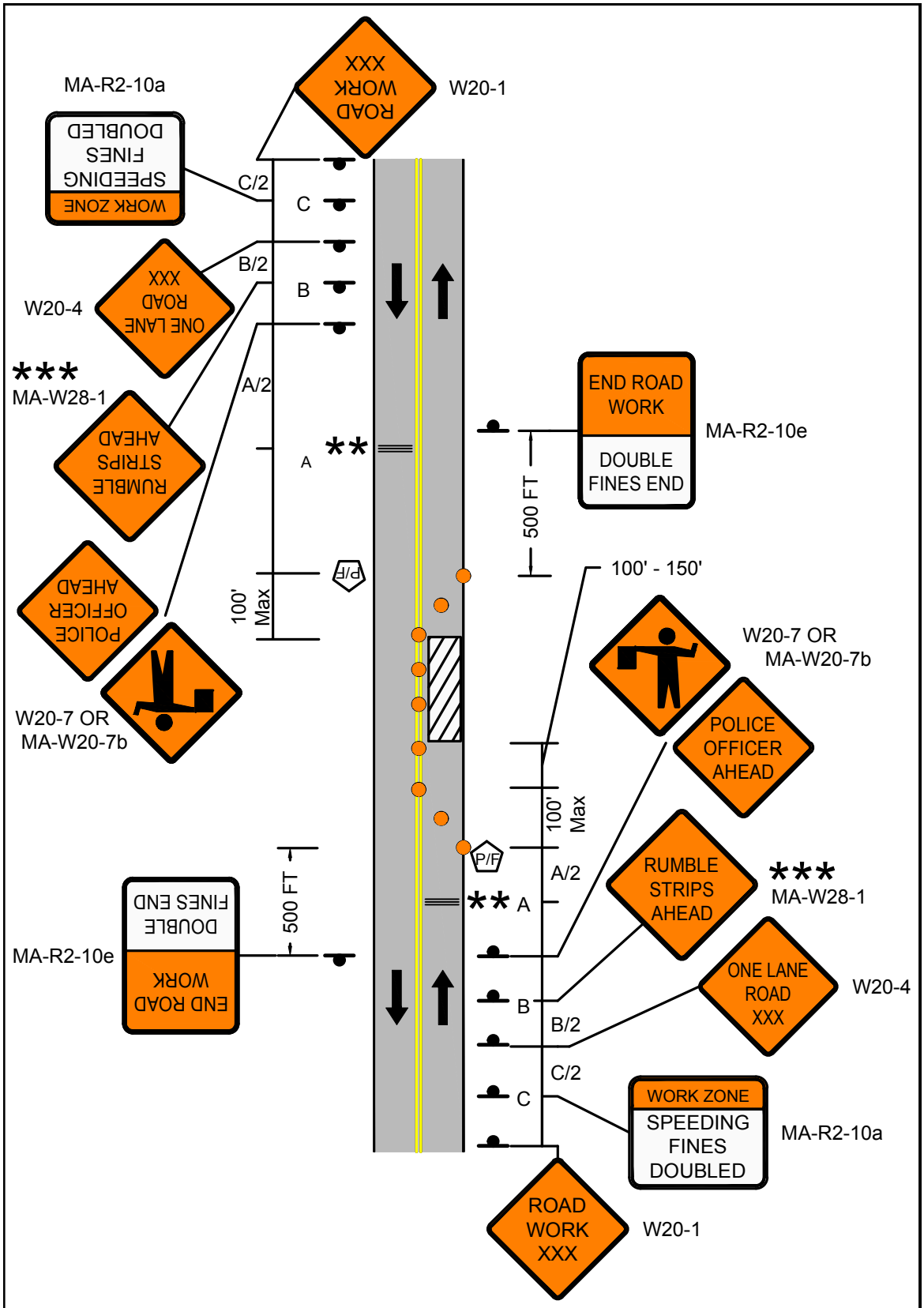
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division

PAGE 21

Work Zone Safety Standard Details and Drawings

FIGURE 7
STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
HALF OF ROADWAY CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 22	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY SHOULDER CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES
1. MA-R2-10a at C/2 and A/2.

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

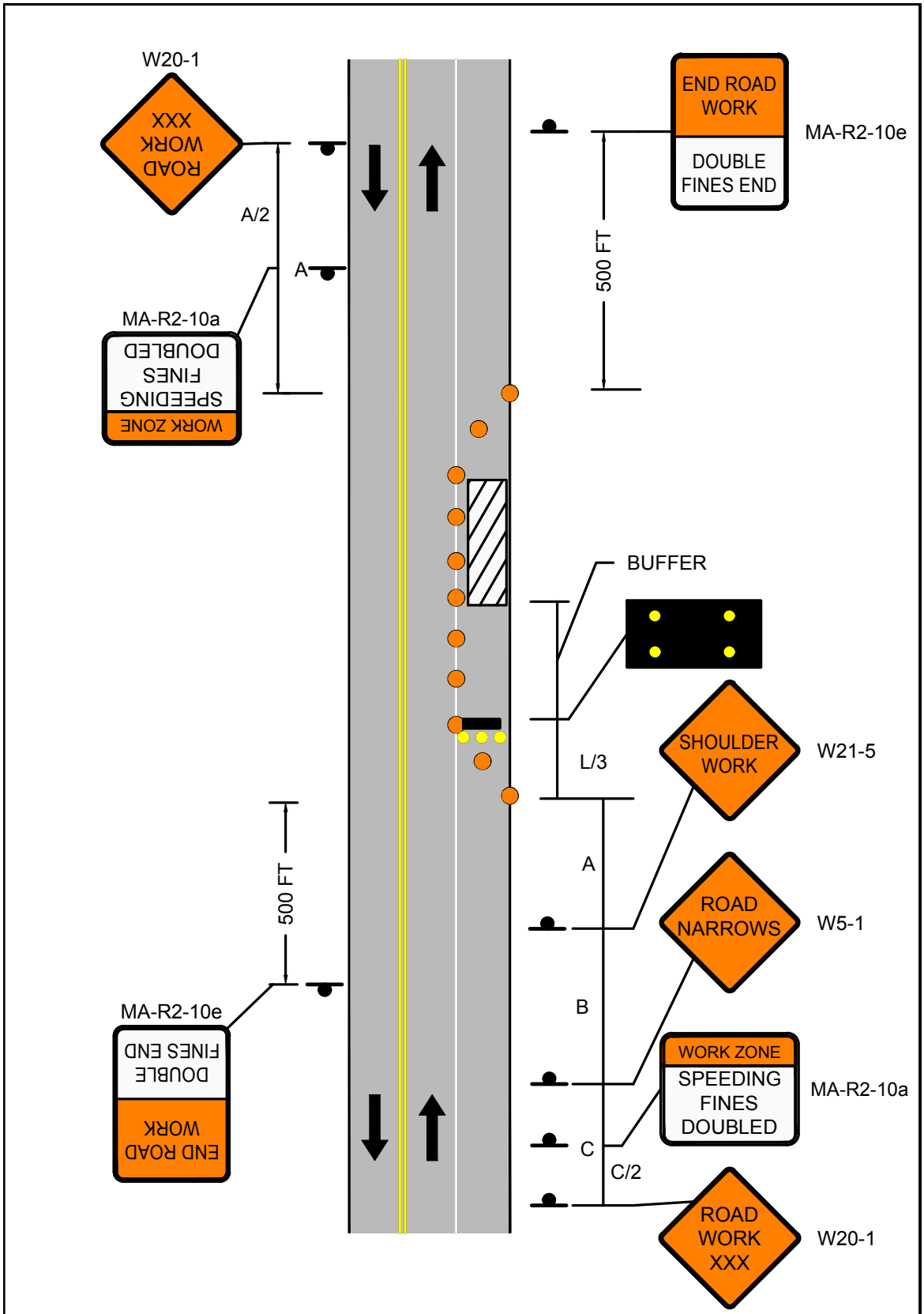
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 23	Work Zone Safety Standard Details and Drawings	FIGURE 8 STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY SHOULDER CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 24	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY WITH TRAVERSABLE SHOULDER HALF OF ROADWAY CLOSED MAINTAIN TWO-WAY TRAFFIC

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	160	305	20	125
45-55	220	330	495	40	100
60-65	260	390	645	40	115

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

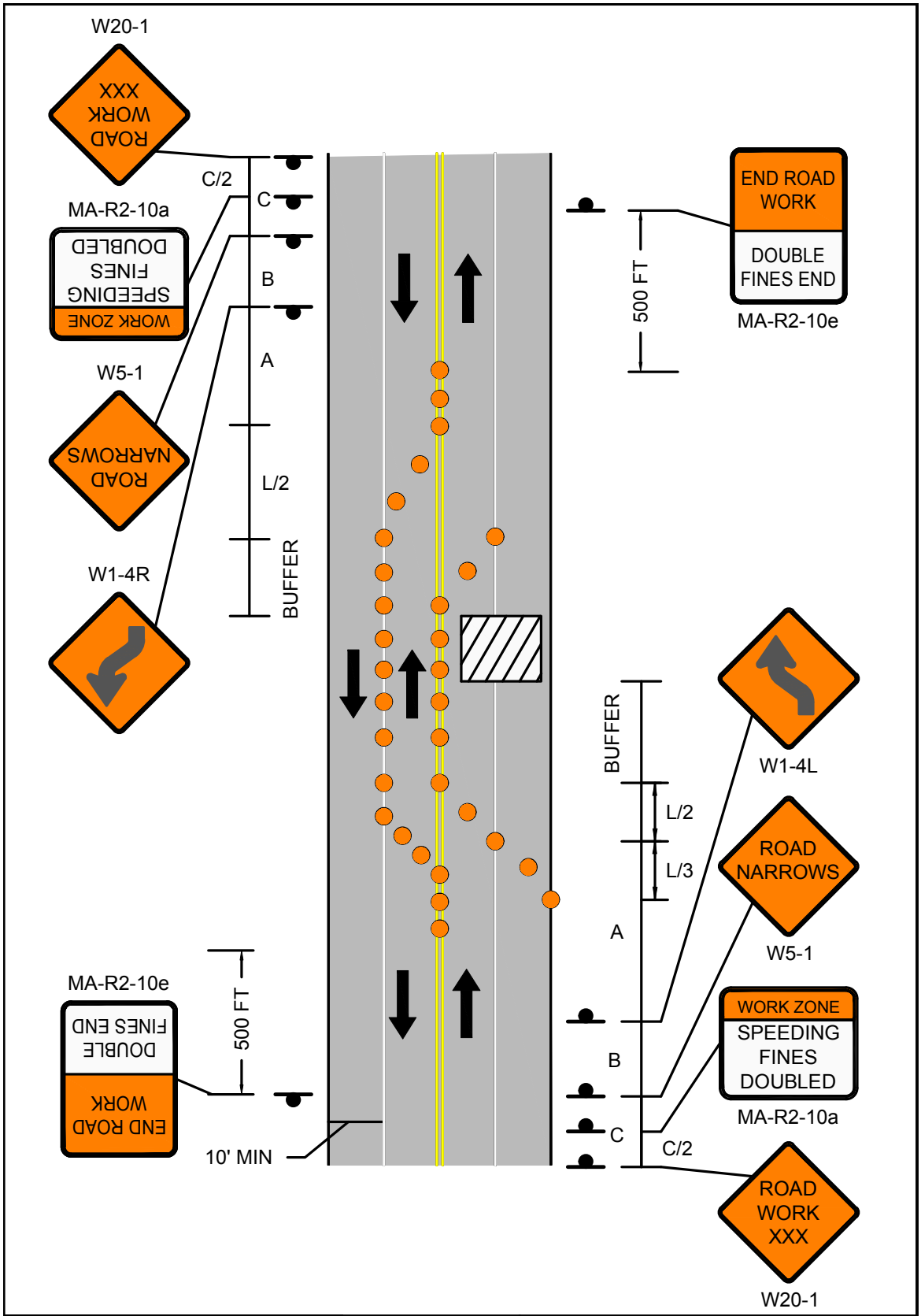
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division

PAGE 25

Work Zone Safety Standard Details and Drawings

FIGURE 9
STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
WITH TRAVERSABLE SHOULDER
HALF OF ROADWAY CLOSED
MAINTAIN TWO-WAY TRAFFIC

massDOT Massachusetts Department of Transportation Highway Division PAGE 26	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY RIGHT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

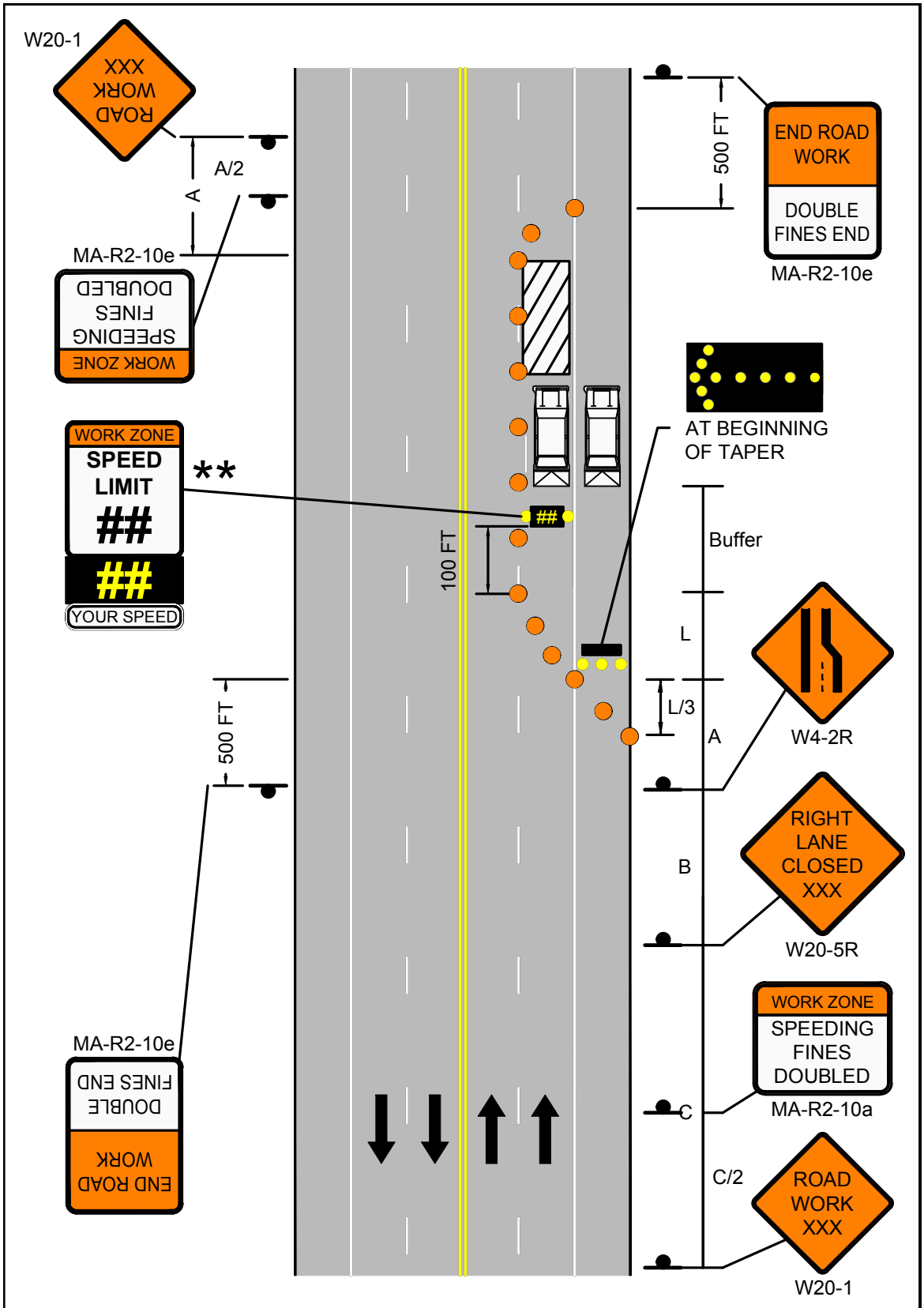
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 27	Work Zone Safety Standard Details and Drawings	FIGURE 10 STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY RIGHT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 28	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY LEFT LANE CLOSED

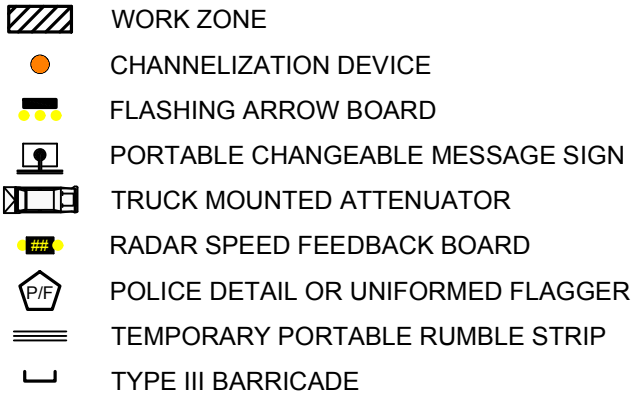
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	105
45-55	500 / 1000 / 1000	660	495	40	80
60-65	1000 / 1600 / 2600	780	645	40	100

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION. 2' OFFSET FROM EDGE OF TRAVEL LANE TO RADAR SPEED FEEDBACK BOARD IS REQUIRED. BOARD MAY BE MOVED FULLY OR PARTIALLY OFF PAVED SHOULDER, IF REQUIRED.

LEGEND



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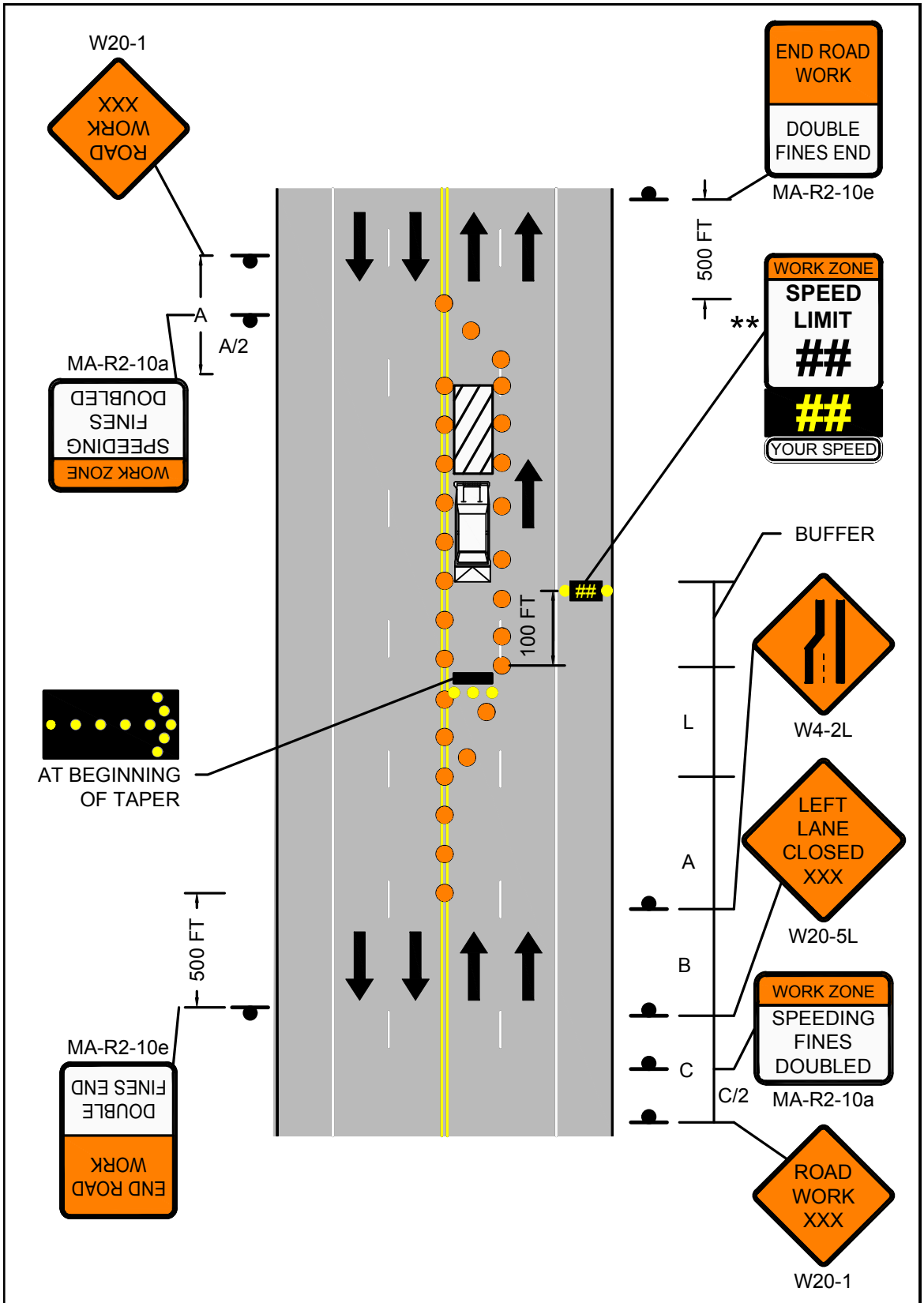


massDOT Massachusetts Department of Transportation Highway Division PAGE 29	Work Zone Safety Standard Details and Drawings	FIGURE 11 STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY LEFT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 30	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	140
45-55	220	660	330	495	40	120
60-65	260	780	390	645	40	140

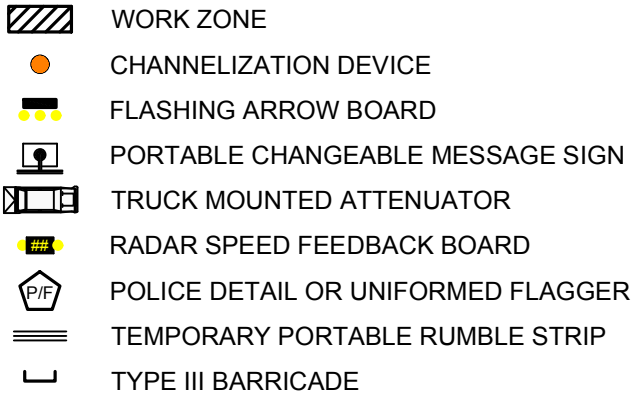
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
3. W1-4L SHALL BE PLACED AT THE MIDDLE OF THE TANGENT.

LEGEND



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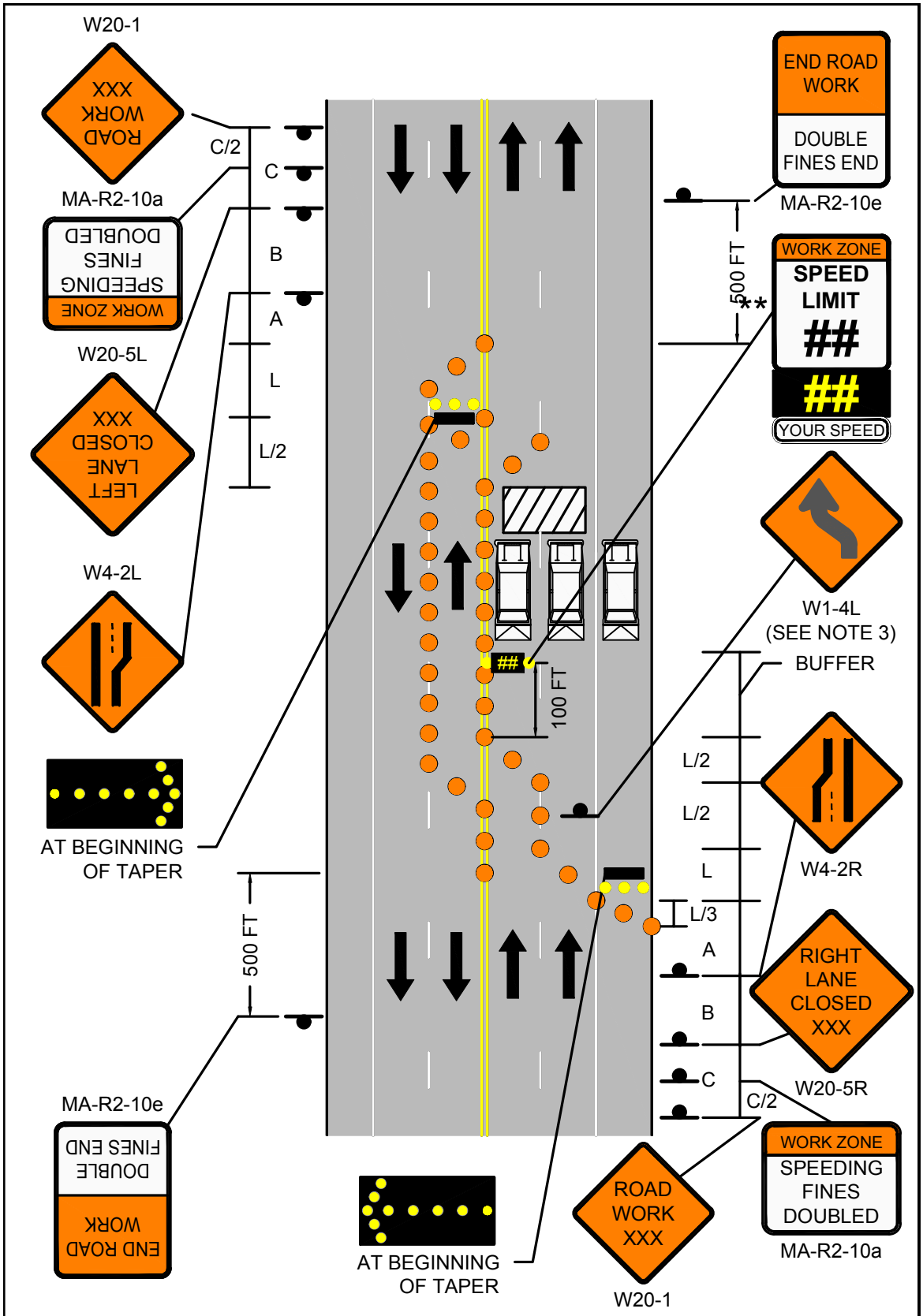


massDOT Massachusetts Department of Transportation Highway Division PAGE 31	Work Zone Safety Standard Details and Drawings	FIGURE 12 STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 32	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

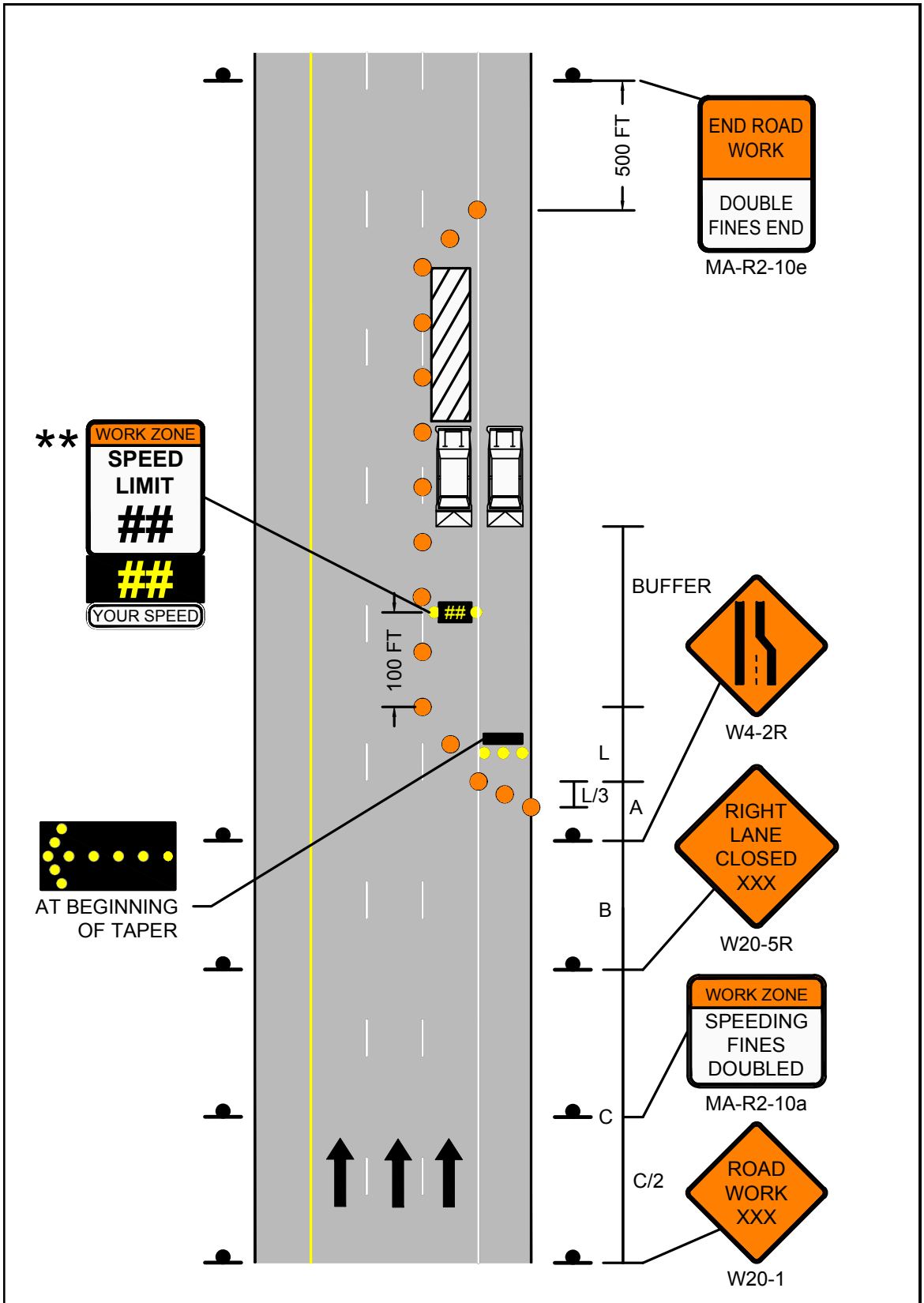
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 33	Work Zone Safety Standard Details and Drawings	FIGURE 13 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 34	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

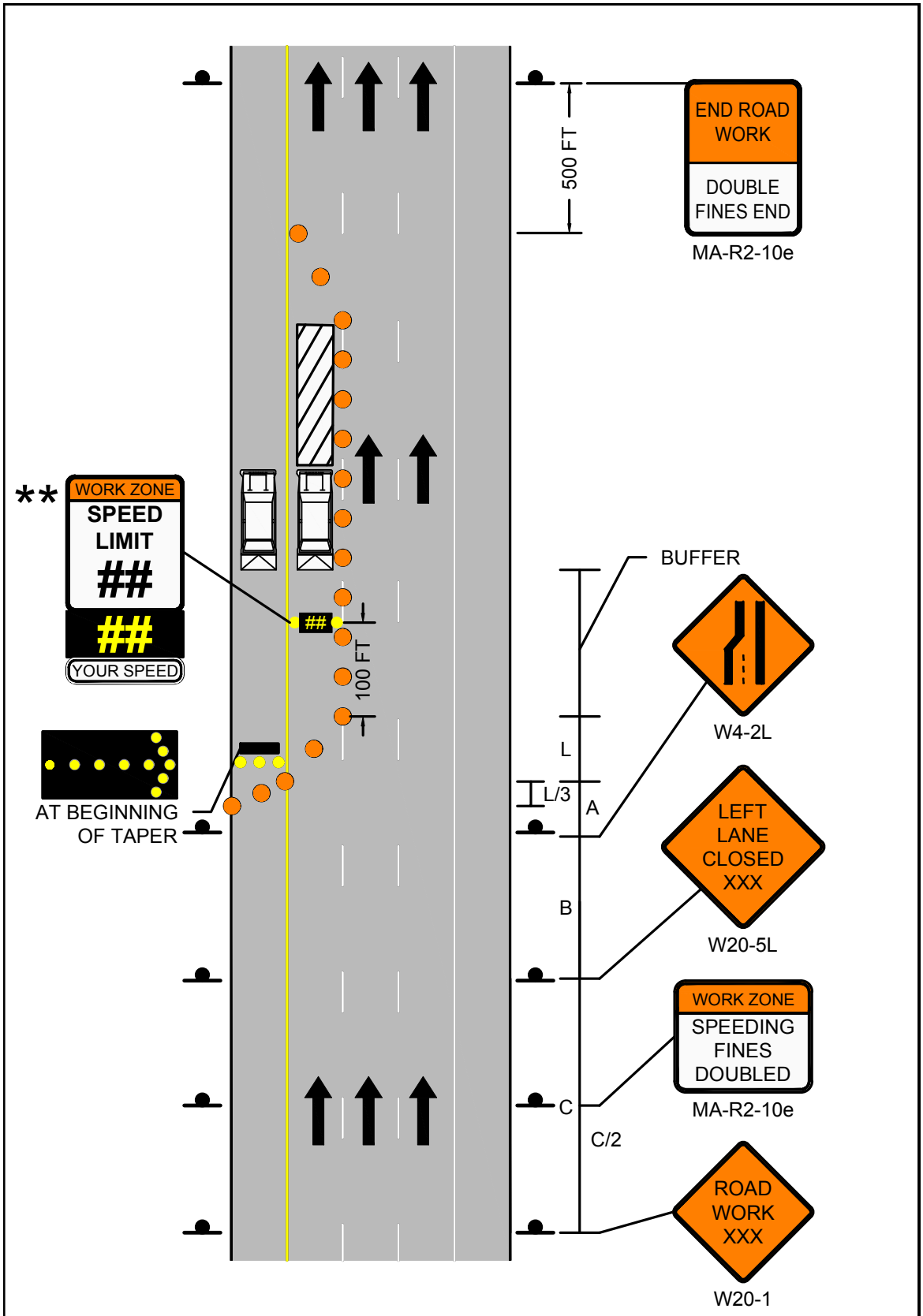
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 35	Work Zone Safety Standard Details and Drawings	FIGURE 14 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 36	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR RIGHT/CENTER LANES CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115

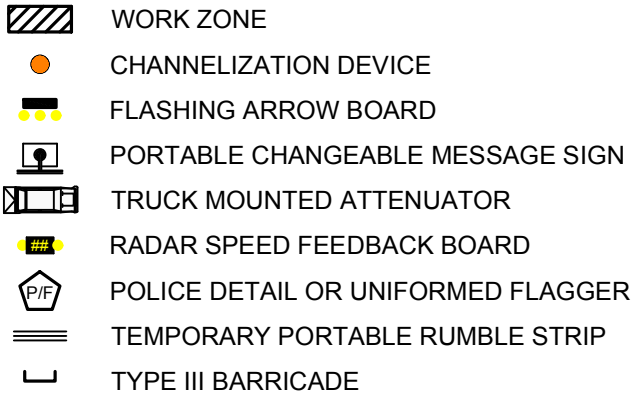
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
3. *** THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

LEGEND



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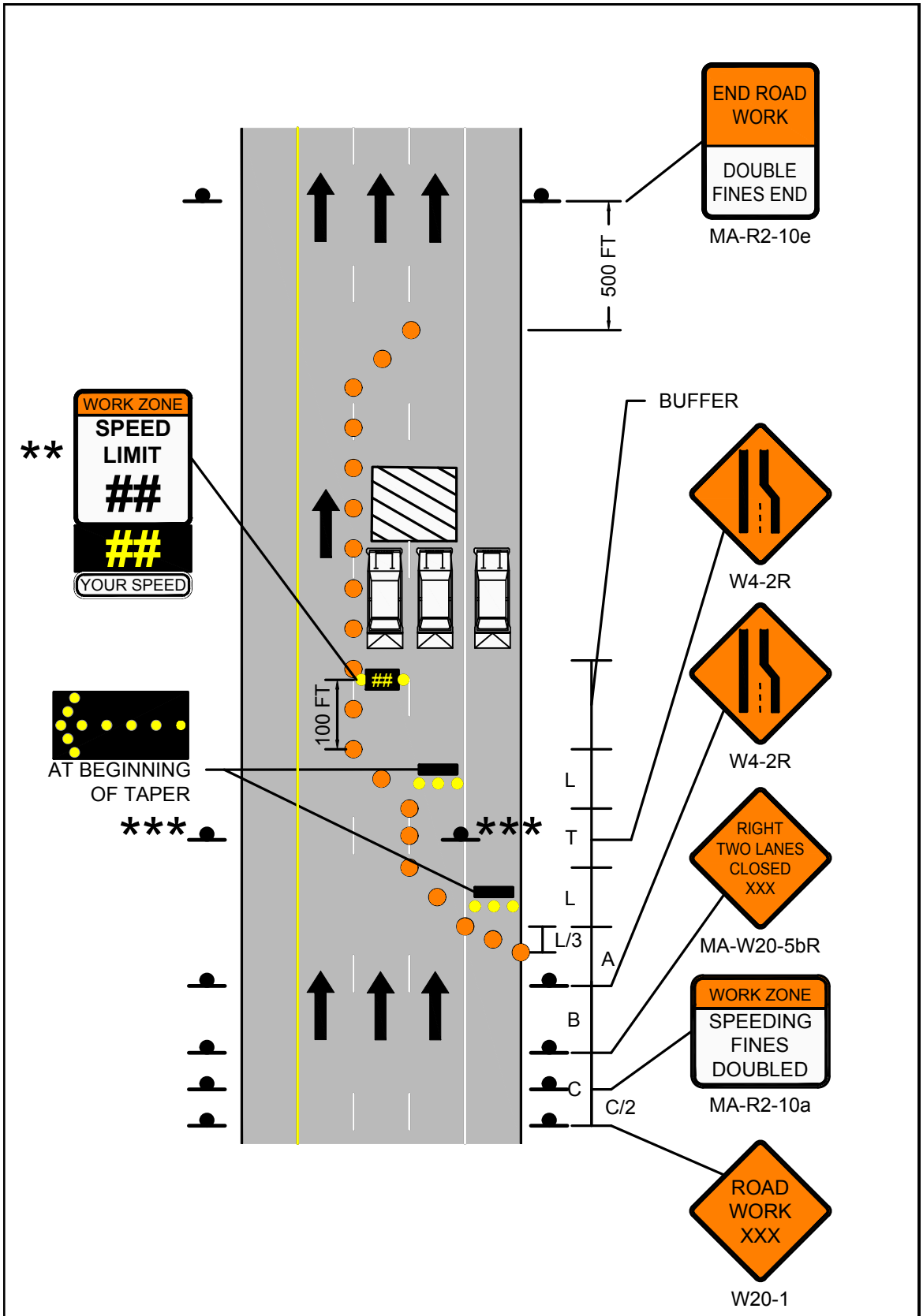


massDOT Massachusetts Department of Transportation Highway Division PAGE 37	Work Zone Safety Standard Details and Drawings	FIGURE 15 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR RIGHT/CENTER LANES CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 38	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR LEFT/CENTER LANES CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115

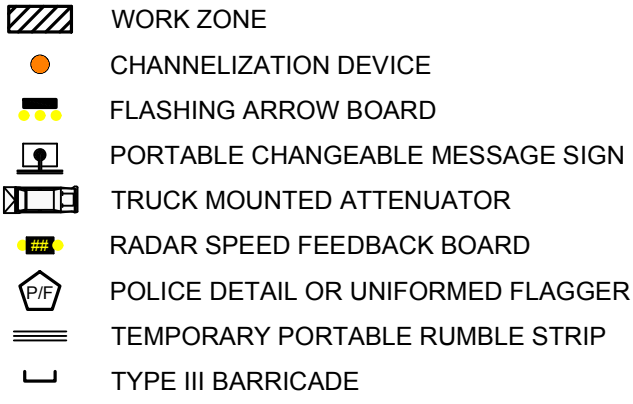
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
3. *** THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

LEGEND



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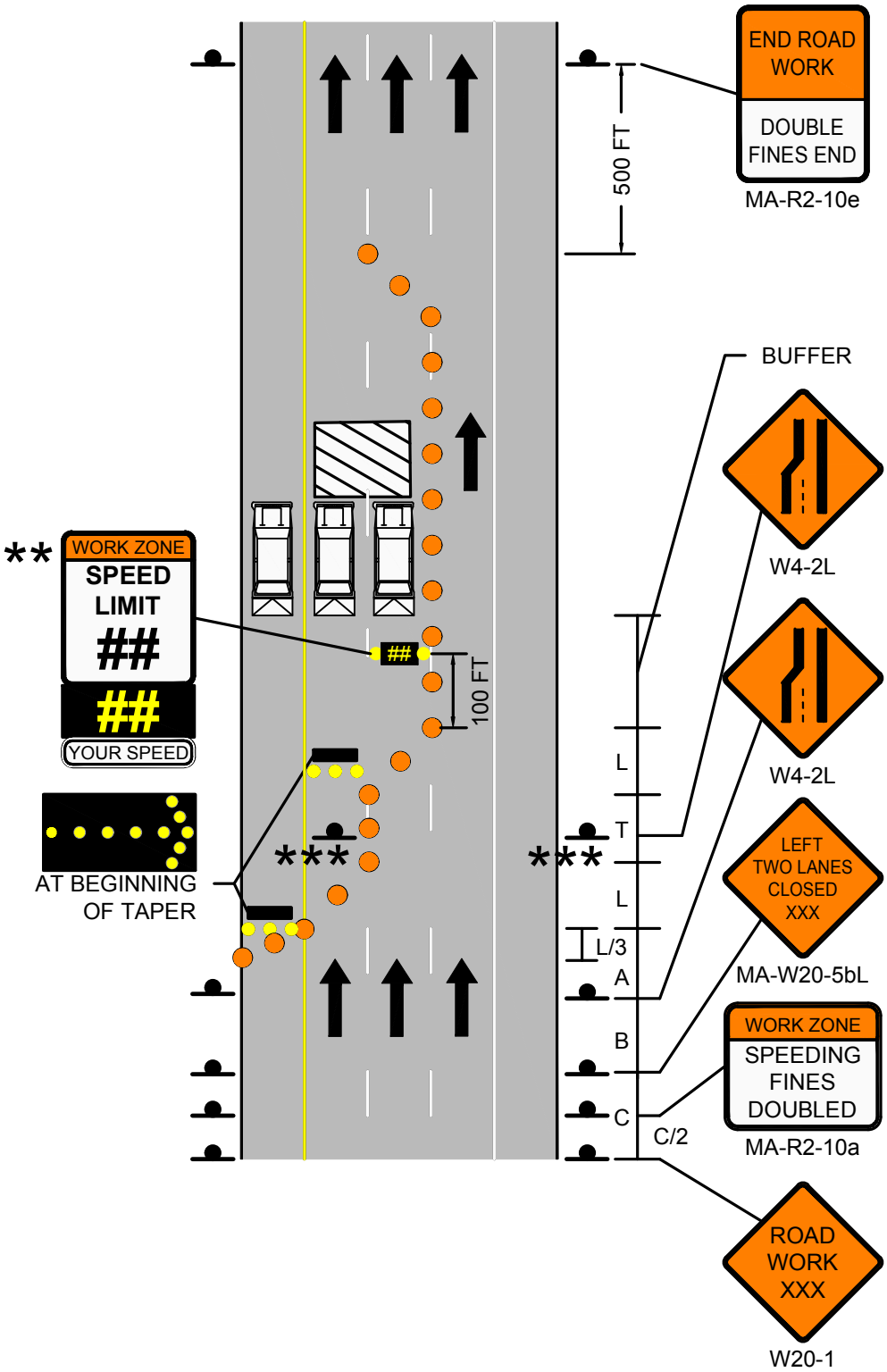


massDOT Massachusetts Department of Transportation Highway Division PAGE 39	Work Zone Safety Standard Details and Drawings	FIGURE 16 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR LEFT/CENTER LANES CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 40	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT SIDE OF OFF RAMP CLOSED

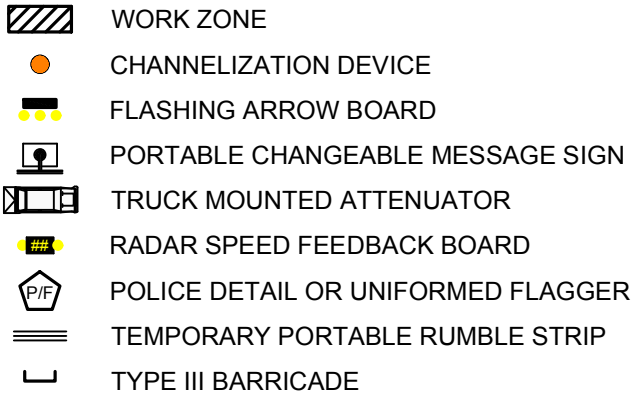
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



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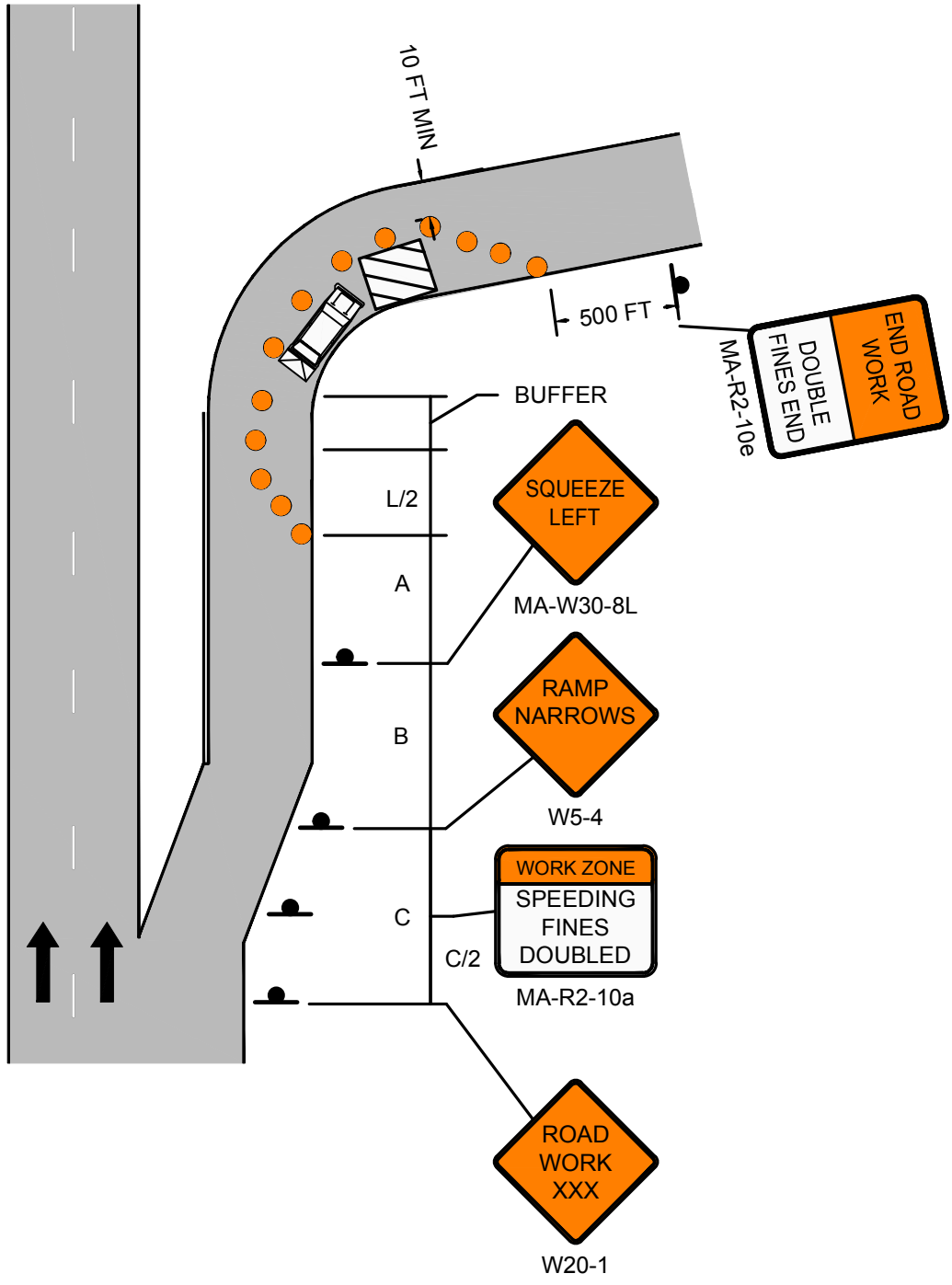


massDOT Massachusetts Department of Transportation Highway Division PAGE 41	Work Zone Safety Standard Details and Drawings	FIGURE 17 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT SIDE OF OFF RAMP CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 42	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT SIDE OF OFF RAMP CLOSED

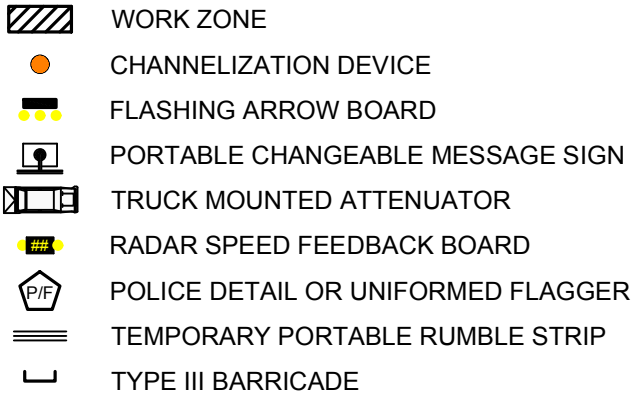
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



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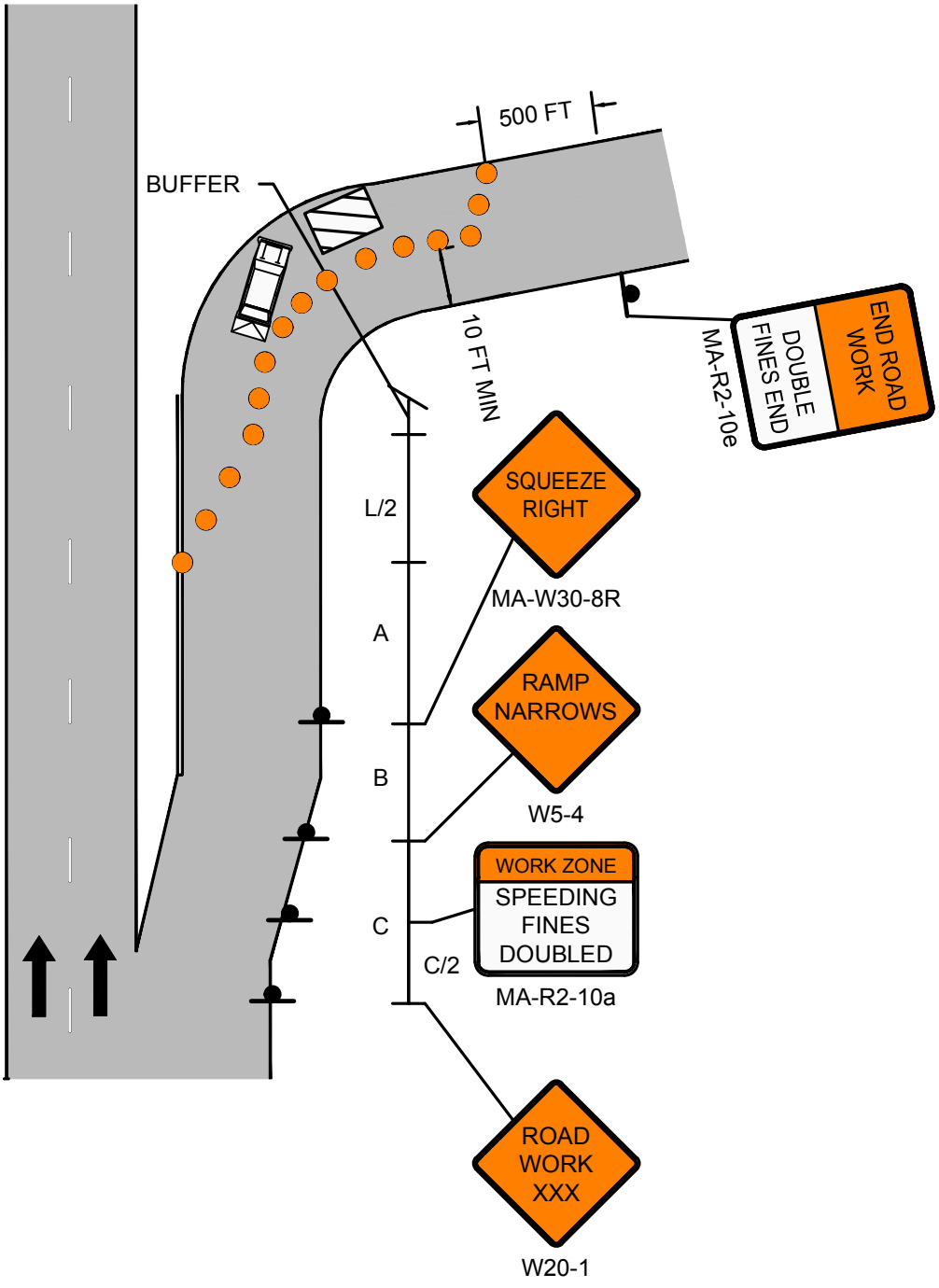


massDOT Massachusetts Department of Transportation Highway Division

Work Zone Safety Standard Details and Drawings

FIGURE 18
STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
LEFT SIDE OF OFF RAMP CLOSED

PAGE 43

massDOT Massachusetts Department of Transportation Highway Division PAGE 44	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND ON RAMP

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	175
45-55	220	660	495	40	135
60-65	260	780	645	40	155

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

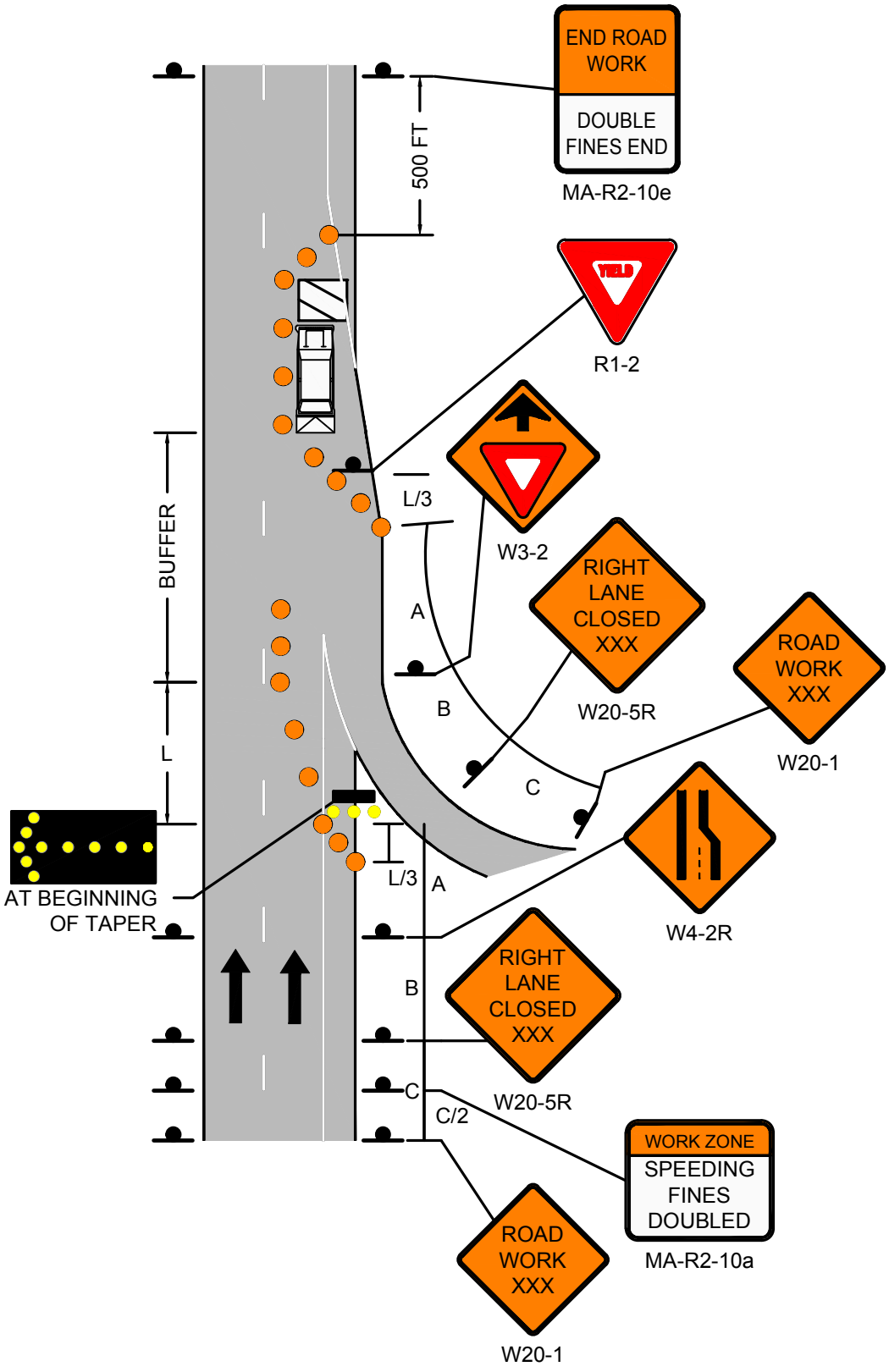
NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND

- WORK ZONE
- CHANNELIZATION DEVICE
- FLASHING ARROW BOARD
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK MOUNTED ATTENUATOR
- RADAR SPEED FEEDBACK BOARD
- POLICE DETAIL OR UNIFORMED FLAGGER
- TEMPORARY PORTABLE RUMBLE STRIP
- TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 45	Work Zone Safety Standard Details and Drawings	FIGURE 19 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND ON RAMP

massDOT Massachusetts Department of Transportation Highway Division PAGE 46	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND OFF RAMP

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	70
45-55	220	660	330	495	40	55
60-65	260	780	390	645	40	65

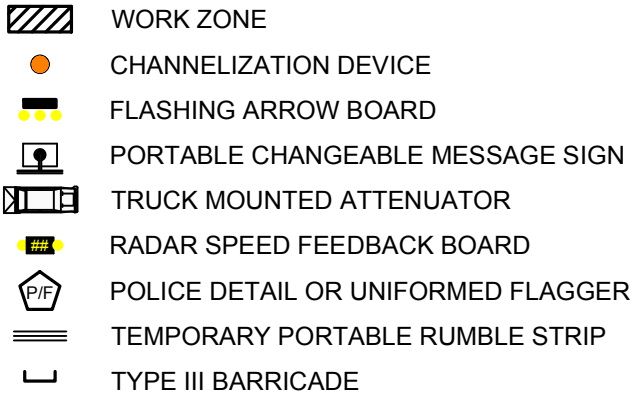
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

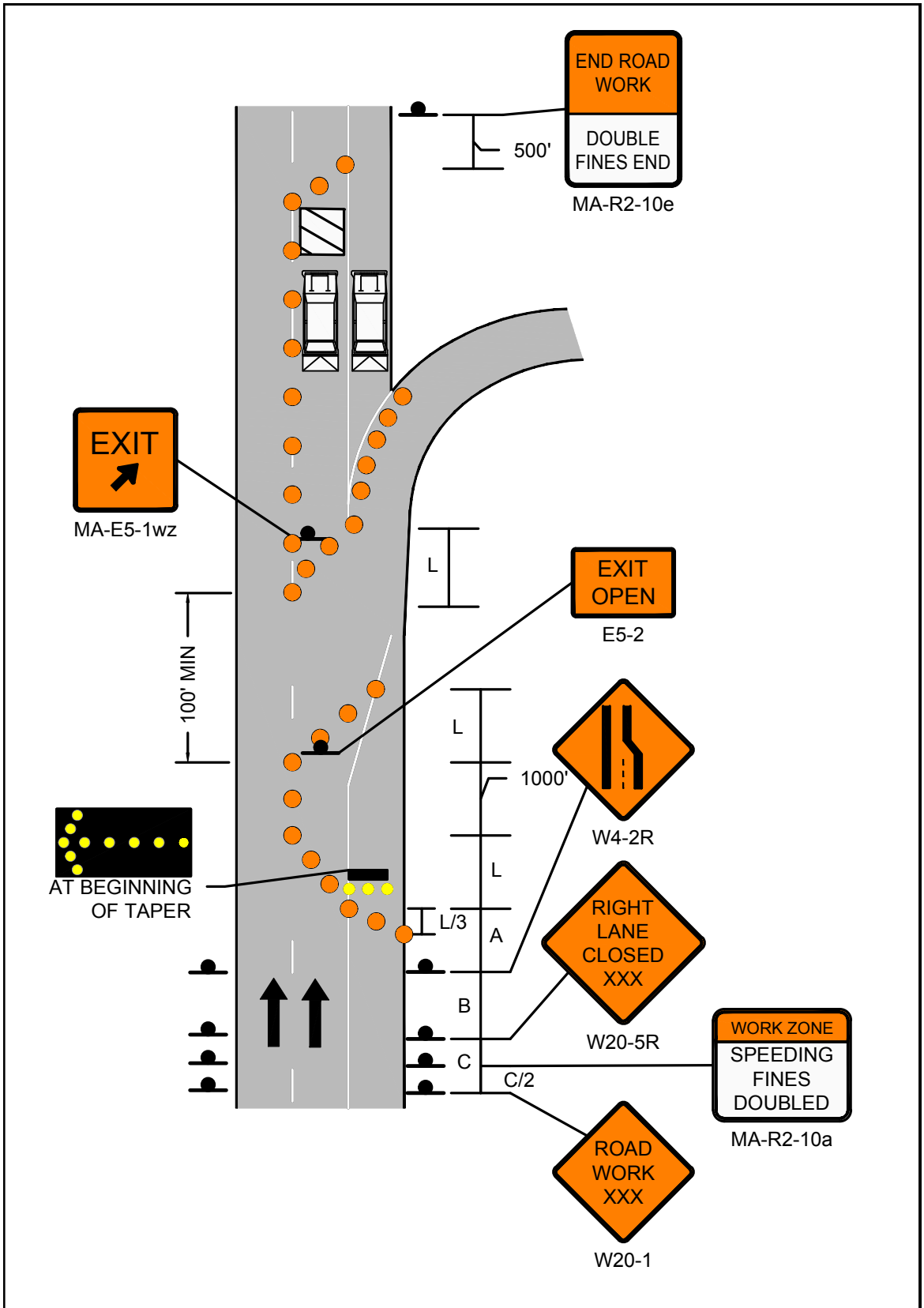
NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



NOT TO SCALE



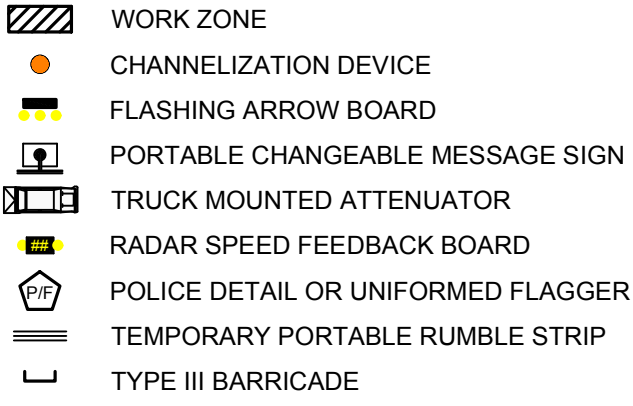
massDOT Massachusetts Department of Transportation Highway Division PAGE 47	Work Zone Safety Standard Details and Drawings	FIGURE 20 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND OFF RAMP

massDOT Massachusetts Department of Transportation Highway Division PAGE 48	Work Zone Safety Standard Details and Drawings	MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

NOTES
1. MA-R2-10a LOCATED AT C/2.
2. * NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. ** OPTIONAL AT ENGINEER'S DISCRETION.

LEGEND



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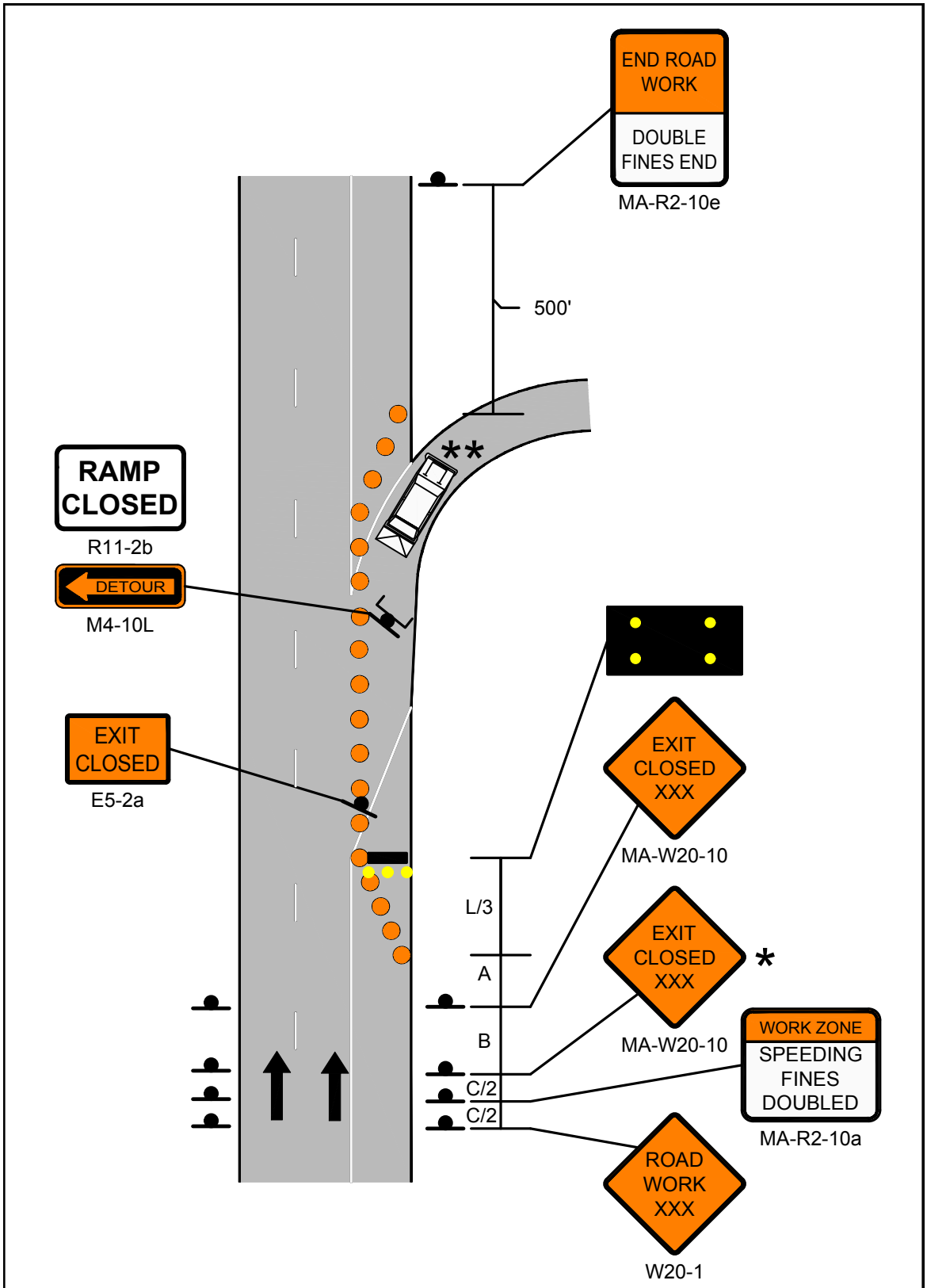


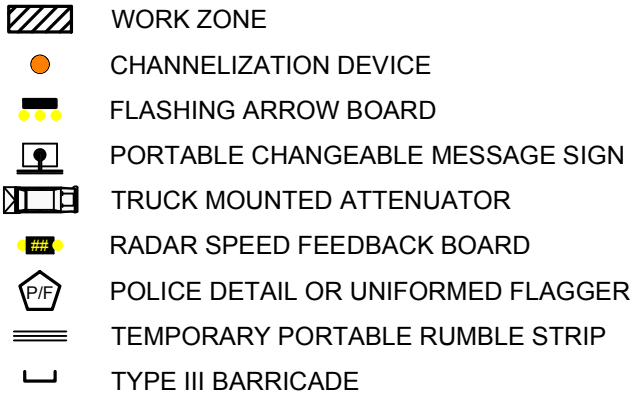
massDOT Massachusetts Department of Transportation Highway Division PAGE 49	Work Zone Safety Standard Details and Drawings	FIGURE 21 MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE

massDOT Massachusetts Department of Transportation Highway Division PAGE 50	Work Zone Safety Standard Details and Drawings	MULTILANE DIVIDED ROADWAY TYPICAL CLOVERLEAF RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

NOTES
1. MA-R2-10a LOCATED AT C/2.
2. * NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. ** OPTIONAL AT ENGINEER'S DISCRETION.

LEGEND



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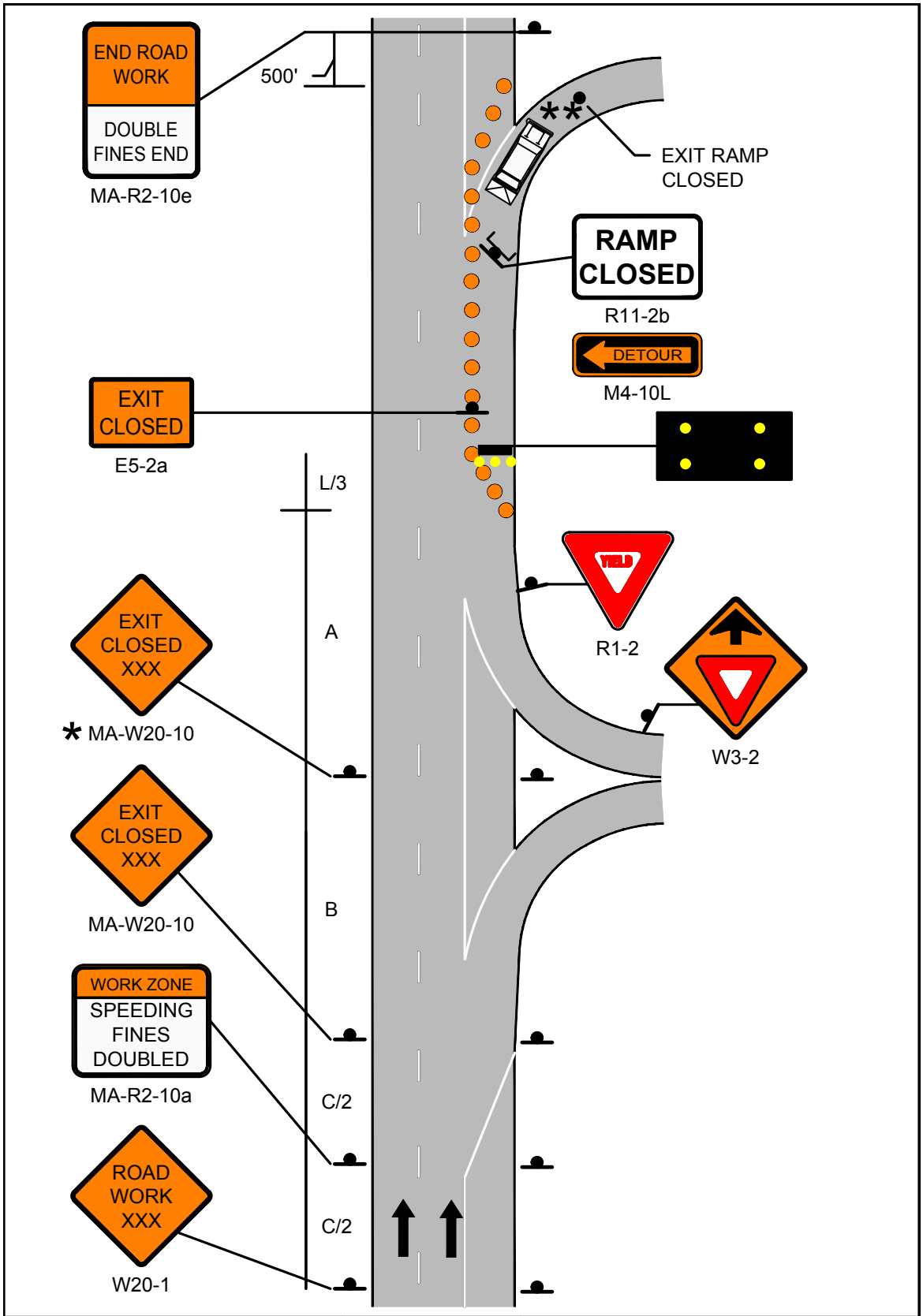


massDOT Massachusetts Department of Transportation Highway Division

Work Zone Safety Standard Details and Drawings

FIGURE 22
MULTILANE DIVIDED ROADWAY
TYPICAL CLOVERLEAF RAMP CLOSURE

massDOT Massachusetts Department of Transportation Highway Division PAGE 52	Work Zone Safety Standard Details and Drawings	MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE ADVANCE SIGNING

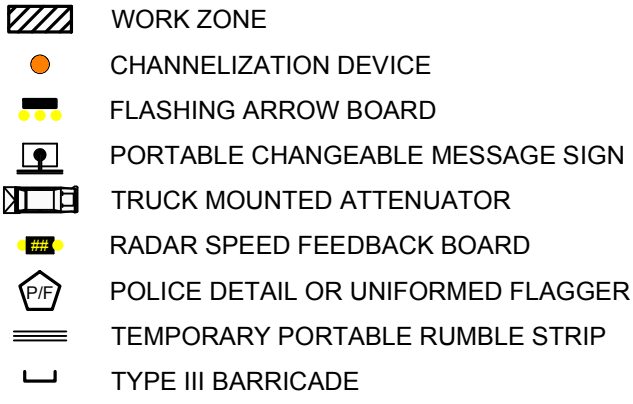
NOTES

1. IF THE CLOSED RAMP IS LOCATED DOWNSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED AT A SUFFICIENT DISTANCE IN ADVANCE OF THE DETOUR ROUTE/RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.

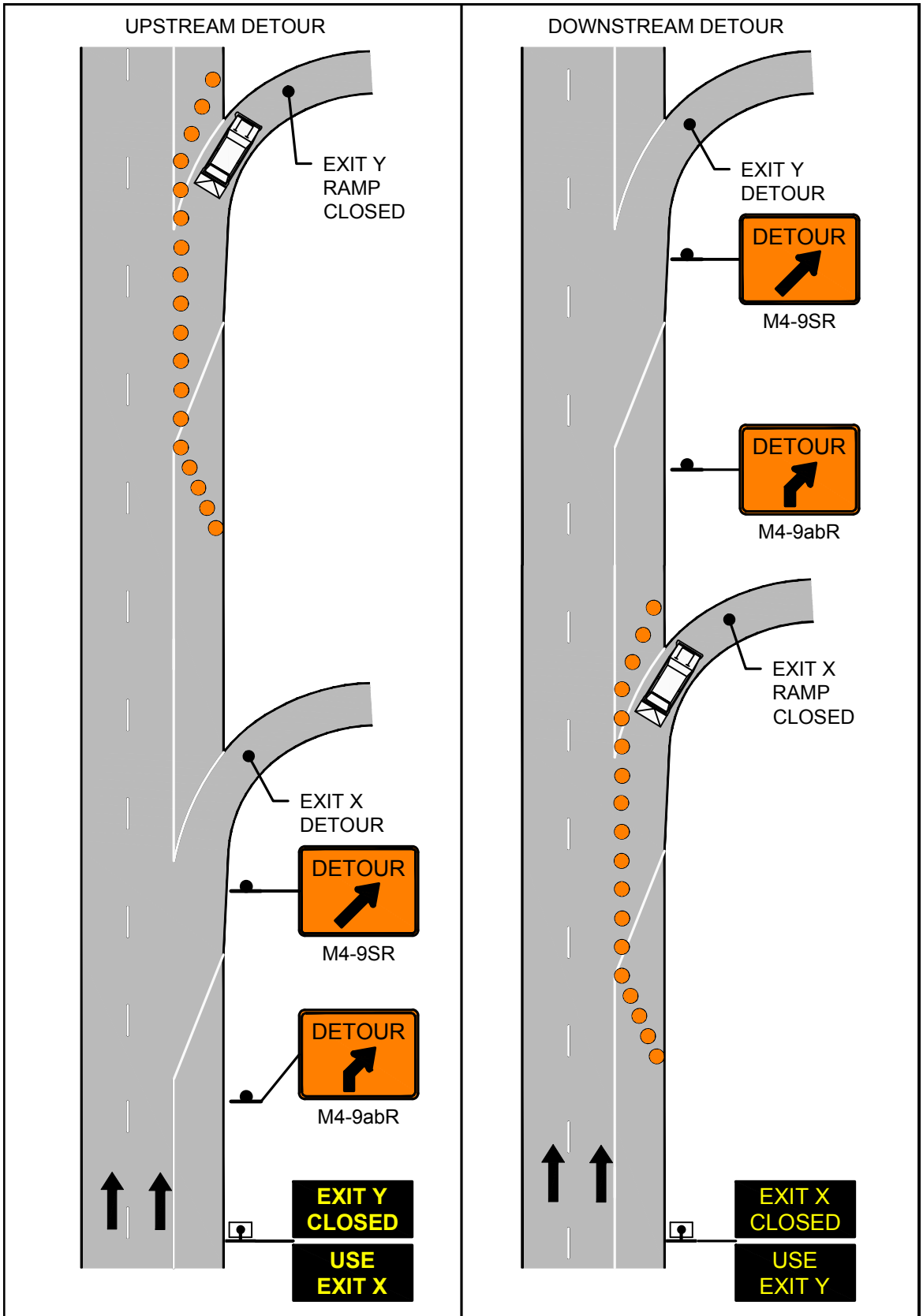
2. IF THE CLOSED RAMP IS LOCATED UPSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED PRIOR TO THE CLOSED RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.

3. A SUFFICIENT NUMBER OF DETOUR SIGNS (M4-9 SERIES) SHOULD BE DEPLOYED TO PROPERLY DIRECT DETOURED TRAFFIC. SIGN SPACING SHALL BE AT THE DIRECTION OF THE ENGINEER.

LEGEND



NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division

PAGE 53

Work Zone Safety
Standard Details
and Drawings

FIGURE 23
MULTILANE DIVIDED ROADWAY
TYPICAL RAMP CLOSURE
ADVANCE SIGNING

massDOT Massachusetts Department of Transportation Highway Division PAGE 54	Work Zone Safety Standard Details and Drawings	FIGURE 24-1 MULTILANE DIVIDED ROADWAY PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS SHEET 1 OF 2

POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
Above 55-mph	20-feet
36-mph to 55-mph	15-feet
35-mph and under	10-feet

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	TANGENT LENGTH BETWEEN TAPERS (T) (FT)
25-40	500 / 500 / 500	640
45-55	500 / 1000 / 1000	1320
60-65	1000 / 1600 / 2600	1560

NOTES

1. THE INTENTION OF THESE DETAILS IS ONLY TO DEPICT THE PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS (TPRS) IN RELATIONSHIP TO THE TAPER AND THE BUFFER OF A SINGLE- OR MULTI-LANE CLOSURE. THE DEPICTION OF THE NUMBER AND SPACING OF ALL OTHER TRAFFIC CONTROL DEVICES IS NOT TO SCALE. REFER TO OTHER DETAILS FOR LANE CLOSURES FOR THE PLACEMENT AND NUMBER OF ALL OTHER TRAFFIC CONTROL DEVICES.
2. THESE DETAILS ONLY DEPICT RIGHT LANE CLOSURES. LEFT LANE CLOSURES SHOULD UTILIZE A MIRROR IMAGE OF THESE SETUPS, STARTING WITH CLOSURE OF THE LEFTMOST LANE.
3. * THIS TPRS ARRAY IS OPTIONAL AT THE ENGINEER'S DISCRETION. IF USED, IT SHOULD BE PLACED ADJACENT TO THE BUFFER.
4. DETAILS SHOW THE MINIMUM NUMBER OF TPRS REQUIRED. ADDITIONAL MAY BE USED IF CONDITIONS WARRANT.

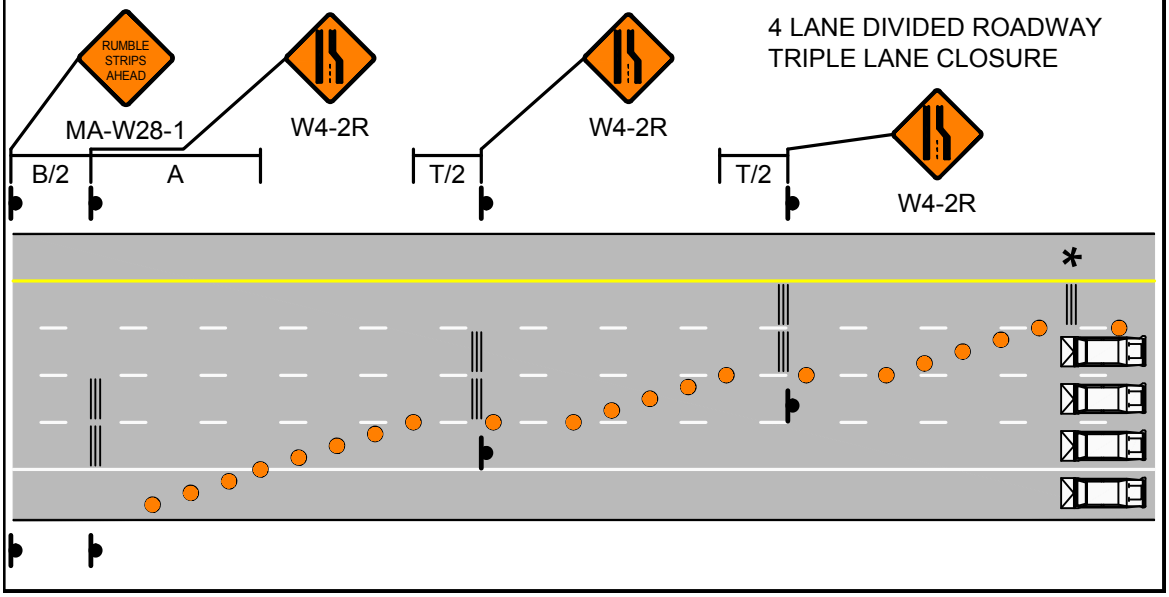
LEGEND

CHANNELIZATION DEVICE

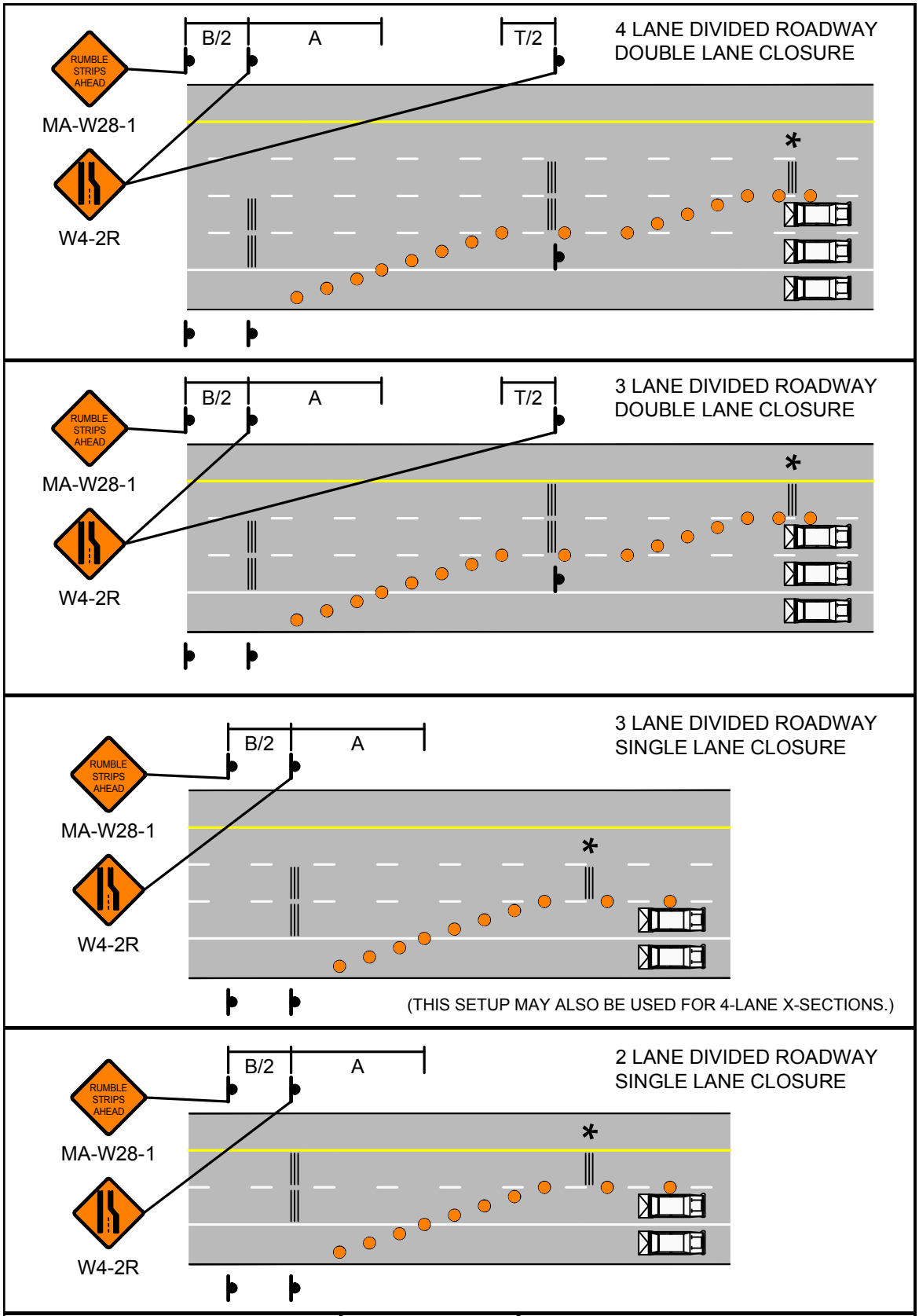
TRUCK MOUNTED ATTENUATOR

TEMPORARY PORTABLE RUMBLE STRIP

NOT TO SCALE



4 LANE DIVIDED ROADWAY
TRIPLE LANE CLOSURE



massDOT Massachusetts Department of Transportation Highway Division

PAGE 55

Work Zone Safety Standard Details and Drawings

FIGURE 24-2
MULTILANE DIVIDED ROADWAY
PLACEMENT OF TEMPORARY
PORTABLE RUMBLE STRIPS
SHEET 2 OF 2

massDOT Massachusetts Department of Transportation Highway Division PAGE 56	Work Zone Safety Standard Details and Drawings	NOTES FOR MOBILE OPERATIONS

Notes for Mobile Operations

- Unless otherwise stated, these notes shall apply to all Mobile Operation setups.
- Additional, setup-specific notes may be found on individual sheets.

1. The Supervisor shall travel the designated roadway prior to scheduling the work to ensure that sufficient and appropriate traffic control devices will be available. Special consideration shall be exercised to ensure that appropriate traffic controls be placed in areas that will have limited visibility of the work areas or any associated traffic queues.

2. Vehicles used for these operations shall be made highly visible with appropriate equipment such as flashing lights, rotating beacons, flags, signs, flashing arrow boards, and/or portable changeable message signs. Any signs mounted to these vehicles shall not obscure the visibility of other devices.

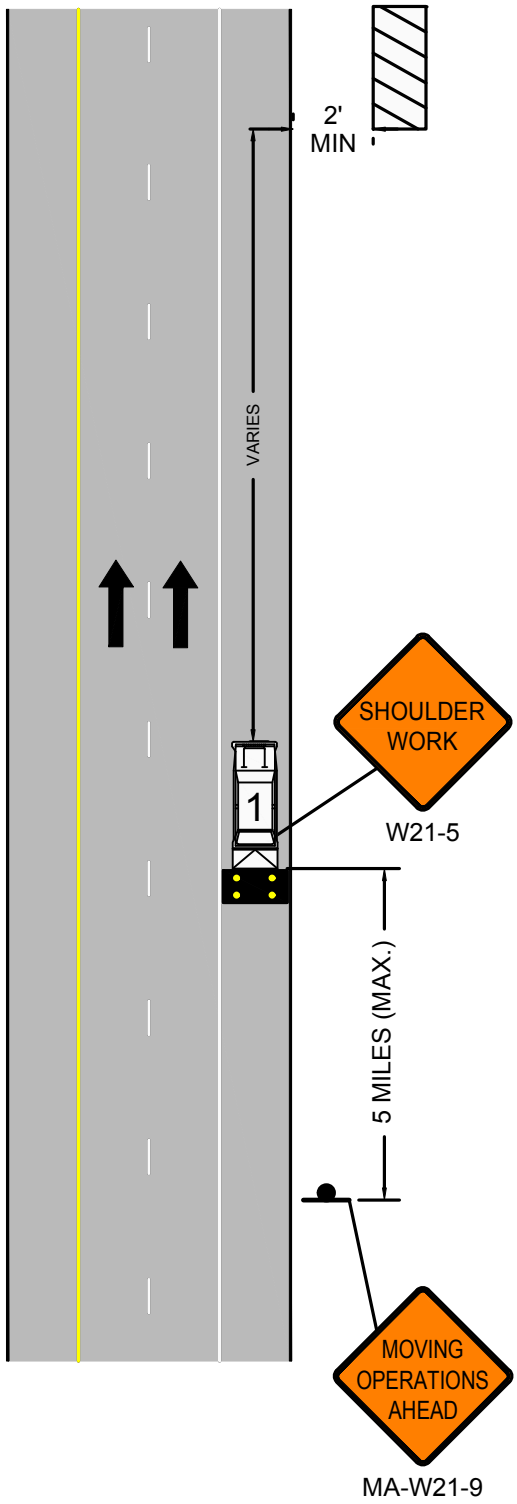
3. All vehicles shown may not be required based upon roadway conditions. However, when needed and practical, additional shadow vehicles and equipment to warn and protect motorists and workers should be used. Based upon roadway conditions, the addition of a police detail with cruiser may be used for additional protection or warning for the traveling public.

4. The distance between the work and shadow vehicle(s) may vary according to the terrain and other factors. Shadow vehicles are used to warn traffic of the operations ahead. Whenever adequate sight distance exists, the shadow vehicle(s) should maintain the minimum appropriate distance and maintain the same speed to prevent non-work related vehicles from entering the work convoy. If this formation cannot be maintained then additional traffic control devices should be deployed in advance of any vertical or horizontal curves that may restrict the sight distance of an oncoming vehicle to either the work vehicle or associated traffic queue.

5. All shadow vehicles shall be equipped with a truck or trailer mounted attenuator (TMA) and a flashing arrow board.

6. Signs should be covered or turned from view when work is not in progress.

7. Portable changeable message signs may be used in lieu of MA-W21-9 signs and any signs mounted directly to a shadow vehicle.



LEGEND

WORK ZONE

SHADOW VEHICLE

FLASHING ARROW BOARD
(WITH STATUS)

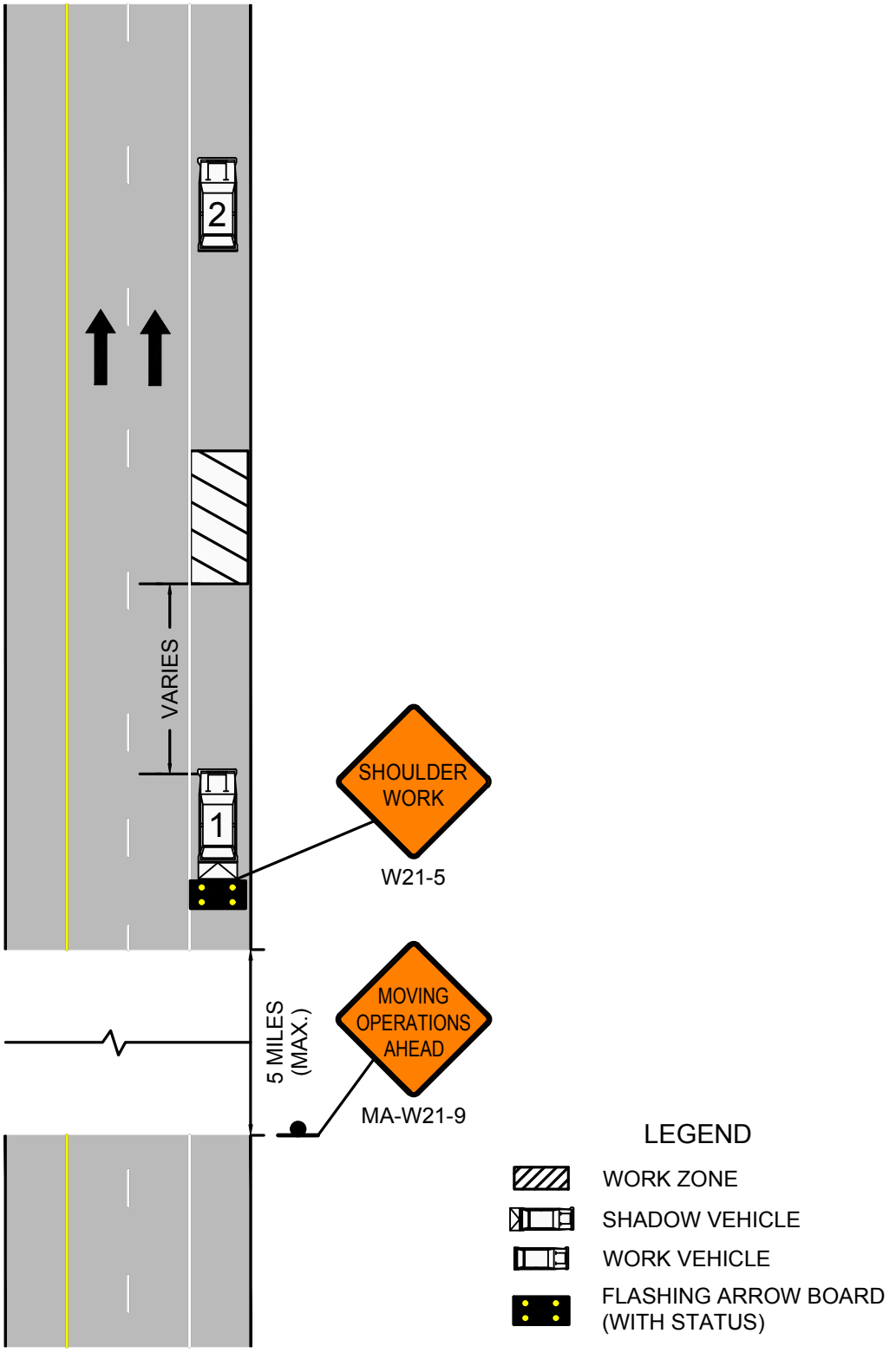
NOT TO SCALE

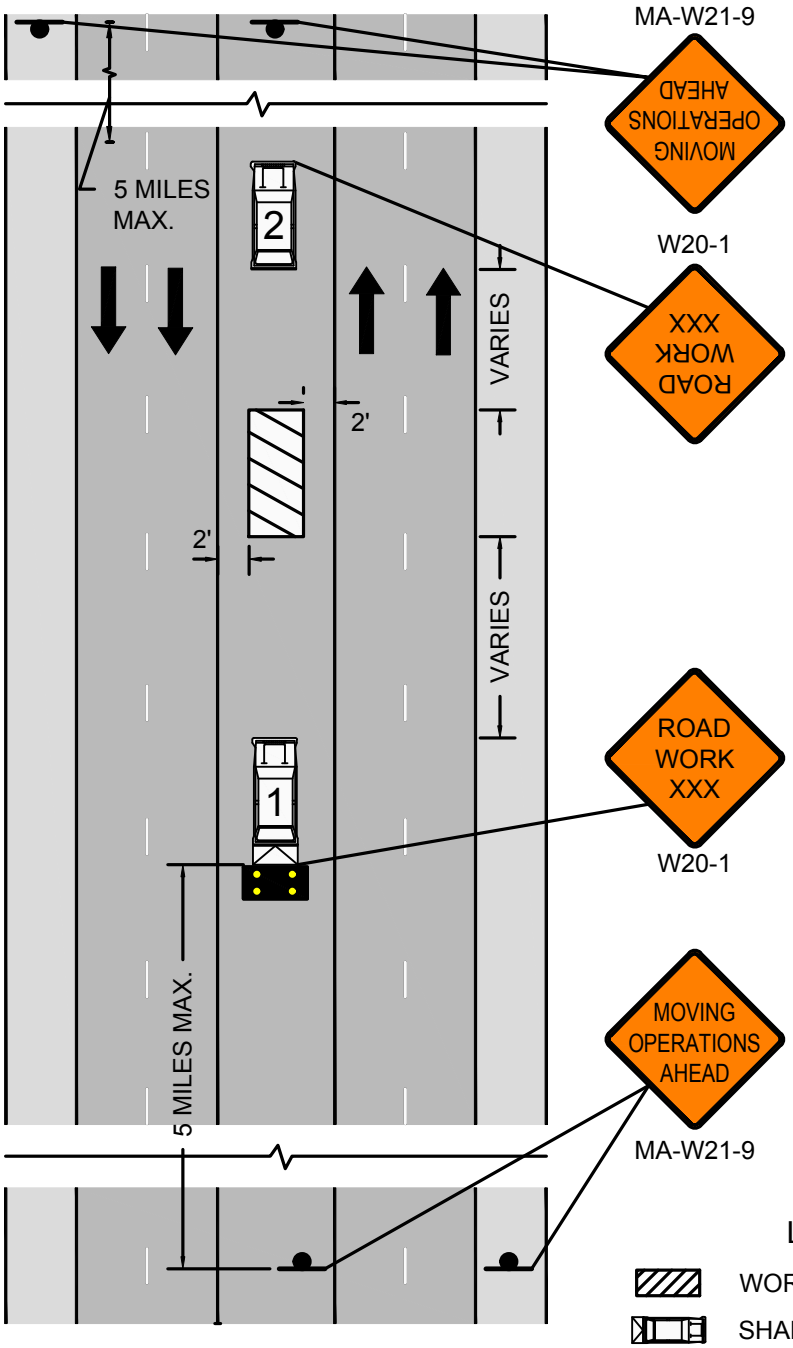
NOTES

1. IF THE WORK AREA IS SUFFICIENTLY AWAY FROM THE EDGE OF ROADWAY (20' MINIMUM) THEN SIGNS AND VEHICLES MAY NOT BE REQUIRED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 57	Work Zone Safety Standard Details and Drawings	FIGURE 25 MOBILE OPERATIONS ANY ROADWAY BEYOND RIGHT SHOULDER

massDOT Massachusetts Department of Transportation Highway Division PAGE 58	Work Zone Safety Standard Details and Drawings	FIGURE 26 MOBILE OPERATIONS ANY ROADWAY SHOULDER





LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

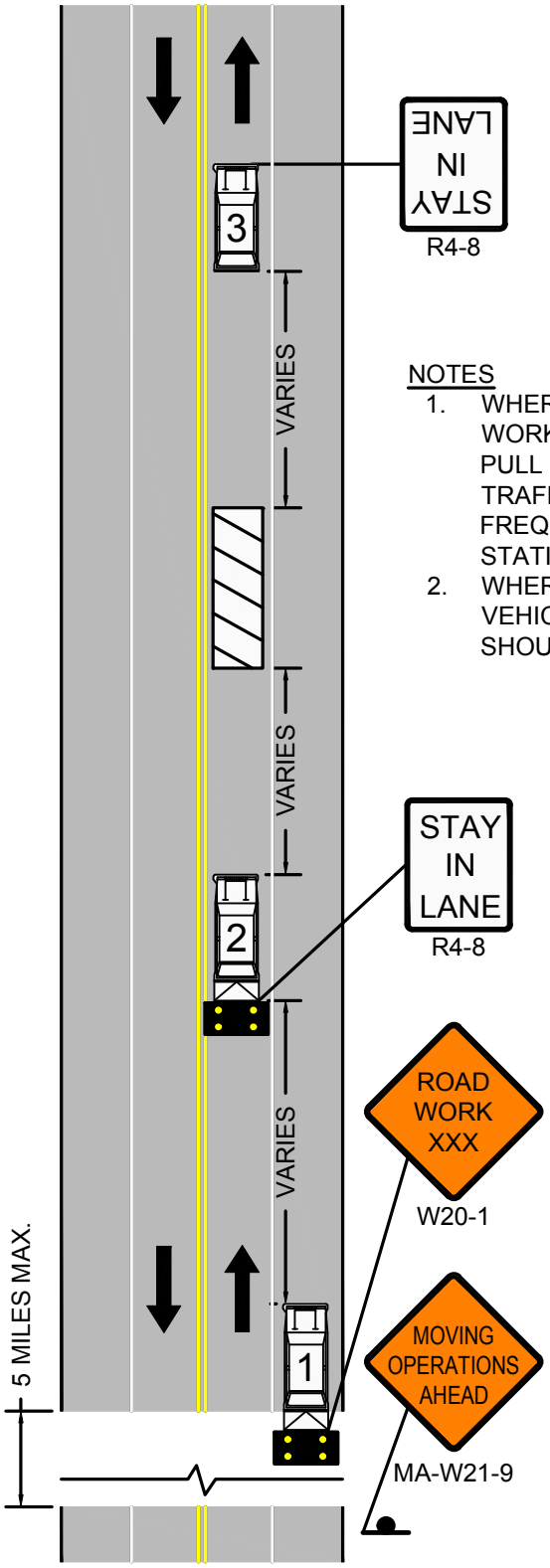
NOT TO SCALE

NOTES

1. IF THE 2' OFFSET CANNOT BE MAINTAINED, A SHORT-TERM STATIONARY SETUP SHOULD BE USED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 59	Work Zone Safety Standard Details and Drawings	FIGURE 27 MOBILE OPERATIONS DIVIDED ROADWAY MEDIAN WORK

massDOT Massachusetts Department of Transportation Highway Division PAGE 60	Work Zone Safety Standard Details and Drawings	FIGURE 28 MOBILE OPERATIONS UNDIVIDED TWO LANE ROADWAY HALF OF ROADWAY CLOSED



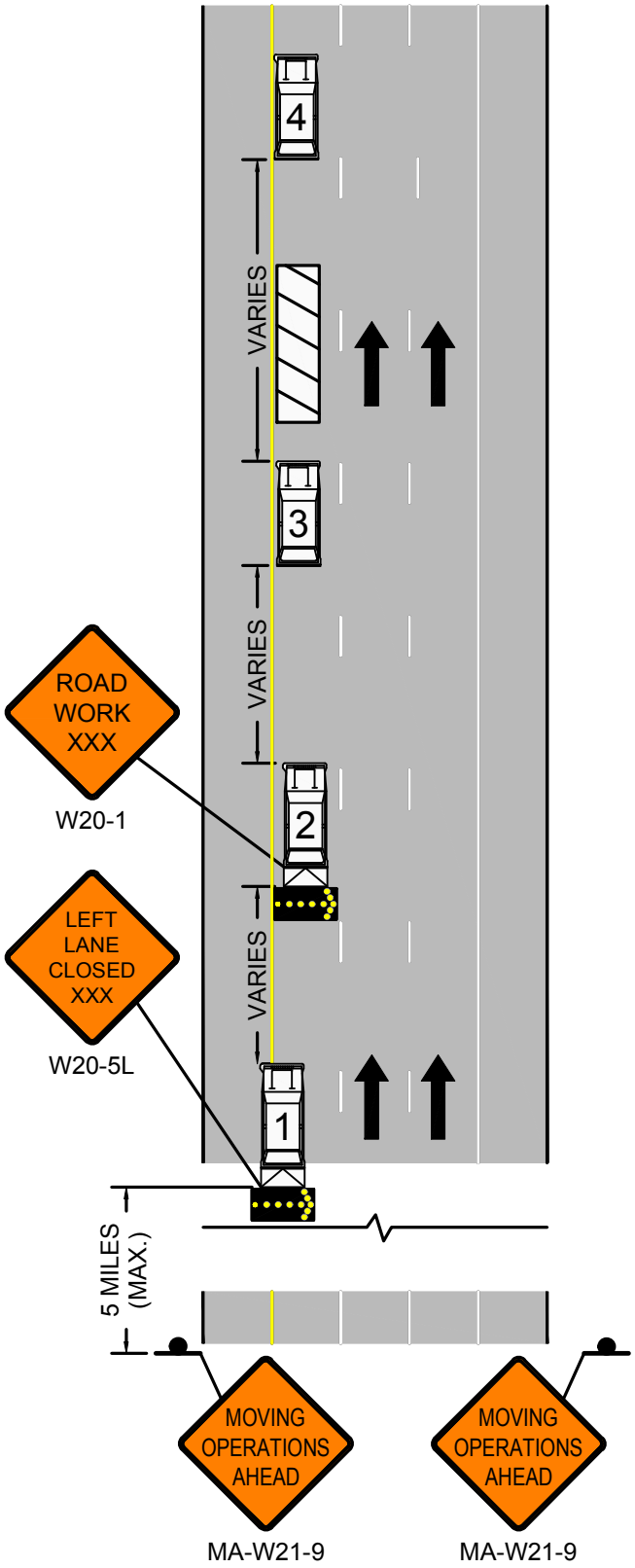
NOTES

1. WHERE PRACTICAL AND WHEN NEEDED, THE WORK AND SHADOW VEHICLE(S) SHOULD PULL OVER PERIODICALLY TO ALLOW TRAFFIC TO PASS. IF THIS CANNOT BE DONE FREQUENTLY, THEN AN ALTERNATE STATIONARY SETUP SHALL BE DEPLOYED.
2. WHERE A WIDE SHOULDER EXISTS, SHADOW VEHICLE #1 SHOULD DRIVE ON THE SHOULDER.

LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE



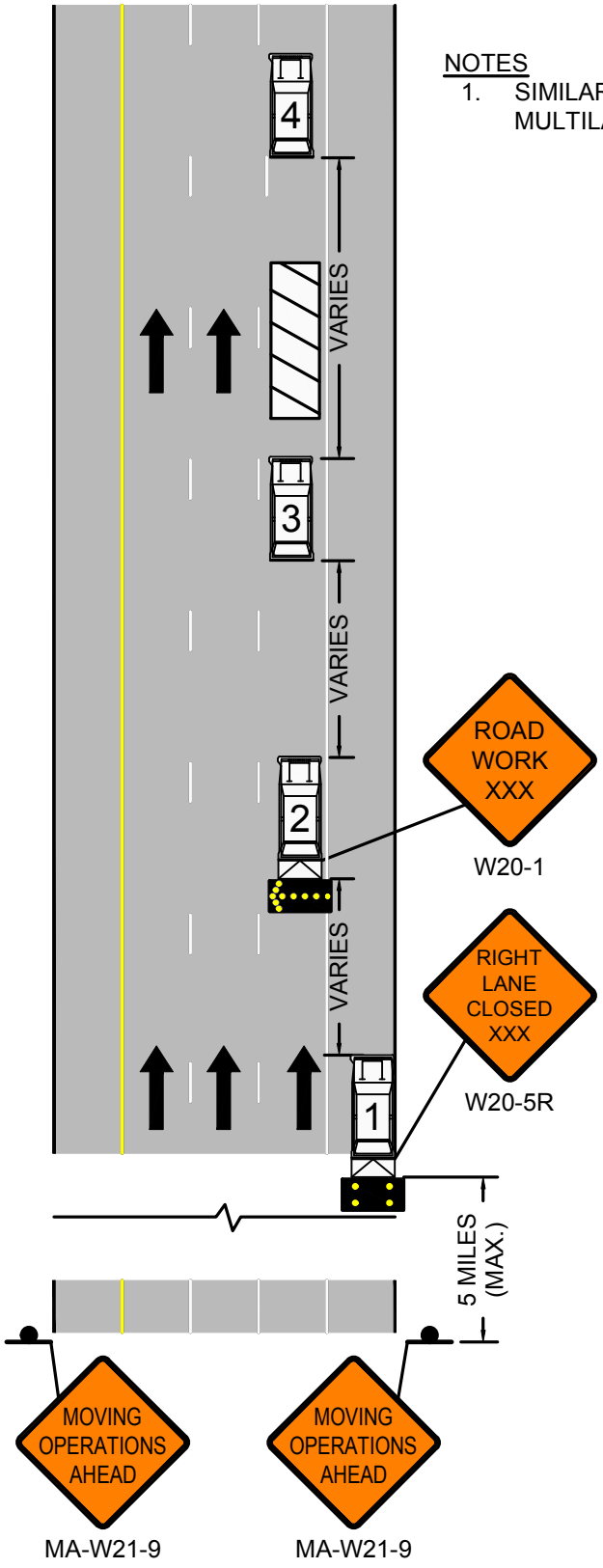
LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE

massDOT Massachusetts Department of Transportation Highway Division PAGE 61	Work Zone Safety Standard Details and Drawings	FIGURE 29 MOBILE OPERATIONS MULTILANE DIVIDED ROADWAY LEFT LANE

massDOT Massachusetts Department of Transportation Highway Division PAGE 62	Work Zone Safety Standard Details and Drawings	FIGURE 30 MOBILE OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT LANE



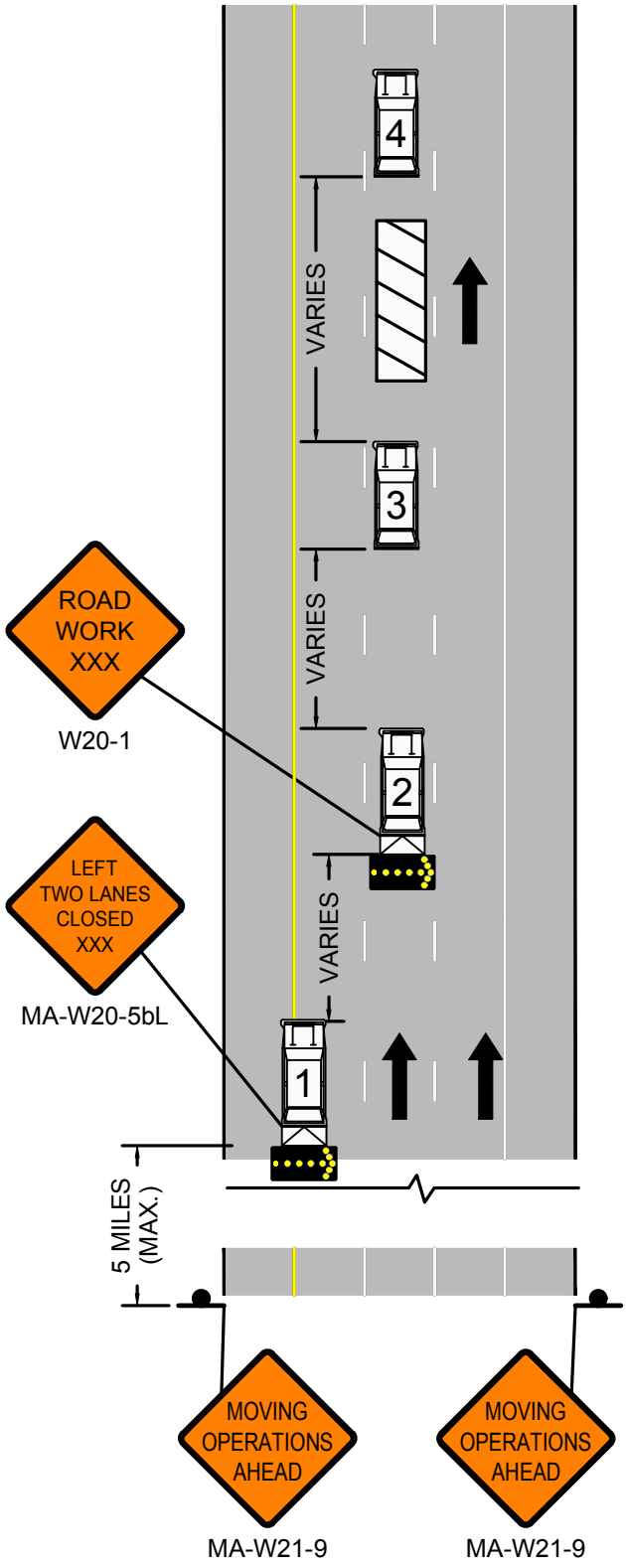
NOTES

1. SIMILAR SETUP MAY BE USED FOR A MULTILANE UNDIVIDED HIGHWAY.

LEGEND

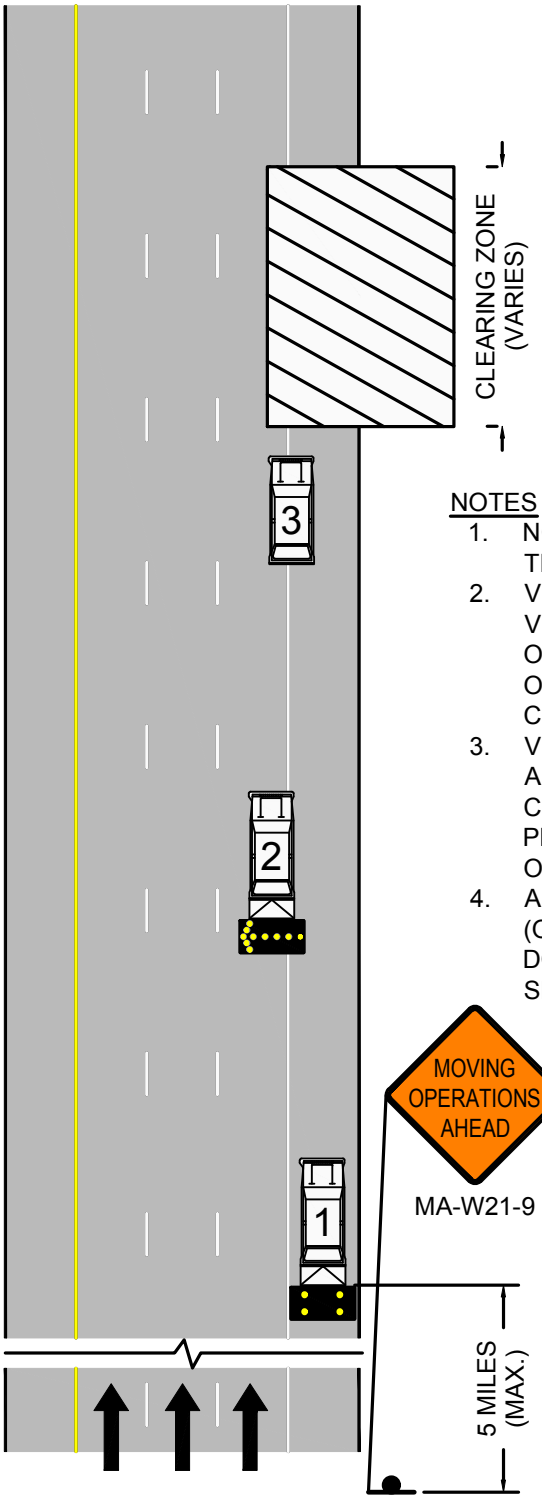
- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 63	Work Zone Safety Standard Details and Drawings	FIGURE 31 MOBILE OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE

massDOT Massachusetts Department of Transportation Highway Division PAGE 64	Work Zone Safety Standard Details and Drawings	FIGURE 32 MOBILE OPERATIONS POST-STORM CLEANUP OPERATION



NOTES

1. NO OTHER NOTES ARE APPLICABLE TO THIS DETAIL.
2. VEHICLE #3 IS A SNOW/DEBRIS REMOVAL VEHICLE AND SHALL ALWAYS BE AWARE OF THE SURROUNDINGS. MORE THAN ONE VEHICLE MAY BE USED IN THE CLEARING ZONE.
3. VEHICLE #1 SHOULD BE EQUIPPED WITH A PCMS, A TMA, AND STAY IN VISUAL CONTACT WITH VEHICLE #3 WHILE PROVIDING AMPLE WARNING TO ONCOMING TRAFFIC.
4. A POLICE DETAIL WITH BLUE LIGHTS (OPTIONAL) SHALL REMAIN DOWNSTREAM OF VEHICLE #1 IN THE SHOULDER.

LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

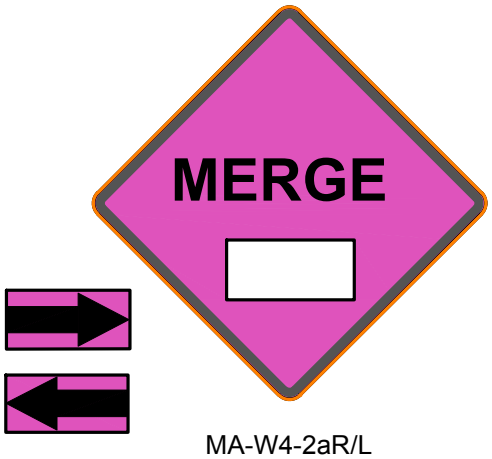
NOT TO SCALE

Notes for Traffic Emergency or Incident Operations

- The goal is to increase awareness of during traffic emergencies or incidents.
- These signs are to be used to differentiate from the traditional construction work zone and an emergency or incident.
- Upon arrival MassDOT First Responders shall assess the magnitude of the scene to determine if the incident is likely to last an hour or more in duration which would trigger the requirement to use these signs.
- Place the "Emergency Ahead" sign on the same side of the road as the incident, if possible, for up to an hour. Emergency response signs should be put up for all incidents and emergencies as soon as possible.
- Place the emergency sign 500 to 1000 feet before the first channelization devices.
- As an incident evolves this sign would be used as a secondary sign with all other emergency controls put in place.
- Only use "MERGE" signs where applicable (Not on 2 lane roads).
- Use MERGE signs on Multi-lane Roads to move traffic away from the incident and keep them in a safe lane.
- Place the MERGE sign about 500 feet before the closure.
- If additional signs are available, they should be placed accordingly as a sign informing people coming in the other direction or on the opposite side of the roadway.
- Use 12 emergency cones spaced 40 to 80 feet apart to form a taper and protect the scene.
- Sequential flashing lights/flares may be used in lieu of or to supplement cones.
- During a major incident that will last for a long duration, the EMERGENCY AHEAD sign should be moved back before an intersecting road or ramp to alert travelers and give them an option of using an alternate route. (Be sure all other devices are in place before moving this sign).

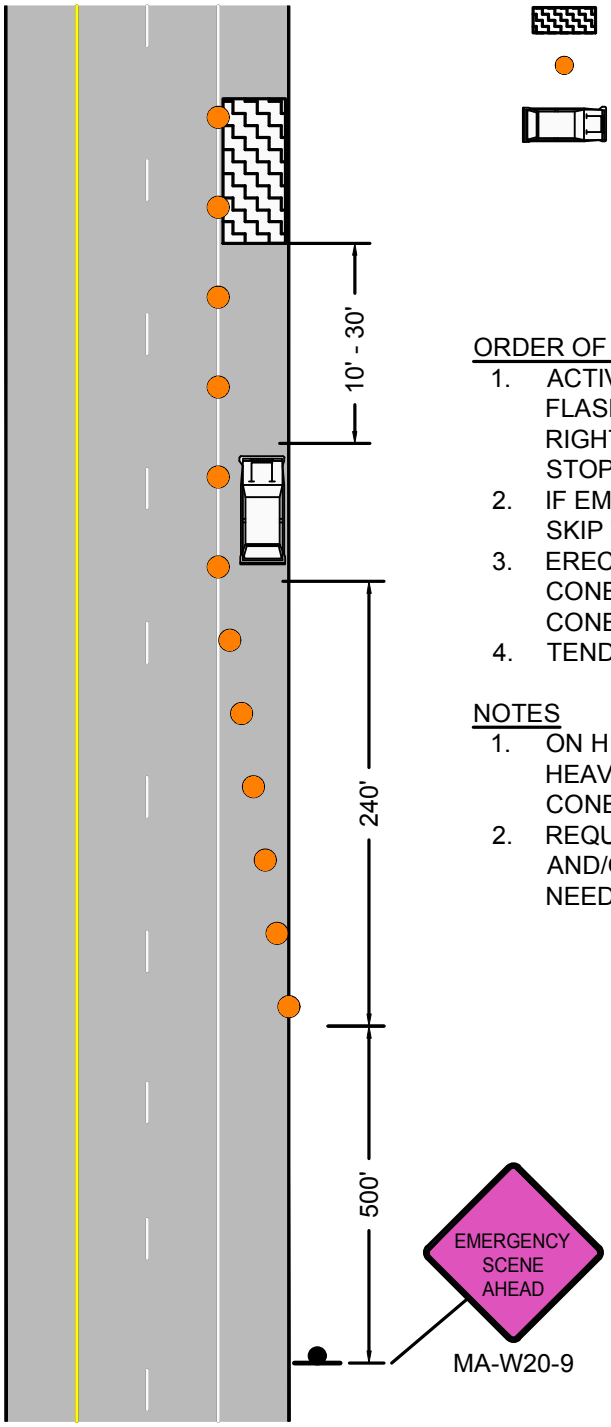
Standard Emergency Signs (36"x36" or 48"x48")

MA-W20-9



MA-W4-2aR/L

massDOT Massachusetts Department of Transportation Highway Division PAGE 66	Work Zone Safety Standard Details and Drawings	FIGURE 33 EMERGENCY RESPONSE ANY ROADWAY SHOULDER ENCROACHMENT



LEGEND

EMERGENCY AREA

CHANNELIZATION DEVICE

EMERGENCY RESPONSE VEHICLE

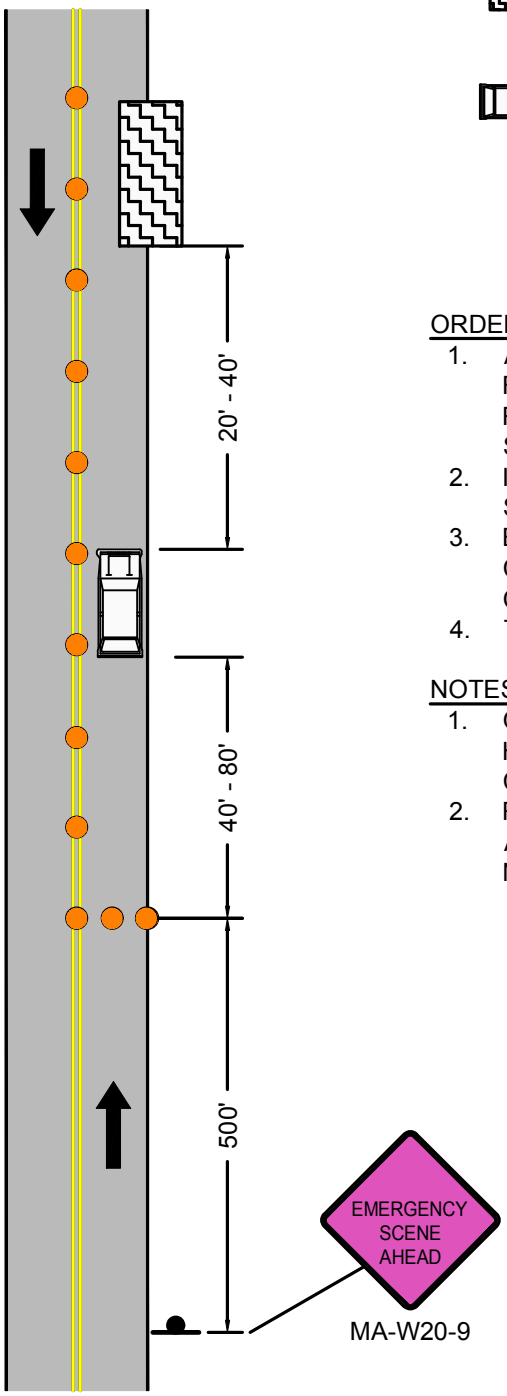
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



LEGEND

EMERGENCY AREA

CHANNELIZATION DEVICE

EMERGENCY RESPONSE VEHICLE

NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

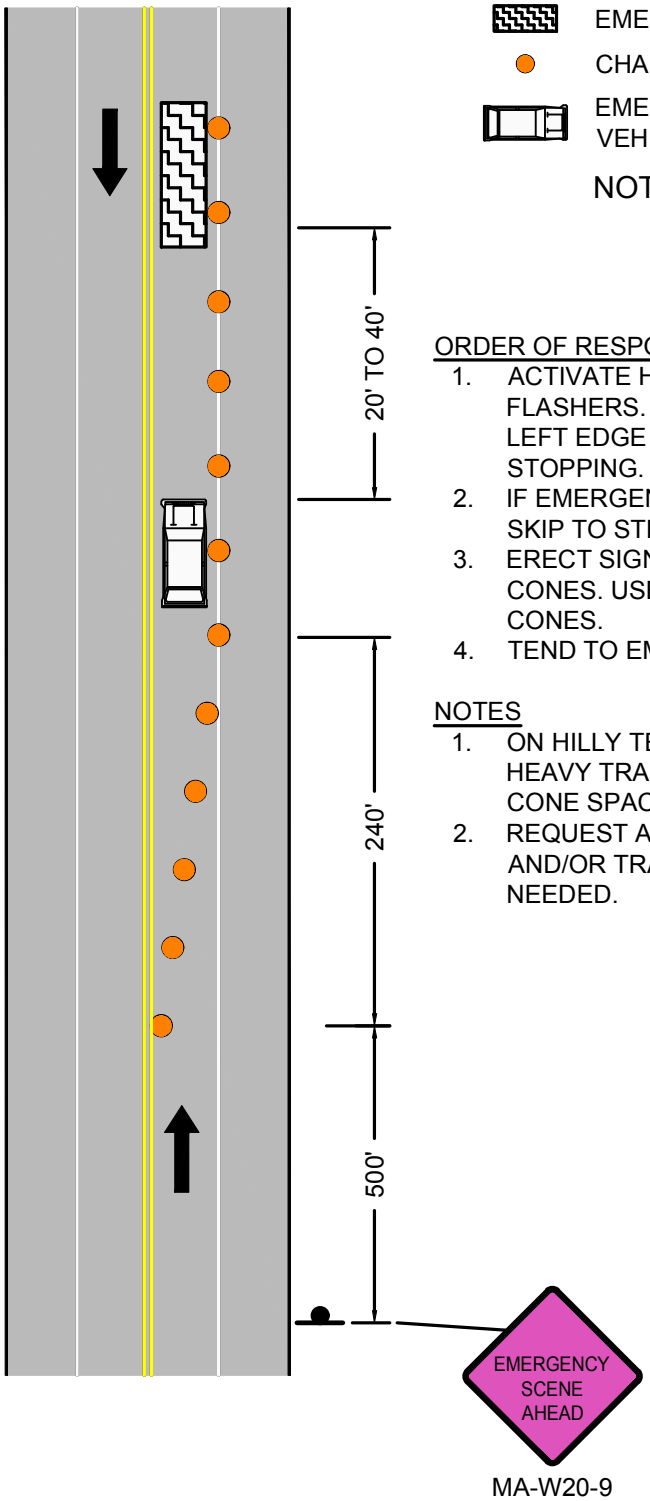
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 67	Work Zone Safety Standard Details and Drawings	FIGURE 34 EMERGENCY RESPONSE TWO LANE ROADWAY NO SHOULDER TRAVEL LANE ENCROACHMENT

massDOT Massachusetts Department of Transportation Highway Division PAGE 68	Work Zone Safety Standard Details and Drawings	FIGURE 35 EMERGENCY RESPONSE TWO LANE ROADWAY TRAVERSABLE SHOULDER SINGLE LANE ENCROACHMENT



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE

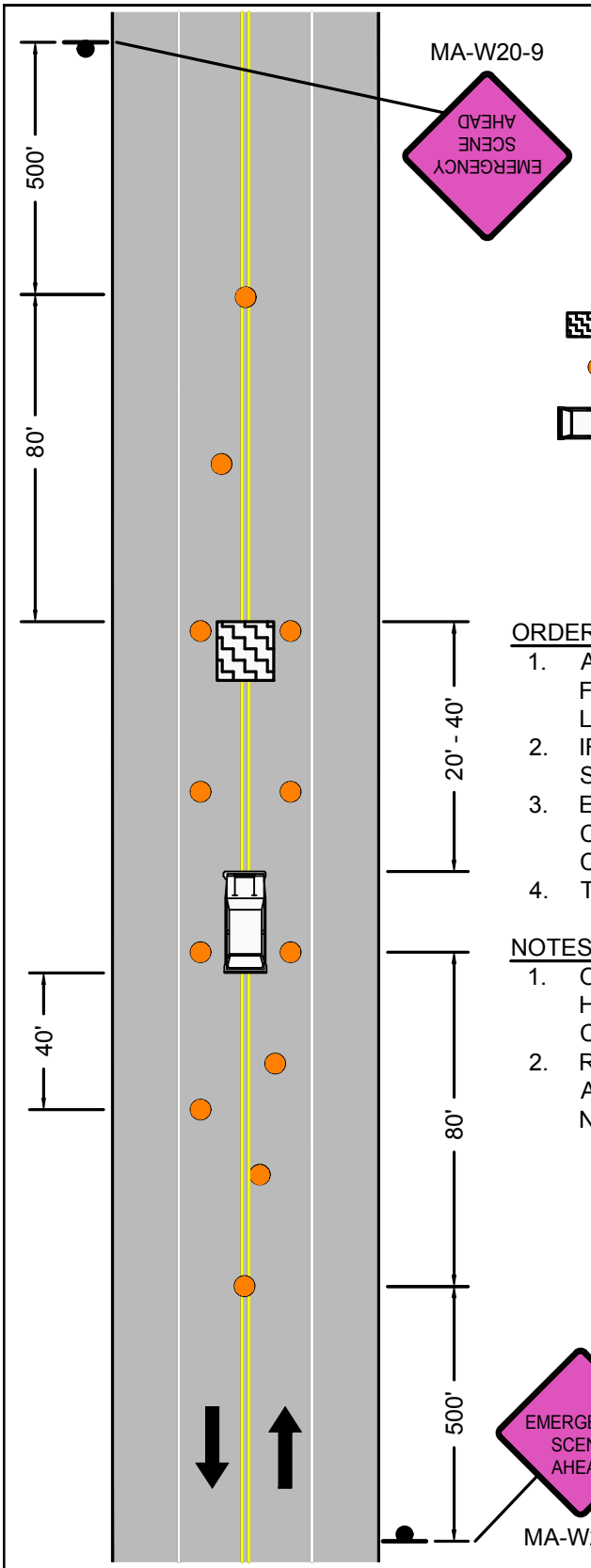
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE LEFT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE

NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

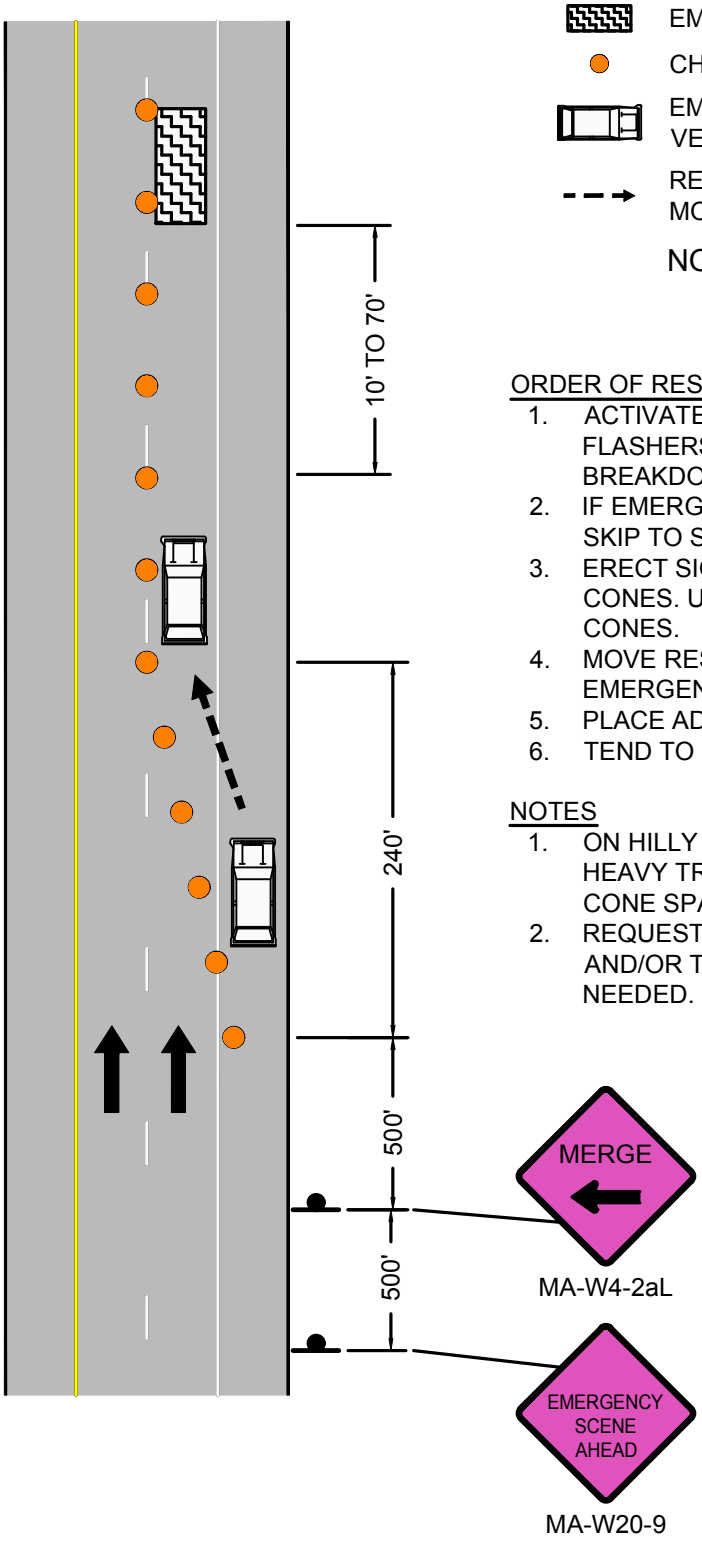
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE ON CENTER LINE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 69	Work Zone Safety Standard Details and Drawings	FIGURE 36 EMERGENCY RESPONSE TWO LANE ROADWAY TRAVERSABLE SHOULDER CENTER OF ROADWAY

massDOT Massachusetts Department of Transportation Highway Division PAGE 70	Work Zone Safety Standard Details and Drawings	FIGURE 37 EMERGENCY RESPONSE MULTILANE DIVIDED ROADWAY RIGHT LANE



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE
- RESPONSE VEHICLE MOVEMENT

NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

LEGEND

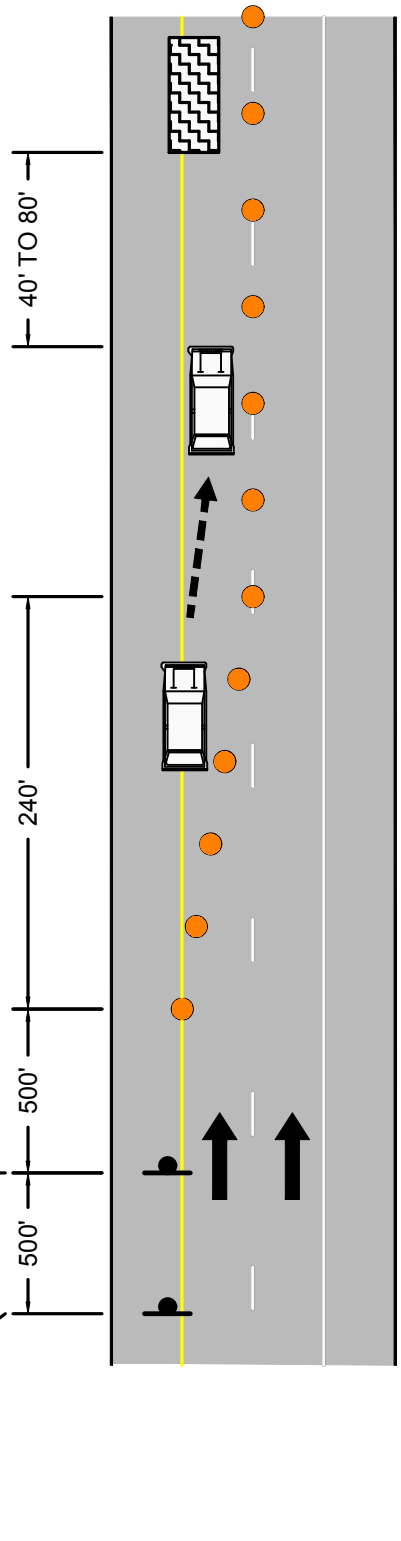
EMERGENCY AREA

CHANNELIZATION DEVICE

EMERGENCY RESPONSE VEHICLE

RESPONSE VEHICLE MOVEMENT

NOT TO SCALE



ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN MEDIAN, IF PRESENT.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

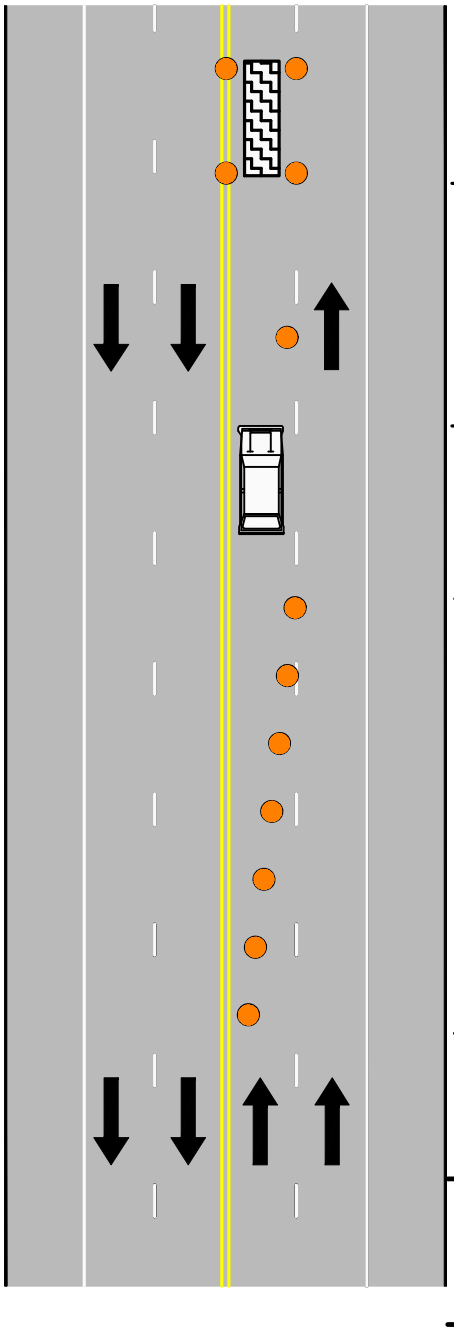
massDOT Massachusetts Department of Transportation Highway Division

PAGE 71

Work Zone Safety Standard Details and Drawings

FIGURE 38
EMERGENCY RESPONSE
MULTILANE DIVIDED ROADWAY
LEFT LANE

massDOT Massachusetts Department of Transportation Highway Division PAGE 72	Work Zone Safety Standard Details and Drawings	FIGURE 39 EMERGENCY RESPONSE MULTILANE UNDIVIDED ROADWAY LEFT LANE



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE

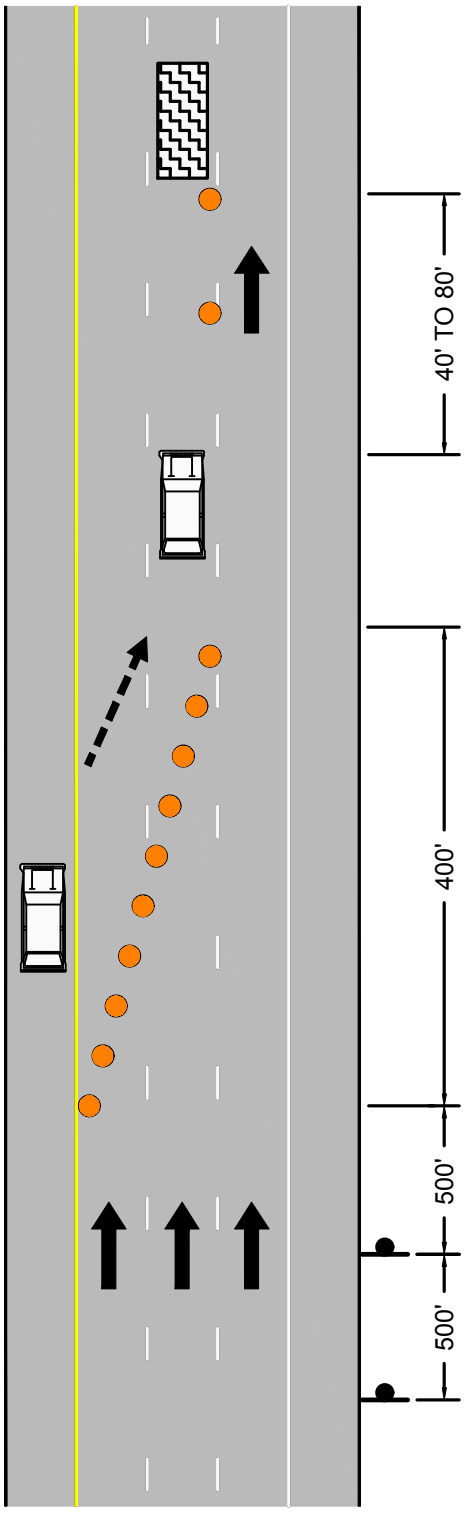
NOT TO SCALE

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF BREAKDOWN LANE OR SHOULDER OR, IF NOT PRESENT, RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE
- RESPONSE VEHICLE MOVEMENT

NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

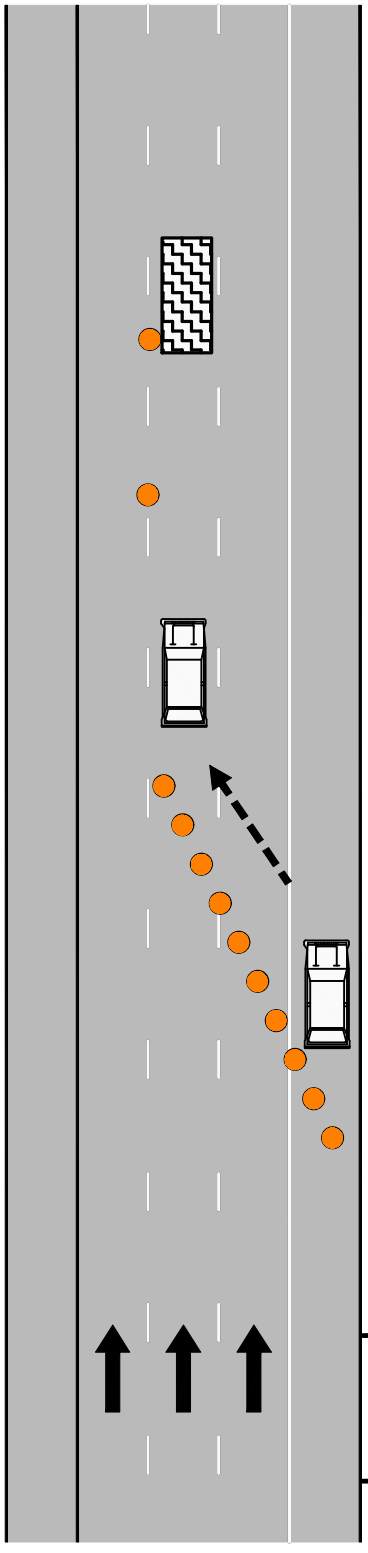
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN MEDIAN, IF PRESENT.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 73	Work Zone Safety Standard Details and Drawings	FIGURE 40 EMERGENCY RESPONSE MULTILANE DIVIDED ROADWAY MIDDLE LANE APPROACH FROM LEFT

massDOT Massachusetts Department of Transportation Highway Division PAGE 74	Work Zone Safety Standard Details and Drawings	FIGURE 41 EMERGENCY RESPONSE MULTILANE DIVIDED ROADWAY MIDDLE LANE APPROACH FROM RIGHT



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE
- RESPONSE VEHICLE MOVEMENT

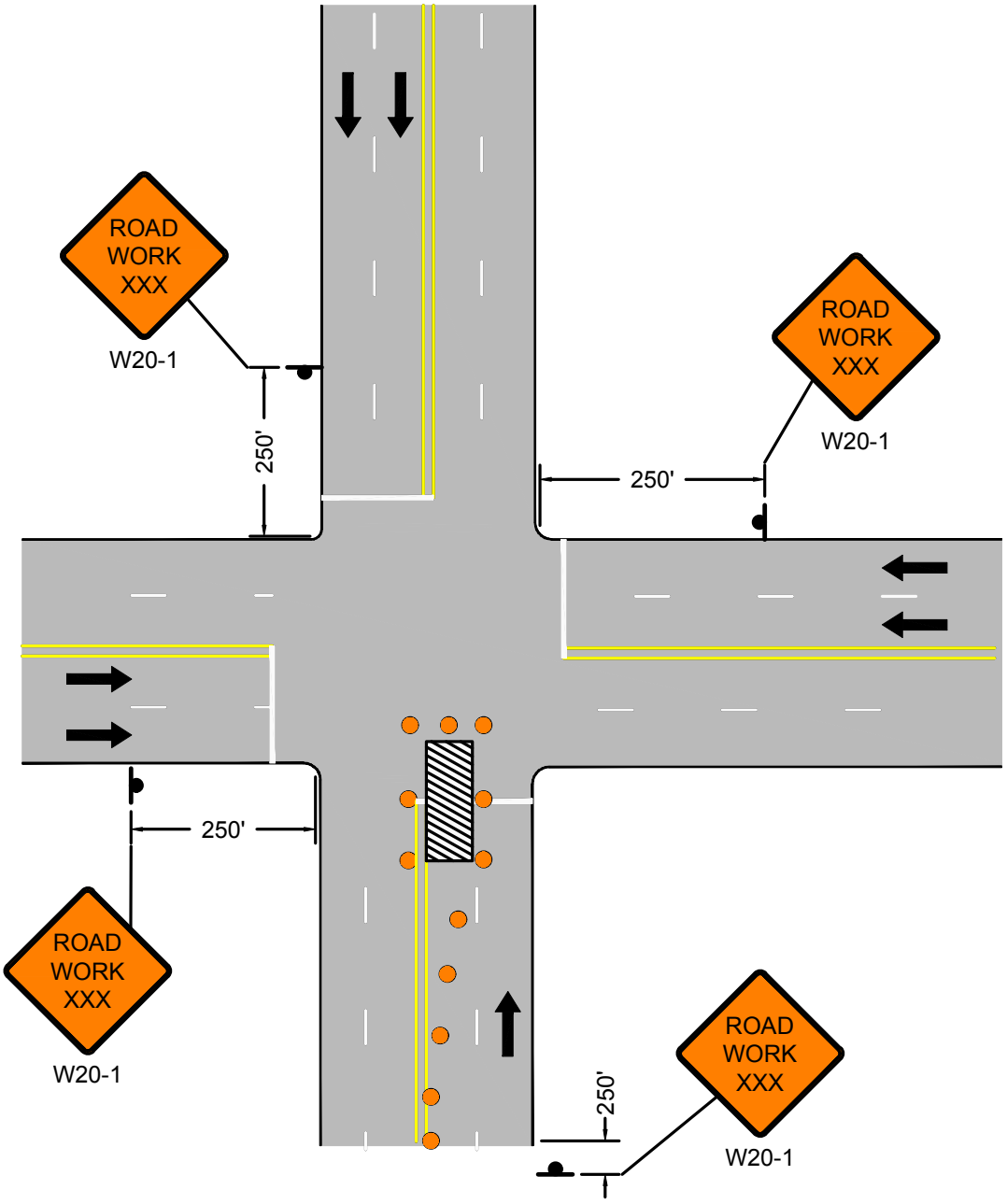
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



LEGEND

WORK ZONE

CHANNELIZATION DEVICE

NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 4 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.

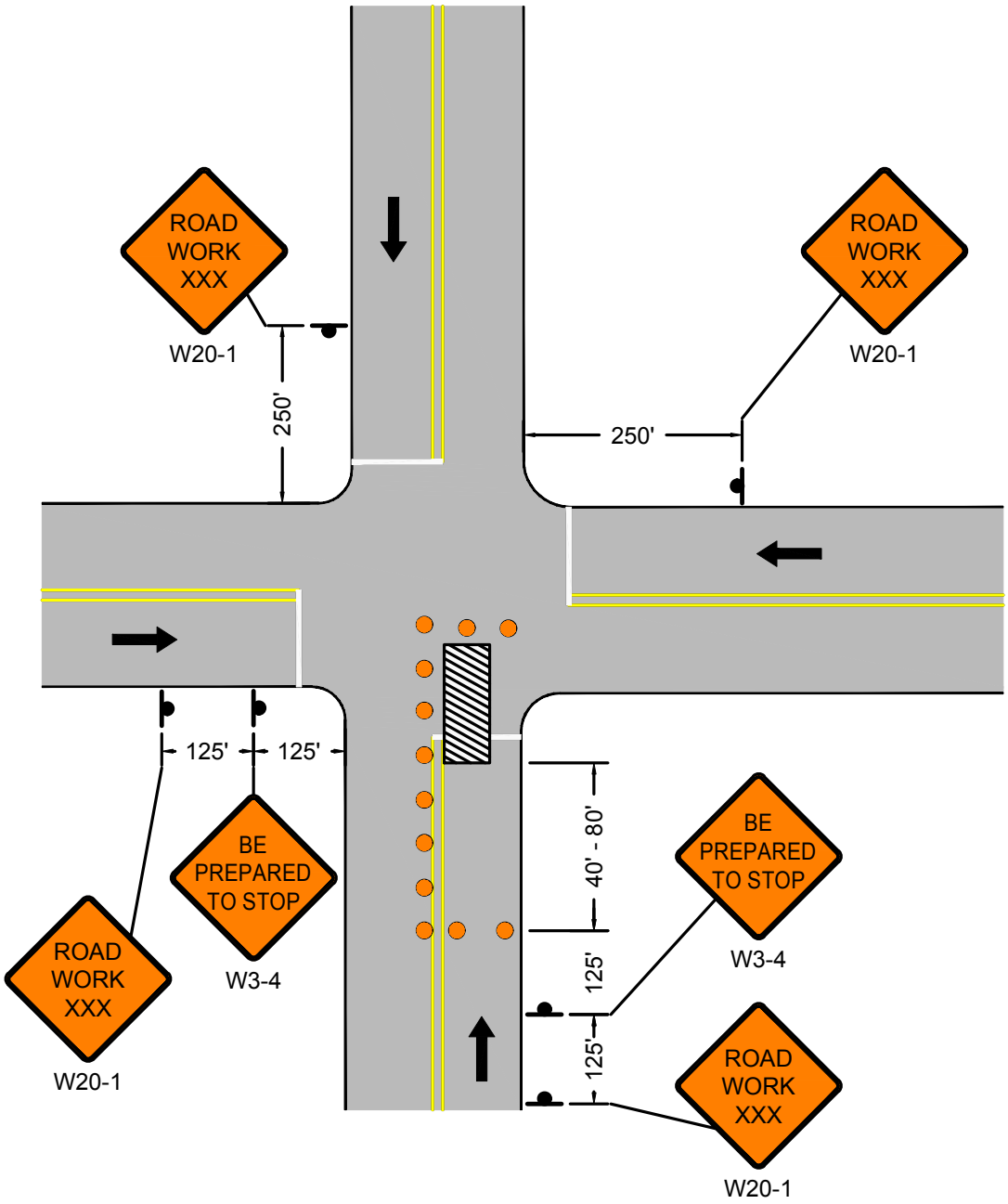
massDOT Massachusetts Department of Transportation Highway Division

PAGE 75

Work Zone Safety Standard Details and Drawings

FIGURE 42
TRAFFIC SIGNAL REPAIR WORK
MULTILANE UNDIVIDED ROADWAY
LEFTMOST OR LEFT TURNING LANE

massDOT Massachusetts Department of Transportation Highway Division PAGE 76	Work Zone Safety Standard Details and Drawings	FIGURE 43 TRAFFIC SIGNAL REPAIR WORK TWO LANE UNDIVIDED ROADWAY ONE LEG OF INTERSECTION



LEGEND

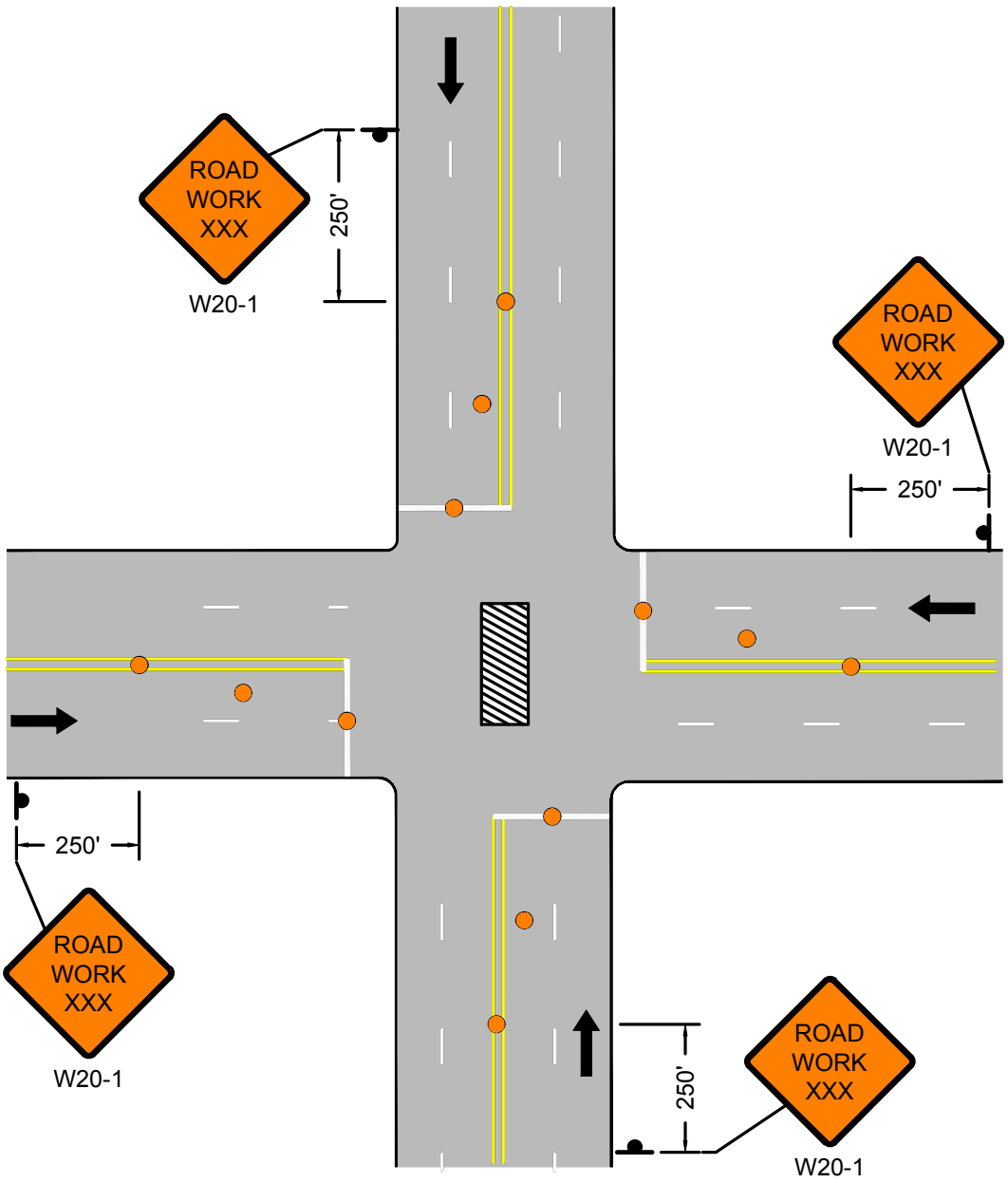
WORK ZONE

CHANNELIZATION DEVICE

NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 6 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.



LEGEND

WORK ZONE

CHANNELIZATION DEVICE

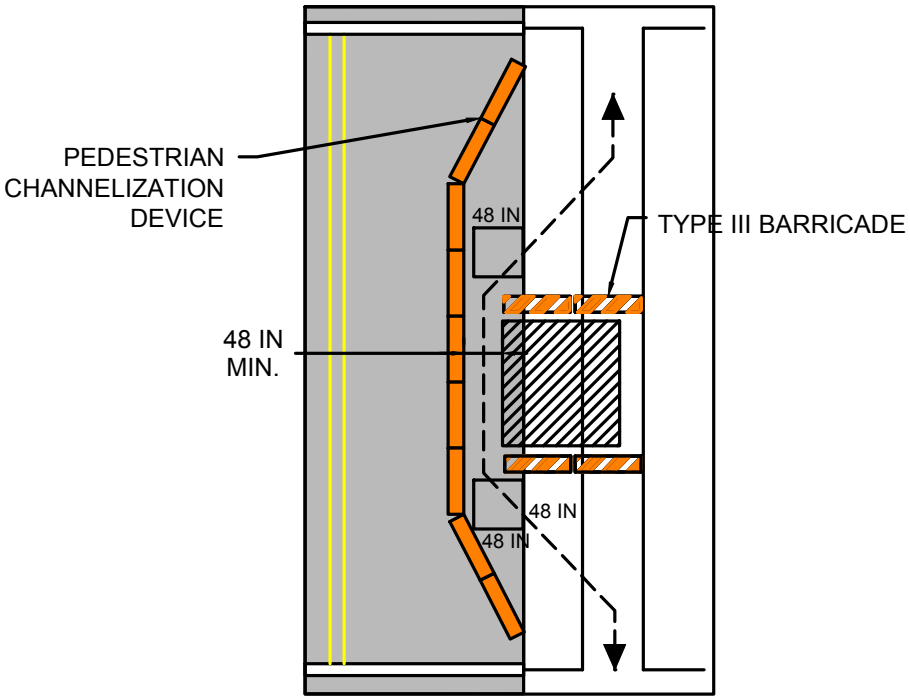
NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 4 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.

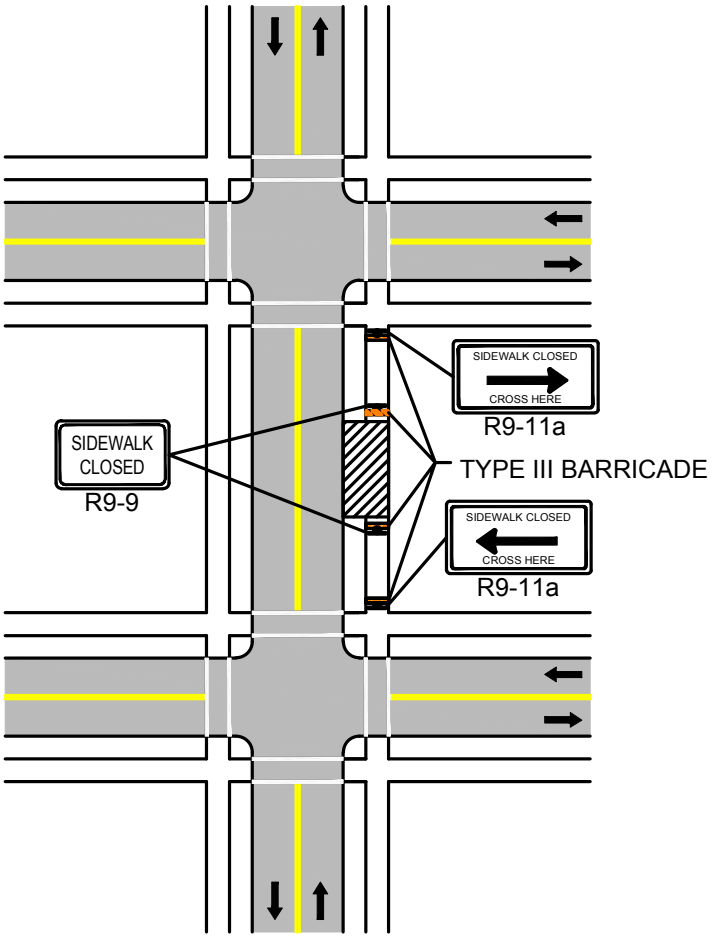
massDOT Massachusetts Department of Transportation Highway Division PAGE 77	Work Zone Safety Standard Details and Drawings	FIGURE 44 TRAFFIC SIGNAL REPAIR WORK MULTILANE UNDIVIDED ROADWAY CENTER OF INTERSECTION

massDOT Massachusetts Department of Transportation Highway Division PAGE 78	Work Zone Safety Standard Details and Drawings	FIGURE 45 PEDESTRIAN BYPASS



NOTES:

1. WHEN EXISTING PEDESTRIAN FACILITIES ARE DISRUPTED, CLOSED, OR RELOCATED IN A TTC ZONE, TEMPORARY FACILITIES SHALL BE PROVIDED AND THEY SHALL BE DETECTABLE AND INCLUDE ACCESSIBILITY FEATURES CONSISTENT WITH THE FEATURES PRESENT IN THE EXISTING PEDESTRIAN FACILITY.
2. A PEDESTRIAN CHANNELIZATION DEVICE THAT IS DETECTABLE BY A PERSON WITH A VISUAL DISABILITY TRAVELING WITH THE AID OF A LONG CANE SHALL BE PLACED ALONG THE FULL LENGTH OF THE TEMPORARY PEDESTRIAN ROUTE.
3. WHEN USED, TEMPORARY RAMPS SHALL COMPLY WITH AMERICANS WITH DISABILITIES ACT.
4. THE ALTERNATE PATHWAY SHOULD HAVE A SMOOTH CONTINUOUS HARD SURFACE FOR THE ENTIRE LENGTH OF THE TEMPORARY PEDESTRIAN FACILITY.
5. THE TEMPORARY SIDEWALK SHOULD BE A MINIMUM OF 4 FEET WIDE. IF THE SIDEWALK EXCEEDS 200 FEET THEN A 5 FOOT BY 5 FOOT PASSING ZONE SHALL BE PROVIDED NEAR THE MID-POINT OF THE CLOSURE.
6. THE PROTECTIVE REQUIREMENTS OF A TTC WORK ZONE MAY HAVE AN IMPACT IN DETERMINING THE NEED FOR TEMPORARY TRAFFIC BARRIERS AND THEIR USE IN PROVIDING PEDESTRIAN DELINEATION SHOULD BE BASED ON ENGINEERING JUDGMENT.
7. ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL TO ASSIST WITH NAVIGATION AROUND THE CLOSURE/WORK AREA MAY BE CONSIDERED AS AN OPTION IN PLACE OF PROVIDING ADA/AAB DEVICES FOR WORK FOR CLOSURES LASTING 4 HOURS OR LESS.
8. CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN; VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE. THESE DETAILS ARE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DETERMINED BY THE ENGINEER.



NOTES:

1. CLOSURE OF A SIDEWALK FACILITY SHALL CONSTITUTE THE PROVISION FOR MANAGING PEDESTRIAN TRAFFIC AND ACCOMMODATING ALL USERS. IF THE EXISTING PEDESTRIAN ACCESS ROUTE(S) CAN BE TEMPORARILY RELOCATED ALONG THE EXISTING SIDEWALK , AND SAID FACILITY PROVIDES A MINIMUM WIDTH OF 48-INCHES OF SOLID, SMOOTH UNOBSTRUCTED SURFACE, THEN NO DETOURING OF THE ROUTE SHALL BE REQUIRED. DELINEATION OF THE WORK AREA IS STILL REQUIRED.

2. IF IT IS NECESSARY TO DIVERT PEDESTRIAN TRAFFIC TO AN ALTERNATE ROUTE ACROSS THE ROADWAY FROM THE EXISTING FACILITY, THE FIGURE ABOVE SHALL BE FOLLOWED TO PROVIDE ADEQUATE DIRECTION TO PEDESTRIANS. ALTERNATE ROUTE SHALL PROVIDE THE SAME LEVEL OF ACCOMMODATION AS THE FACILITY THAT IS BEING DETOURED AND RETAIN ADA COMPLIANCE IN ITS ENTIRETY.

3. FOR EMERGENCY OR SHORT-DURATION SIDEWALK CLOSURES OF 4-HOURS OR LESS, IT IS OPTIONAL TO HAVE ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL AVAILABLE AT ALL TIMES DURING THE CLOSURE TO ASSIST THOSE MOBILITY CHALLENGED PERSONS WHO REQUIRE ADDITIONAL ASSISTANCE TO SAFELY NAVIGATE AROUND THE WORK AREA IN LIEU OF A FULL DETOUR.

massDOT Massachusetts Department of Transportation Highway Division PAGE 80	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS BIKE LANE CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR BIKE ADVANCE WARNING SIGNS (FT) (A,B))	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRANSITION LENGTH (L/3)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	150 / 150	100	305	20	45
45-55	150 / 150	220	495	40	35
60-65	150 / 150	260	645	40	40

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. DETAIL SHALL BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS. SIGNING SHOWN ONLY FOR BIKE TRAFFIC. FOLLOW ALL OTHER RELEVANT DETAILS FOR TTC DEVICES FOR VEHICULAR TRAFFIC.
2. ** SIGN SHALL BE USED ONLY IF THERE IS A MARKED BIKE LANE.
3. *** SIGN SHALL BE USED ONLY IF THERE IS NO MARKED BIKE LANE.

LEGEND


WORK ZONE


CHANNELIZATION DEVICE

FLASHING ARROW BOARD


PORTABLE CHANGEABLE MESSAGE SIGN


TRUCK MOUNTED ATTENUATOR

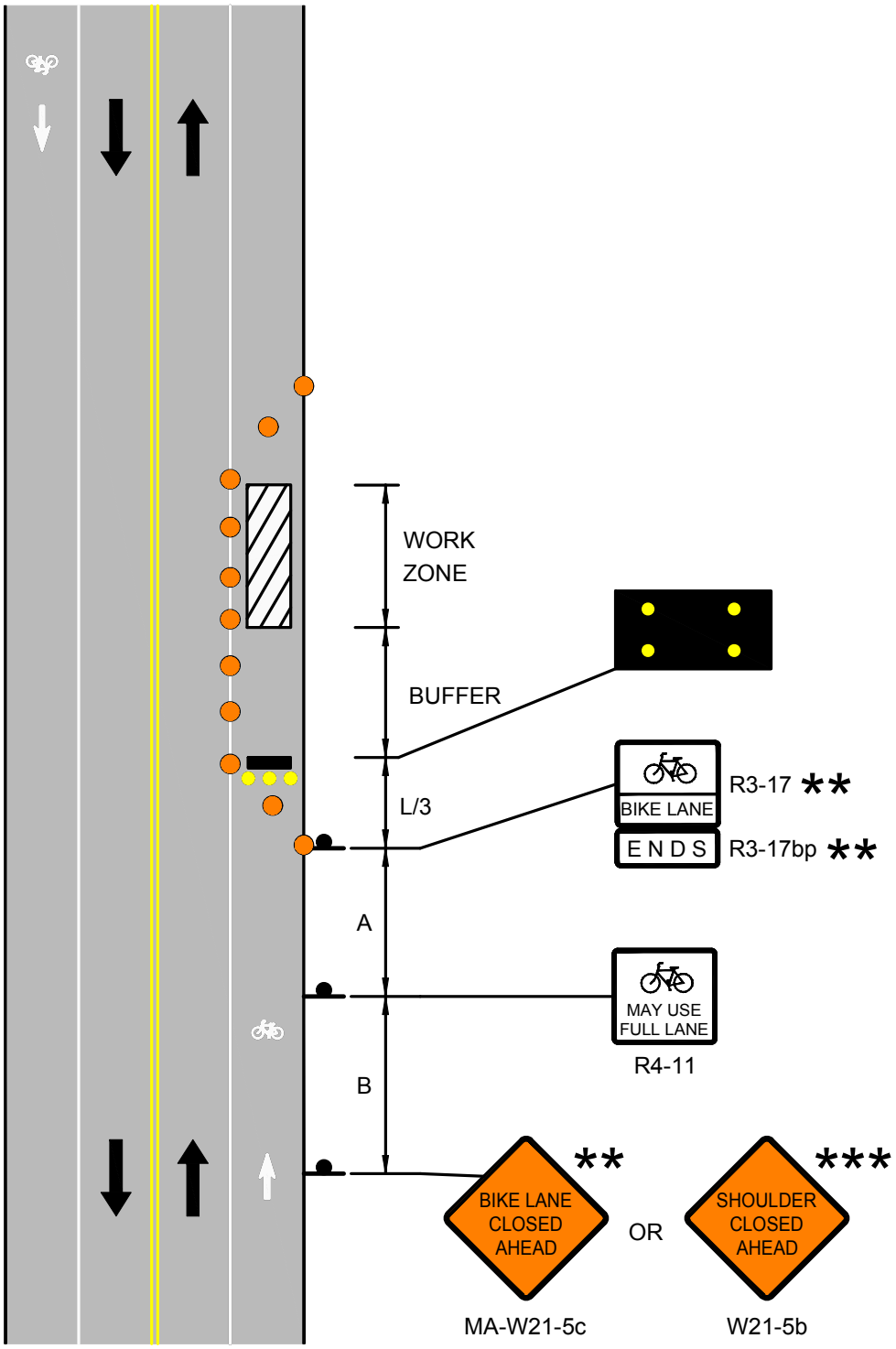
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 81	Work Zone Safety Standard Details and Drawings	FIGURE 48 STATIONARY OPERATIONS BIKE LANE CLOSURE

Rev. June, 2017

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: CHARLEMONT Project File Number: 608858

Contract Number: 125266

Project Description: Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook

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 A00822

APPENDIX A

GEOTECHNICAL ENGINEERING REPORT

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100% GEOTECHNICAL ENGINEERING REPORT

EAST OXBOW ROAD OVER OXBOW BROOK
BRIDGE NO. C-05-042

CHARLEMONT, MASSACHUSETTS
MASSDOT CONTRACT NO. 115754
MASSDOT PROJECT NO. 608858

Prepared for:

March 2023
(revised from November 2021 and October 2022)

Prepared by:

nobis

585 Middlesex Street
Lowell, Massachusetts 01851

March 9, 2023 (revised from November 19, 2021 and September 28, 2022)
File No. 100169.000

Mr. Chris Wall, PE
Project Manager, Bridge
CHA
11 King Court
Keene NH 03431-4648
p 603.460.5008
e cwall@chacompanies.com

Re: 100% Geotechnical Engineering Report
East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Charlemont, Massachusetts
MassDOT Contract No. 77851
MassDOT Project No. 608858

Dear Mr. Wall:

Nobis Engineering, Inc. d/b/a Nobis Group© (Nobis) is pleased to submit this final report to CHA to present the results of our subsurface exploration program and summarize geotechnical recommendations for design of the proposed replacement bridge carrying East Oxbow Road over Oxbow Brook in Charlemont, Massachusetts (the site). Refer to **Figure 1** for a Site Locus Plan.

Photo 1 – View of bridge looking north

The scope of work performed by Nobis included the review of available subsurface data, field location and observation of subsurface explorations performed at the site, evaluation of the subsurface conditions encountered and soil laboratory test results, evaluation of piezometric pressure measurements, and preparation of this

geotechnical engineering report. Our preliminary work was initially performed under contract with Patrick Engineering between 2018 and 2020. Our current scope has been performed in accordance with our initial proposal to CHA for geotechnical services, dated July 9, 2021 and our proposal to provide final design and construction administration services, dated March 24, 2022. Existing site features referenced herein are based on Nobis' site observations and measurements, and a topographic survey drawing provided in AutoCAD format by CHA, dated November 3, 2021. Elevations provided herein are in feet and are relative to the North American Vertical Datum (NAVD88). This report has been revised to include responses to MassDOT review comments. This report is subject to the limitations presented in **Appendix A**.

BACKGROUND

Nobis understands that the scope of the project includes the complete replacement of Bridge No. C-05-042, which carries East Oxbow Road over Oxbow Brook. The existing single-span bridge structure was built in 1940 and is currently structurally deficient. The span length is approximately 51 feet, with a width in the skewed direction (37 degrees) of approximately 33.5 feet. The substructure consists of concrete abutments supported on spread footings. Nobis understands the bridge vertical alignment is expected to remain approximately the same. The horizontal clearance is expected to be slightly increased.

The bridge is located within a valley. The surrounding area generally slopes downward from the east and west toward the bridge, with grades ranging from approximately elevation (El.) 700 feet roughly 150 feet east and west of the bridge to approximate El. 635 within Oxbow Brook beneath the existing bridge. The existing bridge approach roadway gradually slopes upward from the south to north with the bridge deck having an approximate elevation ranging from El. 647 to El. 645.5 feet. Refer to the Site Locus Plan in **Figure 1** for a more complete representation of the topographic relief at the project site.

No underground utilities extend below the existing bridge; however, above grade electrical lines extend across the bridge. Significant amounts of cobbles and boulders are evident along and within the brook and throughout the project area.

The proposed bridge will consist of a single span, steel stringer structure with a length of approximately 63 feet. The bridge substructure will consist of an integral abutment bridge supported on drilled micropiles, which will require a design exception. The integral abutment heights are anticipated to be approximately 10 feet. The existing abutments will be cut at the

mudline and backfilled with dumped rip-rap to provide protection for the new abutments which will be located behind the existing.

A preliminary hydraulic analysis was performed by MassDOT in November 2019 to evaluate the potential scour at the bridge. Based on the results of the analyses, the calculated abutment design and check scour depths are 6.04 and 6.46 feet, respectively.

A temporary bridge, located to the west of the existing bridge, will service East Oxbow Road vehicular traffic during construction of the replacement bridge. It is understood the temporary bridge will consist of an Acrow bridge supported on shallow foundations. The temporary bridge will be approximately 60 feet long and have a 12-foot-wide travel way. Due to the lower site grades along the western side of the temporary bridge and roadway approaches, earth support will be required.

Photo 2 – Well located approximately 70 feet southwest of the bridge

It should be noted that an exposed well was located approximately 70 feet southwest of the existing bridge. The well was approximately 6-foot square and had moss-covered side walls. The well was observed on various dates and seasons throughout the drilling process. Some days water was observed to be flowing out of the top of the well (similar to Photo 2) and at other times the water level within the well was deeper.

The initial structural loads and displacements at the abutments were provided by CHA in their calculations entitled "Pile Load Design (Vertical Loads)" dated November 12, 2021. The maximum one-way thermal displacement at the bridge abutment is 0.25 inches and the loads are indicated in **Table 1** below:

Table 1 – Abutment Loads

	Strength	Service
Vertical (kips)	177.6	130.1
Lateral (kips)	4.2	1.8

CHA recently performed a Finite Element Analyses (FEA) on the proposed bridge structure using the computer software Midas. Based on the results of the Midas analyses, the maximum one-way thermal displacement at the bridge abutment is 0.24 inches, and the updated maximum pile loads are indicated in **Table 2** below:

Table 2 – Abutment Loads

	Strength	Service
Vertical (kips)	201.2	143.1
Lateral (kips)	7.9	5.9

Refer to the attached **Figure 2** for the approximate location and nature of the existing features at the site.

SUBSURFACE CONDITIONS

Existing Information

Based on our review of available surficial geologic maps, the surficial geologic conditions at the site most likely consist of thin deposits of glacial till overlying bedrock. The maps also indicate the presence of bedrock outcropping in the vicinity of the site. A site-focused plan view developed from a 2010 USGS surficial geologic map entitled "Surficial Geologic Map of the Heath Quadrangle, Massachusetts" (Stone & DiGiacomo-Cohen) along with the corresponding description of the geologic units are provided on **Figure 3**.

A 1968 USGS bedrock geologic map entitled "Geologic Map of the Heath Quadrangle, Massachusetts-Vermont" (Hatch Jr. & Hartshorn) indicated bedrock at the site consists of the Hawley Formation, which is described as consisting of "interbedded amphibolites, greenstones, and feldspathic schists and granulites, with minor thin beds of quartz-mica schist." Refer to the attached **Figure 4** for a site-focused portion of the USGS Bedrock Geologic Map.

Subsurface Exploration Program

General

To collect subsurface information and assess generalized subsurface conditions at the site, Nobis coordinated and observed a subsurface exploration program consisting of seven (7) test borings (BB-1 through BB-7), four (4) pavement cores (PC-1 through PC-4), and three (3) streambed sediment samples (SS-1 through SS-3). Nobis also coordinated the drilling of three additional borings and installed vibrating wire piezometers (VWPZ-1 through VWPZ-3) in each of the three borings. The subsurface explorations were field-located at the site by Nobis personnel using taped measurements from prominent site features. Refer to **Figure 2** for the approximate locations and a summary table of the subsurface explorations. Subsurface profiles depicting conditions in the longitudinal direction of the bridge through the bridge, to the east of the bridge, and to the west of the bridge are presented in **Figures 5, 6, and 7**, respectively.

The pavement cores and test borings BB-1 and BB-2 were performed by Seaboard Drilling, Inc. of Chicopee, Massachusetts, and streambed sediment samples collected by Nobis between December 17 and 19, 2018. Due to access limitations, drilling of the remaining test borings was postponed until a more compact rig could be mobilized and winter conditions subsided. The subsurface exploration continued with the drilling of BB-3 through BB-5, performed between April 16 and 18, 2019 by New England Boring Contractors (NEBC) of Derry, New Hampshire. Borings BB-6 and BB-7 were added due to the decision to move the temporary bridge location to the western side. These borings were performed by NEBC on November 18 and 19, 2019. The borings performed for the installation of the vibrating wire piezometers were performed by NEBC between May 18 and 21, 2020.

Test Borings

The test borings were advanced to depths ranging from approximately 29.5 to 43 feet below ground surface (bgs), corresponding to elevations ranging from approximately El. 604 to El. 619. Test borings were performed utilizing several rigs: a truck-mounted B-53 Mobile (BB-2), a track-mounted Diedrich D-50 Turbo (BB-1) and an Acker Soil Scout drill rig (BB-3 through BB-7). Borings were advanced using standard drive and wash methods and 4-inch inside diameter (I.D.) casing. Standard Penetration Tests (SPTs) were performed using 140-pound automatic and safety hammers and split-spoon samples were generally recovered at 5-foot intervals with some continuous sampling at the start of a few borings.

Photo 3 – View of boring BB-3 being drilled

Split-spoon samples obtained from the test borings were classified by a Nobis representative using the Modified Burmister classification system. Between 9 and 10 feet of NX-sized bedrock core sampling was performed in each boring except for borings BB-6 and BB-7 where no bedrock coring was performed. Due to the known presence of artesian conditions in the region, and as evidenced in some of the borings, the drilling subcontractor tremie-grouted each borehole upon completion of bedrock coring. Test boring logs are attached as **Appendix B**.

Pavement Cores

The pavement cores (PC-1 through PC-4) were staggered on both sides of East Oxbow Road and were advanced using a thin-wall coring machine. The intent of the pavement cores was to evaluate the existing pavement thickness and perform sampling of pavement subgrade soils for laboratory testing. The laboratory testing is intended to assist CHA with their pavement design. Subgrade soil bulk samples were obtained for laboratory analysis using a shovel and/or post hole digger. The majority of the pavement cores broke-up upon extraction and were not photographed or logged. The pavement core locations were backfilled with soil and patched with asphalt cold-patch upon completion.

Photo 4 - View of pavement core hole

Piezometers

Three borings (VWPZ-1 through VWPZ-3) were advanced by New England Boring Contractors between May 18th and 21st, 2020 for the specific purpose of installing vibrating wire piezometers within the bedrock. The piezometer installations were recommended by Nobis to evaluate the known artesian pressures which have been observed to exist at the site.

Borings were advanced using standard drive and wash methods and 4-inch inside diameter (I.D.) casing along with rock coring with an NX-sized rock coring barrel. Once the rock coring was completed in each boring, a Geokon Model 4500S-350 kPa vibrating wire piezometer was installed within the bedrock at depths ranging from 36 to 38 feet, corresponding to elevations ranging from approximately El. 607 to El. 611. The piezometers were encapsulated within filter sand and the remainder of the borehole was filled with grout.

Photo 5 - View of vibrating wire piezometer before installation

The three piezometers were each connected to a readout box that was placed at northeast corner of the bridge behind the guardrail. Nobis personnel travelled to the site from installation through September 2022 to download piezometer readings that were saved within the readout box. During the last reading in September 2022, it was observed that the piezometers stopped recording in August 2022.

Piezometric depths and elevations are presented in **Figures 8 and 9**, respectively. Boring logs documenting the piezometer installations for VWPZ-1 through VWPZ-3 are presented in the piezometer logs and are attached as **Appendix C**.

Sediment Samples

Three (3) streambed soil samples were obtained from the upstream side of Oxbow Brook approximately 50 feet away from the centerline of the existing bridge (i.e., approximately one span-length of existing bridge). The three samples (SS-1, SS-2, and SS-3) were collected from the north bank, channel center, and south bank, respectively. The soil samples were previously

submitted to the laboratory for gradation testing to assist MassDOT with their scour design but are also included in **Appendix D**, as discussed below.

Laboratory Test Results

The following samples were selected from the Nobis explorations and submitted to GeoTesting Express of Acton, Massachusetts for the following laboratory tests:

- Eight (8) Particle Size Analyses (ASTM D422); including four from the borings, one bulk combined sample from the pavement core holes, and three sediment samples for the hydraulic analyses;
- One (1) Modified Proctor Test (ASTM D1557) from the bulk combined sample from the pavement core holes; and,
- One (1) California Bearing Ratio (CBR) Test (ASTM D1883) from the bulk combined sample from the pavement core holes.

The laboratory test results are provided as **Appendix D**.

Subsurface Conditions Encountered

The generalized soil stratigraphy encountered in the explorations consisted of topsoil or asphalt overlying intermittent fill, glacial till deposits, and bedrock. For more detailed descriptions of the subsurface conditions encountered in the test borings, refer to **Appendix B**. Subsurface profiles depicting conditions in the longitudinal direction of the bridge through the bridge, to the east of the bridge, and to the west of the bridge are presented in **Figures 5, 6, and 7**, respectively.

Generalized descriptions are discussed below in order of increasing depth:

Topsoil: Between approximately 2 and 6 inches of topsoil was encountered in each boring except BB-2 and BB-7. The topsoil generally consisted of dry to moist, loose to medium dense, dark brown, fine to coarse sand with varying amounts of silt, gravel, and roots.

Asphalt: Between approximately four (4) and six (6) inches of bituminous asphalt pavement were observed and/or sampled in boring BB-2 and pavement cores PC-1 through PC-4.

Fill: Fill soils were encountered in each boring (except BB-5) to depths ranging from approximately 3 to 7.5 feet. The fill composition varied across the site, but generally consisted of dry to wet, loose to very dense or hard, brown, sands and gravels with varying amounts of silt and clay, with occasional roots and asphalt particles. Based on a shallow refusal encountered in BB-1 and occasional observed drilling resistance in other borings, shallow cobbles and/or boulders are likely present in the fill soils. The SPT N-values in the fill ranged from 6 to 58 blows-per-foot (bpf).

Photo 6 – View of glacial till in split spoon sample

Glacial Till: Glacial till was encountered in each boring below the fill or topsoil to depths ranging from 21 to 33 feet below the ground surface (bgs). The till consisted of very stiff to hard glacial till soils generally consisting of wet, gray, silt and clay with up to 35 percent fine or fine to coarse sand (by weight) and occasional fine gravel. Based on observed changes in drilling behavior and core samples obtained in BB-2 and BB-4, the glacial till contains scattered cobble and/or boulder clasts. The SPT N-Values within this stratum ranged from 16 to over 100 bpf (on inferred boulders) in the borings.

Bedrock: Bedrock was encountered in each of the seven borings at depths ranging from approximately 21 to 33 feet bgs, corresponding to elevations ranging from approximately El. 629 to El 614.5. Bedrock was not cored in borings BB-6 and BB-7, but was inferred based on rollerbit action.

Photo 7 – View of bedrock core from the site

The bedrock at the site generally consists of very hard, slightly weathered to fresh, moderately fractured to sound (with the exception of core C-4 within boring BB-4), light gray, very fine- to medium-grained Schist with occasional quartz-mica interbedding, very close to moderately close, horizontal to moderately-dipping joints. Bedrock core recoveries ranged from 47 to 111 percent and Rock Quality Designations (RQD) varied between 8 percent (very poor) and 92 percent (excellent).

It should be noted that although not sampled, up to a foot of weathered bedrock was inferred in borings BB-1 and BB-2 based on observed drilling behavior and approximately 3 to 5 feet of weathered bedrock was observed within the piezometer logs VWPZ-1 and VWPZ-2.

Groundwater: Groundwater measurements were obtained upon completion of test borings under cased borehole conditions after between 10 and 45 minutes of stabilization. In borings where artesian conditions were not present, measurements varied between 4 and 7.7 feet bgs in BB-6 and BB-2, respectively, or elevations corresponding to approximately El. 643 and El. 637. Note that water was introduced to boreholes during the test boring rotary wash process, and that fluctuations in the observed groundwater levels will occur due to variations in precipitation, temperature, and other factors different from those existing at the time the measurements were made.

As anticipated, artesian conditions exist beneath the proposed replacement bridge, and were observed upon sampling bedrock in borings BB-1, BB-3, BB-4, VWPZ-1, and VWPZ-3 with water slowly flowing out of the surface of the borehole. Due to the rising water level, a reliable groundwater measurement was not obtained upon completion of these borings. To control the pressure head and mitigate the upward migration of groundwater, and as a precaution in borings where artesian conditions were not observed (BB-2, BB-5, BB-6 and BB-7), borings were tremie-grouted to the ground surface. Water was no longer observed to be flowing out of the boreholes upon departing the site after each grouting. Note that flowing water was observed only after coring the bedrock.

The piezometers installed within VWPZ-1 through -3 indicated the presence of artesian conditions at the site. The piezometer data was downloaded from the readout box on an approximate monthly basis. The piezometer results indicated that artesian pressures of up to approximately 12 feet above the ground surface were detected during wet periods.

The water level in Oxbow Brook was measured at a depth of approximately eight (8) feet below the surface of the existing bridge deck on December 17, 2018, corresponding to an approximate elevation of 639 feet.

GEOTECHNICAL CONSIDERATIONS

The primary geotechnical issues impacting design and construction of the proposed bridge foundations include the following, which are discussed in more detail below:

- proximity of Oxbow Brook, the relatively shallow groundwater levels, and the artesian conditions at the site; and,
- the presence of cobbles and boulders.

Shallow Groundwater and Artesian Conditions – The groundwater levels near the proposed bridge abutments were approximately 4 to 8 feet below the ground surface during drilling, where artesian conditions were not present. Where artesian conditions were encountered, groundwater was observed flowing out of several boreholes only after coring bedrock. The piezometric pressures were measured at the site over approximately 1.5 years and varied from approximately 10 feet below the ground surface to as high as 12 feet above the ground surface. The artesian conditions are believed to be located within the bedrock and associated fractures and are confined by the cohesive glacial till stratum. However, artesian pressures should also be anticipated throughout the full depth of overburden soils. The artesian conditions at the site will require special procedures when excavating and installing foundations at the site.

Due to the groundwater and the adjacent Oxbow Brook, a cofferdam providing both groundwater and river water cutoff will be required for construction of the bridge foundations. Driven steel sheeting could be difficult to install due to the presence of cobble and boulders and the dense glacial till but may still be feasible. Potential alternatives to driven sheeting include sand bagging or Porta-Dams but do not offer the same level of resistance to groundwater and river water that steel sheeting would.

Cobbles and Boulders – Numerous cobbles and boulders were encountered during the exploration program and are also evident along the banks and within the Oxbow Brook. It is anticipated that the cobbles/boulders may impact excavations and installation of the foundations, cofferdams, and temporary earth support at the site.

The use of integral abutments is desired for this bridge reconstruction. However, driven H-piles, which are typically used for integral abutment support in Massachusetts, are not feasible due to the presence of high bedrock at the site. CHA is recommending drilled micropiles be utilized as an alternative to driven H-piles. CHA has applied for and was granted a waiver from MassDOT to utilize drilled micropiles as an alternative to driven H-Piles for abutment support.

It should be noted that artesian conditions are likely prevalent at the site especially at times of high precipitation. Excavations performed at the site and installation of the drilled micropiles will need to account for the artesian pressures during construction.

DESIGN RECOMMENDATIONS

The following recommendations are based on our understanding drilled micropiles (DMPs) will be utilized for support of the integral abutments. The recommendations provided herein were prepared utilizing the 2020 AASHTO LRFD Bridge Design Specifications and the 2020 MassDOT LRFD Bridge Manual. These recommendations are subject to the limitations contained in **Appendix A**.

Abutment – Drilled Micropiles

CHA has indicated that the bridge foundations will consist of integral abutments supported by drilled micropiles (DMPs). We understand that a waiver is required and has been provided by MassDOT to allow the use of micropiles with an integral abutment bridge. Based on plans provided by CHA, the proposed abutment micropile cap is approximately 25 feet wide, 10.8 feet tall and 4 feet thick. The bottom of the south and north pile cap is proposed at El. 635.6 and 637.8 (embedment depth of 4.1 feet), respectively.

For our analyses described below, we initially evaluated two micropile sizes which consist of:

- 9.625-inch-diameter, 0.545-inch-thick permanent casing, #11 center bar
- 10.75-inch-diameter, 0.500-inch-thick permanent casing, #11 center bar

Based on our analyses and discussions with the Structural Engineer, the project team decided to proceed with the smaller diameter micropile (9.625 OD). The center bar will need to increase from a #11 to a #14 due to the increase in axial load. A yield strength of 80 ksi for the permanent casing and 60 ksi for the central reinforcement were assumed for our analyses. It should be noted that a

casing strength of 80 ksi exceeds the MassDOT requirement of 52 ksi; therefore, a MassDOT waiver was required and has been issued to allow use of casing with a yield strength of 80 ksi for this project. A bond zone length of 5 feet and a plunge length of 1 foot within the bedrock was also assumed in our analysis.

The piles should be designed to account for corrosion per AASHTO LRFD requirements. For our analyses, we included 1/16-inch of sacrificial steel for corrosion protection on the exterior of the pile casing surface. Section 3.2.4.2.10 of the MassDOT LRFD Bridge Manual requires that a 60% reduction in moment capacity be assumed to account for threaded connections. As a result of this reduction, no threaded casing joints should be located within 3 feet of the pile cap. The total depth of micropile where threaded joints are prohibited should be specified on the construction drawings.

It should be noted that other casing and rebar sizes may be better suited to the project (provided MassDOT approval is obtained), depending on economics, availability, load test requirements, and the potential to modify the pile cap layout as the project approaches final design. DMPs should be designed in accordance with utilizing the 2020 AASHTO LRFD Bridge Design Specifications and the 2020 MassDOT LRFD Bridge Manual.

Lateral and axial results of our analyses are presented below. Micropile calculations are provided in **Appendix E**.

Lateral Resistance, Deformations and Pile Fixity

The lateral resistance, deformations and pile fixity were evaluated using L-Pile 2022 software produced by Ensoft. A single row of five (5) vertical 9.625-inch micropiles were evaluated for lateral stability.

The estimated depth to fixity for the micropiles is approximately 14 feet below bottom of pile cap (approximate El. 621 feet).

Our lateral analyses are based on the thermal deflection of 0.24-inches provided by CHA, and a fixed-head condition (i.e., no pile head rotation) between the micropiles and pile cap. The estimated pile moment and shear have been estimated as summarized in **Table 3**. Our results include analyses on both corroded sections (1/16" loss of section) and uncorroded sections and service and strength load cases. It should also be noted that we revised our

analyses to exclude the passive resistance behind the integral abutment when performing our lateral analyses per the MassDOT Bridge Design Manual, 2022.

Table 3 – Results of Lateral Analyses

Micropile Section	Corrosion Allowance (in)	Load Case	Axial Load (kips)	Max Moment at Pile Cap Interface (kip-in)	Max Shear (kip)
9.625-in. OD @ 0.545-in (80 ksi)	1/16	Strength	201.2	669	15.4
		Service	143.1	667	15.5
	No	Strength	201.2	724	16.3
		Service	143.1	722	16.4

Axial Resistance

DMPs socketed into bedrock would transfer structural loads through the soil overburden directly into the bedrock. The micropiles should be designed as Type A friction piles, developing all of their capacity through skin friction in the bedrock bearing stratum, with no design capacity developed from end bearing or materials above bedrock. We recommend a factored skin resistance of 20.2 kips per square foot (ksf) for micropiles socketed in bedrock at this site. This is based on a grout-to-rock nominal resistance of 28.8 ksf (using AASHTO Table C10.9.3.5.2-1) and a resistance factor of 0.7 which assumes a static load test is performed on a DMP at the site.

Based on a micropile factored compressive design load of 201.2 kips (Strength I) and an estimated factored geotechnical resistance of 20.2 ksf between the rock and grout interface, the abutment micropiles are anticipated to have a required bond length of approximately 4.5 feet for an 8.535-inch-diameter rock socket (9.625-inch-diameter micropile). However, regardless of the tested resistance and casing size, we recommend micropiles should extend a minimum of 6 feet into bedrock (5 foot bond length and 1 foot plunge) due to the potential for varying bedrock conditions and fractured nature of rock. A minimum plunge length of 1-foot is a MassDOT requirement.

Note that the estimated pile resistances are approximate. Pile embedment lengths will need to be re-evaluated during construction using the results of the static load test on a pre-production micropile.

Pile Settlements

It is anticipated that pile settlements may generally be equivalent to the elastic compression of the pile, plus the inelastic compression within the bearing layer. The inelastic compression of the piles within bedrock is anticipated to be small (less than 1/8 inch). The elastic compression is expected to be less than ¼ inch at the full design load.

Lateral Earth Pressure

The magnitude of lateral earth pressure developed by the backfill is dependent on the relative wall displacement and may be considered to be between full passive and at-rest pressures. In accordance with Section 3.10.8 of the 2020 MassDOT LRFD Bridge Manual, the coefficient of horizontal earth pressure (K) for design of integral abutments shall be:

$$K = 0.43 + 5.7[1 - e^{-190(\delta_T/H)}]$$

where: δ_T = Thermal Movement of Bridge Deck
H = Height of Integral Abutment Wall

This equation is based on the use of compacted Gravel Borrow backfill behind the abutments. Based on a total thermal movement, δ_T, of 0.24 inches, per CHA thermal calculations (refer to **Appendix E**) and an approximate abutment height of 10.83 feet, we recommend a horizontal earth pressure coefficient (K) of 2.12.

We understand that an approach slab will be utilized. As such, application of a live load surcharge is not required on the abutment wall. The proposed abutments should be designed to drain, and therefore, be analyzed assuming that hydrostatic pressure will not be applied to the abutments. We recommend ignoring passive earth pressure for soil in front of walls in stability analyses. Seismic loads should not be considered for design of the integral abutments as the abutments will engage the backfill to resist seismic displacements.

Approach Slabs

New approach slabs are required for construction of the new bridge abutments. The approach slabs should rest on the back of the abutment and be free to rotate about the

abutment. The intent is to avoid abrupt differential settlement between the bridge abutment and backfill placed behind the abutment.

Global Stability Analyses

A global stability analysis was performed at the northern bridge abutment for the post-construction condition. Stability analyses were performed using geometry developed from existing and proposed topographic information, and subsurface conditions observed during our subsurface exploration program. It was assumed the wall will be free-draining and no hydrostatic pressure was not incorporated into the stability analysis. Passive resistance at the base of the wall (i.e., proposed rip-rap) was neglected for evaluating global stability.

The 2D limit equilibrium software, Slide2 written by Rocscience, was used to evaluate the global slope stability at the northern embankment (assumed to be the worst-case the embankment). The limit-equilibrium method of slices (Spencer) was used to compute the factor of safety (FS) against slope failure under static loading conditions.

Our results indicate a global stability factor of safety of above 1.5 for the embankment, which demonstrates that the minimum acceptable factor of safety for global stability was achieved. Refer to **Appendix E** for the global stability results.

Note that since the site is considered a Seismic Design Category A (i.e., Zone 1), a global stability analysis under seismic loading conditions is not required in accordance with Section 11.5.4.2 of AASHTO.

Temporary Bridge

Nobis recommends that the proposed temporary bridge abutments be supported on shallow foundations bearing on the natural glacial till or on Structural Fill placed over the till. All existing fill, organics, and structures should be removed from within the influence zone of shallow foundations, as defined herein.

Bearing Resistance and Settlement

Nobis estimated the factored bearing resistance for the proposed temporary bridge abutments using information obtained from the subsurface explorations. The calculated factored

bearing resistance was based on shallow spread footings bearing on dense glacial till (or Structural Fill placed over till), a resistance factor of 0.45, and an embedment depth of 4 feet. The factored net bearing resistance at the strength and service limit states is as indicated in **Table 4** below.

Table 4 – Bearing Resistance Soil Parameters

Estimated Friction Angle	38 degrees
Footing Embedment	4 feet
Assumed Effective Footing Width	3.7
Nominal Bearing Resistance	21.7 ksf
Factored Bearing Resistance	9.8 ksf
Service Limit Bearing Resistance at S = 1.0 in.	13.5 ksf

For frost protection, a minimum embedment depth of at least four (4) feet below the lowest adjacent grade should be maintained. The footing should also be located at least 4 horizontal feet from temporary earth support exposed to the elements.

The total and differential settlements of the temporary abutment foundations are expected to be less than 1 inch and ½-inch, respectively, at a service limit state bearing pressure of up to 13.5 ksf. This settlement is elastic and the majority of it should occur as the structure is being built. The temporary bridge bearing resistance and settlement calculations are attached as **Appendix E**.

Lateral Earth Pressures

We recommend that the proposed temporary bridge abutments be designed based on the following soil parameters which assume that Ordinary Borrow or Gravel Borrow are used to backfill the temporary bridge approach areas:

- Friction angle, ϕ, = 32 degrees for retained soil (compacted Gravel Borrow or Ordinary Borrow)
- Soil density, γ = 120 pcf for retained soil (compacted Gravel Borrow or Ordinary Borrow)
- Horizontal backfill slope behind the wall
- Wall friction angle of 20 degrees

The temporary abutments are greater than 5 feet in height, so we recommend they be designed using an at-rest earth pressure coefficient (K_a) = 0.31 in accordance with MassDOT LRFD Bridge Manual Section 3.1.6 and assuming footings are not directly on bedrock.

In addition, a live load surcharge should be applied to account for vehicular traffic (AASHTO Article 3.11.6.4). The live load surcharge may be estimated as a uniform horizontal earth pressure due to an equivalent height of soil in accordance with AASHTO Tables 3.11.6.4-1 and 3.11.6.4-2. The proposed abutment walls should be designed to drain, and therefore, be analyzed assuming that hydrostatic pressure will not be applied to the abutments/wingwalls. In accordance with MassDOT guidelines, passive pressures should not be used when determining the stability of retaining walls.

A sliding coefficient of friction tan ϕ of 0.62 is recommended for cast-in-place concrete placed on glacial till or Structural Fill placed over till, assuming an angle in internal friction (ϕ) of 32 degrees for the subgrade materials. The recommended C value is 1.0 per AASHTO Section 10.6.3.4 for cast-in-place concrete resting on soil.

Global Stability Analyses

Similar to the permanent bridge, a global stability analysis was also performed at the northern bridge abutment for the temporary bridge condition. The analysis for the temporary bridge was similar to the permanent with the exception that the temporary earth support was modeled using infinite strength. Based on our results, the estimated factor of safety against static global stability failure is 1.6. Refer to **Appendix E** for the global stability results at the temporary bridge location. It should be noted that our assumptions regarding the temporary bridge may change during construction. We recommend that the Contractor perform a slope stability analyses once the final details of the temporary bridge structure are known.

Geotechnical Seismic Design Considerations

The seismic parameters developed for the proposed bridge are provided below per the AASHTO Guide Specifications for LRFD Seismic Bridge Design and considering that the bridge is not critical or essential:

- Mapped Ground and Spectral Response Coefficients (USGS Seismic Hazard Maps):
  - Horizontal Peak Ground Acceleration (PGA): 0.058

- Horizontal Response Spectral Acceleration, 0.2 Sec (S_S): 0.132
- Horizontal Response Spectral Acceleration, 1.0 Sec (S_1): 0.040

- Site Class: C (AASHTO Table 3.4.2.1-1):
- Site Factors for Site Class "C" (AASHTO Tables 3.4.2.3-1, and -2):
  - F_{pga} = 1.2, F_a = 1.2, F_v = 1.7
- Design Spectral Response Parameters for Site Class "C":
  - A_S = 0.070, S_{DS} = 0.158, S_{D1} = 0.068

Per AASHTO Article 3.5, the site is assigned Seismic Design Category A based on a calculated S_{D1} of 0.068. It should be noted that a liquefaction analysis is not required for structures assigned to Seismic Design Category A; however, in our opinion, the soils are not liquefiable. The seismic design calculations are attached as **Appendix E**.

CONSTRUCTION CONSIDERATIONS

Obstructions

Cobbles and boulders were encountered in the fill and glacial till soils based on observations during drilling (rollerbitting and spoon sampling). Additionally, numerous cobbles and boulders were scattered along the mudline and banks of the Oxbow Brook. The presence of obstructions may impact excavation foundation installation, and installation of temporary earth support systems at the site. We recommend the project specifications contain provisions to contend with boulders/obstructions in advance of construction at the site.

Temporary Bridge Abutment Subgrade Preparation

Prior to performing any excavations for the proposed temporary bridge abutment, these areas should be stripped of any existing structures, surficial cobbles/boulders, and topsoil/vegetation soils from within the bearing influence zone of proposed footings (i.e., inside the cofferdam).

Exposed subgrade soils which are dry should be proof-compacted with a minimum of 6 passes of a walk-behind vibratory plate or drum compactor. Where exposed soil subgrades are at or near the groundwater level, static proof-compaction methods may be used in lieu of vibratory methods. Excavation could also potentially be performed in the wet without proof-compaction and include a tremie slab to reduce dewatering, potential subgrade instability, and provide a toe for the cofferdam sheeting.

Exposed footing subgrade soils should be protected from disturbance. Disturbed footing subgrades and/or loose or soft zones should be over-excavated to firm and stable ground and replaced with compacted Crushed Stone or tremie concrete if "in the wet" construction procedures are utilized. Crushed Stone placed in excess of 4 inches thick should be wrapped in non-woven filter fabric.

Fill should not be placed over frozen soil. Soil subgrades should be protected against frost both during and after construction.

We recommend that a qualified geotechnical engineer evaluate foundation subgrades and observe subgrade proof-compaction and fill placement and compaction.

Drilled Micropile Installation

During drilled micropile installation, it is anticipated that cobbles, boulders or other obstructions will be encountered. Observation of micropile installation should be made by experienced geotechnical personnel. The depth of pile and casing, depth of strata changes, pile alignment, center bar placement and the grout take should be verified and documented for each pile. In general, the drill holes for the piles should be fully cased through the soil and bedrock and be retracted to create the required bond zone within the bedrock.

It should be noted that artesian pressures may be encountered during drilling, depending upon the season and recent precipitation levels. The artesian pressures appeared to be located within the bedrock fractures; however, pressures could also be high in the overburden soils. The Contractor should be prepared the handle artesian pressures throughout the drilling and grouting process. Artesian pressures at the site appeared to be heavily influenced from recent precipitation based on the piezometer readings Nobis performed between 2020 and 2022.

To minimize effects of the potential artesian pressures that have been documented at the site, potential options for the Contractor during micropile installation may include, but are not limited to the following:

- Having appropriate dewatering plans and equipment in place to handle anticipated flows into excavations including contingency plans;
- restricting excavations and micropile installations to drier seasons;
- using hollow bars for micropile installations;

- including additives to the grout for the purpose of increasing its weight; and/or,
- grouting micropiles under pressure.

Micropile Load Testing

Static load testing of micropiles is required per AASHTO Section 10.9.3.5.4. We recommend that tension load tests be performed (ASTM D3689) on one sacrificial test pile at the site. DMPs are often tested in tension because they are typically designed as friction-only piles and tension testing allows the ground surface to be used as the reaction force rather than using reaction piles or a reaction block, which is required for compressive testing.

The tension test should be performed and evaluated such that no skin friction within the soil overburden is included in the micropile resistance. This could be performed utilizing an oversized casing to the top of the bearing zone or by utilizing tell-tales at the top and bottom of the bearing zone. The static load test should be within 10 feet of the footprint of the proposed abutment but at least 5 feet away from any production pile. The proposed test pile location should be noted on the design plans.

The 2020 AASHTO LRFD Bridge Construction Specifications requires sacrificial micropile testing to 150 percent of the factored design load. Therefore, the required micropile test load is 301.8 kips (factored design load of 201.2 kips * 1.5). This load exceeds the yield strength of 135 kips (2.25 square inches * 60 ksi) for a drilled micropile with a No. 14 bar utilizing 60 ksi steel. Therefore, for testing purposes we recommend that a larger bar size be utilized such that a tension load test can be performed. A stronger bar (75 ksi or 150 ksi) could also be utilized but an upsize of the center bar would still be necessary. An appropriate structural resistance factor should also be incorporated into the test.

In addition to the sacrificial static tests, proof testing of production micropiles to 100 percent of the factored design load (201.2 kips) should be performed. We recommend a minimum of one proof test at each abutment. This load exceeds the yield strength of 135 kips (2.25 square inches * 60 ksi) a drilled micropile with a No. 14 bar utilizing 60 ksi steel. Therefore, for testing purposes we recommend that a larger bar size or a stronger bar be utilized for the proof test piles such that tension load tests can be performed. An appropriate structural resistance factor should also be incorporated into the test. This will satisfy the requirement that a minimum of 5% of piles be

proof tested in accordance with AASHTO Section 10.9.5.3.4. Successful proof testing should be performed and completed prior to the installation of remaining piles within that abutment.

Earthwork and Compaction

Fill material placement should be in accordance with Sections 150 and M of the Massachusetts Department of Transportation Standard Specifications for Highways and Bridges. Reference is also made to the following **Table 5**:

Table 5 – Fill Materials and Uses

Borrow Material	MASSDOT Spec. No.	Use
Ordinary Borrow	M1.01.0	General Fill
Special Borrow	M1.02.0	Drainage or stabilization fill
Gravel Borrow	M1.03.0, Type b	Behind abutments
Sand Borrow	M1.04.0	Drainage fill
Crushed Stone for Bridge Foundations	M2.01.1	Drainage fill behind abutments

Fill should be placed in loose layers not more than 12 inches thick and compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). In confined areas, place only 6-inch layers and compact with manually operated, powered vibratory compactor acceptable to the geotechnical engineer. Crushed Stone, where used, for any required depth of more than 12 inches, should be placed in 6-inch layers and compacted to an unyielding surface. Crushed stone should be wrapped in filter fabric, such as Mirafi 140N, or equivalent. Backfill behind the abutment walls should consist of free-draining Gravel Borrow fill (M1.03.0, Type b) and provisions made for weep holes.

Compaction within 5 feet of abutment walls less than 15-feet-high, or within 10 feet of walls greater than 15-feet-high should be performed using a vibratory walk-behind roller or plate compactor. Protect footings from frost at all times during construction. Structural fill should not be placed over frozen soil.

Reuse of Excavated Materials

Based on the soil descriptions on the boring logs, it is not anticipated that much of the existing on-site soils to be excavated for foundation construction would meet the gradation requirements for Gravel Borrow. Additionally, some of the excavated soils will be located below the groundwater level and are anticipated to be saturated. Soils not meeting the Gravel Borrow specification may be reused as Ordinary Borrow in non-structural areas not requiring a free-draining material, provided that weather conditions are satisfactory, the moisture content is suitable and can be controlled, and the materials can be compacted to the required density. Excavated soils that are not able to be reused on site will need to be transported to an off-site location and properly disposed of.

Reuse of excavated on-site soils is predicated upon placement during satisfactory weather conditions, proper control of the moisture content and compaction to the required density. Re-use of on-site soils should be at the acceptance of the geotechnical engineer prior to placement.

Stockpiles of fill materials should be maintained to prevent material from fluctuating from the optimum moisture content, freezing, separating due to migration of fine-grained soils, and collection of snow or ice within the stockpiles.

Construction Dewatering and Temporary Excavation Support

Due to the depth of excavation, groundwater levels and associated artesian conditions, and presence of the adjacent brook, a temporary earth support system (i.e., cofferdam) will be required for the foundation abutment construction. The Contractor should be prepared to manage and control groundwater and water from the adjacent brook during foundation excavation, including seepage and hydraulic gradients and artesian pressures that could result in instability of the subgrade, as well as to control surface water from entering excavations to provide a dry and stable subgrade.

The Contractor should be responsible for selecting the dewatering methods based on his proposed methods and equipment used for excavation. The method of dewatering will depend on time of year that the work is performed, size and type of the cofferdam, and the length of time the excavation is left open. Dewatering efforts must satisfy requirements of local, state, and federal environmental and conservation authorities.

We anticipate that a cofferdam consisting of driven sheet pile walls would be possible but might be difficult to install at the site due to the cobbles and boulders and the glacial till at the site (even though the till is generally cohesive). Other potential less-expensive options include sand bagging, earthen dams, and the use of a structure such as a Porta-Dam. These less-expensive options would likely not be as effective at controlling the groundwater and river water as steel sheeting would be.

Temporary earth support for support of the temporary bridge and associated temporary access roadways is anticipated to consist of micropile and lagging.

Temporary earth support systems (including the soldier pile and lagging system proposed to support the western side of the temporary bridge access roadways) should be selected by the Contractor and designed by a Professional Engineer registered in the Commonwealth of Massachusetts and retained by the Contractor. Where excavation sides are cut back and sloped, they should be in accordance with Occupational Safety and Health Administration (OSHA) Construction Industry Standards. Dewatering systems should be designed by an earthwork contractor with demonstrated experience in construction involving waterways.

Contract Documents and Construction Monitoring

We recommend that Nobis be considered to assist you with preparing/reviewing special provisions and to review near final plans for conformance with our geotechnical recommendations and also to provide submittal reviews for construction procedures during foundation and earthwork phases of the project. Construction services may include micropile installation and load testing observations, verification of subgrade soils, observation of proofrolling operations, monitoring installation of cofferdams, and in general, observe compliance with recommendations in this report and the contract documents.

We appreciate the opportunity to assist you with this project. Should you require additional information, please do not hesitate to contact us.

Very truly yours,

NOBIS GROUP®

MAR 9, 2023

Alfred Jones, PE
Director, Geotechnical Services

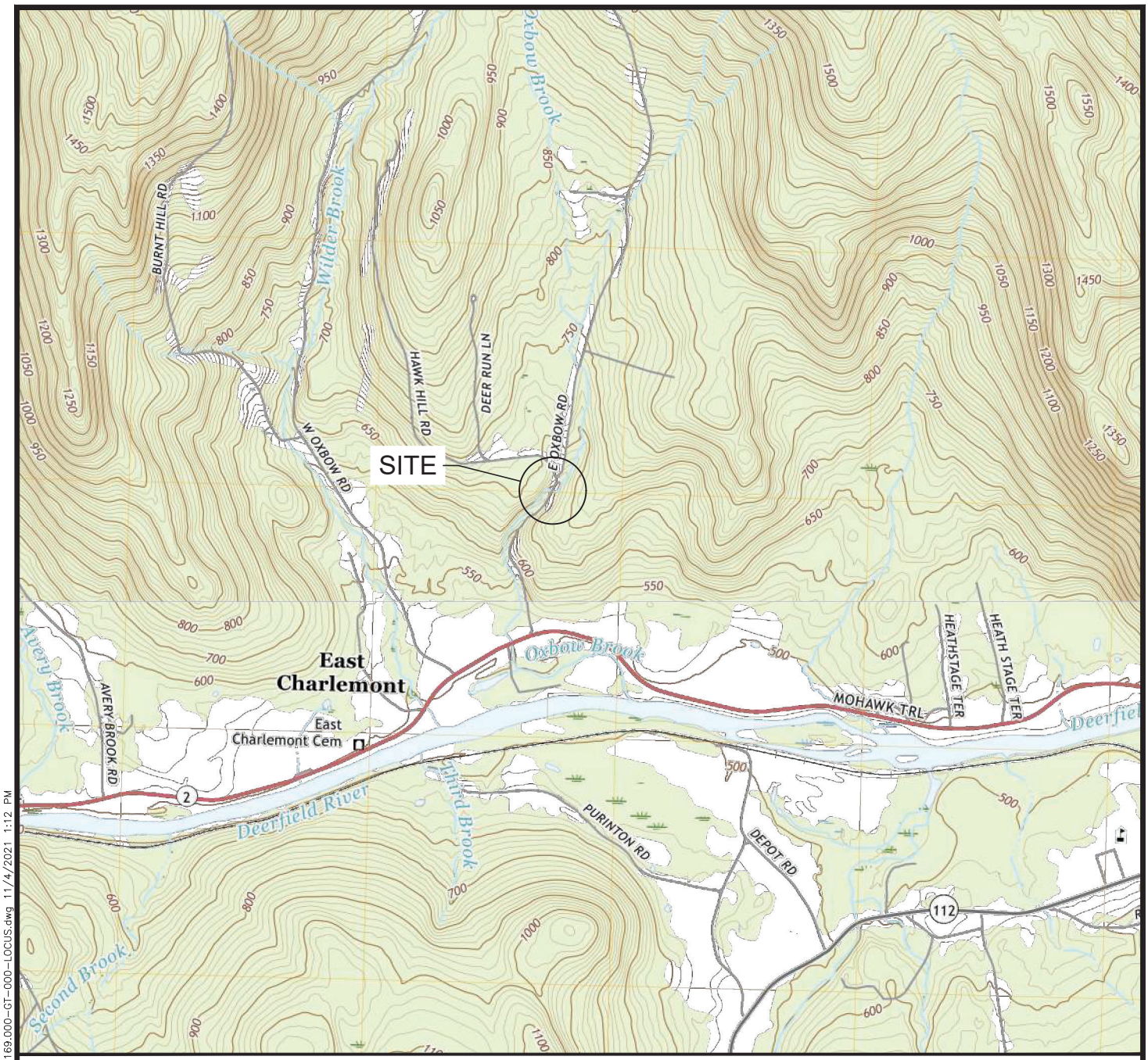
Brien T. Waterman, PE
Project Reviewer

Attachments: Figures

Appendix A	Limitations
Appendix B	Boring Logs
Appendix C	Vibrating Wire Piezometer Logs
Appendix D	Laboratory Test Data
Appendix E	Calculations

j:\100169.010 - massdot charlemont bridge fd-ca\report\100169.010 east oxbow road over oxbow brook geotech report 100% - 3-9-23.docx

FIGURES



NORTH

2018 USGS TOPOGRAPHIC MAPS
ASHFIELD & HEATH QUADRANGLES
CHARLEMONT, MASSACHUSETTS
CONTOUR INTERVAL 10 FEET (HEATH), 20 FEET (ASHFIELD)
NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

APPROXIMATE SCALE
1 INCH = 2,000 FEET

PROJECT FILE NO. 608858

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QUADRANGLE LOCATION

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FIGURE 1
SITE LOCUS PLAN
CHARLEMONT

EAST OXBOW ROAD OVER
OXBOW BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

NOVEMBER 2021

BRIDGE NO. C-05-042

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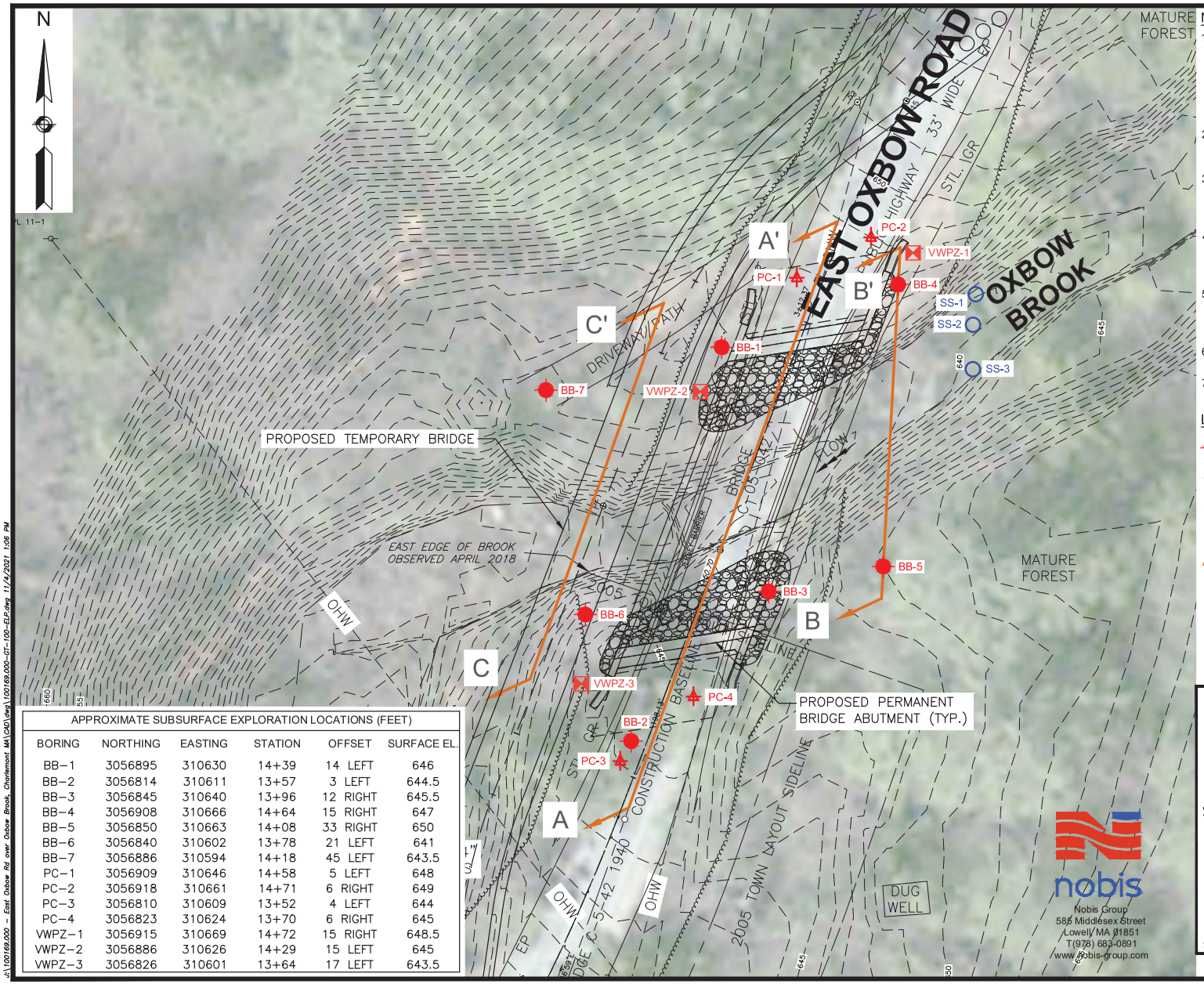

APPROXIMATE SUBSURFACE EXPLORATION LOCATIONS (FEET)

BORING	NORTHING	EASTING	STATION	OFFSET	SURFACE EL.
BB-1	3056895	310630	14+39	14 LEFT	646
BB-2	3056814	310611	13+57	3 LEFT	644.5
BB-3	3056845	310640	13+96	12 RIGHT	645.5
BB-4	3056908	310666	14+64	15 RIGHT	647
BB-5	3056850	310663	14+08	33 RIGHT	650
BB-6	3056840	310602	13+78	21 LEFT	641
BB-7	3056886	310594	14+18	45 LEFT	643.5
PC-1	3056909	310646	14+58	5 LEFT	648
PC-2	3056918	310661	14+71	6 RIGHT	649
PC-3	3056810	310609	13+52	4 RIGHT	644
PC-4	3056823	310624	13+70	6 RIGHT	645
VWPZ-1	3056915	310669	14+72	15 RIGHT	648.5
VWPZ-2	3056886	310626	14+29	15 LEFT	645
VWPZ-3	3056826	310601	13+64	17 LEFT	643.5

NOTES

1. THE BASE PLAN WAS DEVELOPED USING AN AUTOCAD SURVEY FILE PREPARED BY PATRICK ENGINEERING DATED NOVEMBER 13, 2019. PROPOSED CONDITIONS DEPICTED HEREON ARE BASED ON AN AUTOCAD DRAWING PROVIDED BY CHA ON NOVEMBER 3, 2021. THE AERIAL IMAGE WAS DOWNLOADED FROM MASSDOT GIS WEBSITE ON DECEMBER 21, 2018.
2. LOCATIONS AND SITE FEATURES DEPICTED ARE APPROXIMATE AND SHOWN FOR ILLUSTRATIVE PURPOSES.
3. PAVEMENT CORES AND TEST BORINGS BB-1 AND BB-2 WERE PERFORMED BY SEABOARD DRILLING, INC. OF CHICOPEE, MASSACHUSETTS, AND OBSERVED BY NOBIS BETWEEN DECEMBER 17 AND 16, 2018.
4. TEST BORINGS BB-3 THROUGH BB-5 WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE, AND OBSERVED BY NOBIS BETWEEN APRIL 16 AND 18, 2019.
5. TEST BORINGS BB-6 AND BB-7 WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE, AND OBSERVED BY NOBIS ON NOVEMBER 18 AND 19, 2019.
6. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
7. REFER TO FIGURES 5, 6 AND 7 FOR SUBSURFACE PROFILES.

LEGEND

- BB-1 — APPROXIMATE LOCATION OF TEST BORING
- SS-1 — APPROXIMATE LOCATION OF SEDIMENT SAMPLE
- PC-1 — APPROXIMATE LOCATION OF PAVEMENT CORE
- VWPZ-1 — APPROXIMATE LOCATION OF VIBRATING WIRE PIEZOMETER
- SUBSURFACE PROFILE LINE

0 20' 40'

GRAPHIC SCALE

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FIGURE 2
SUBSURFACE EXPLORATION LOCATION PLAN

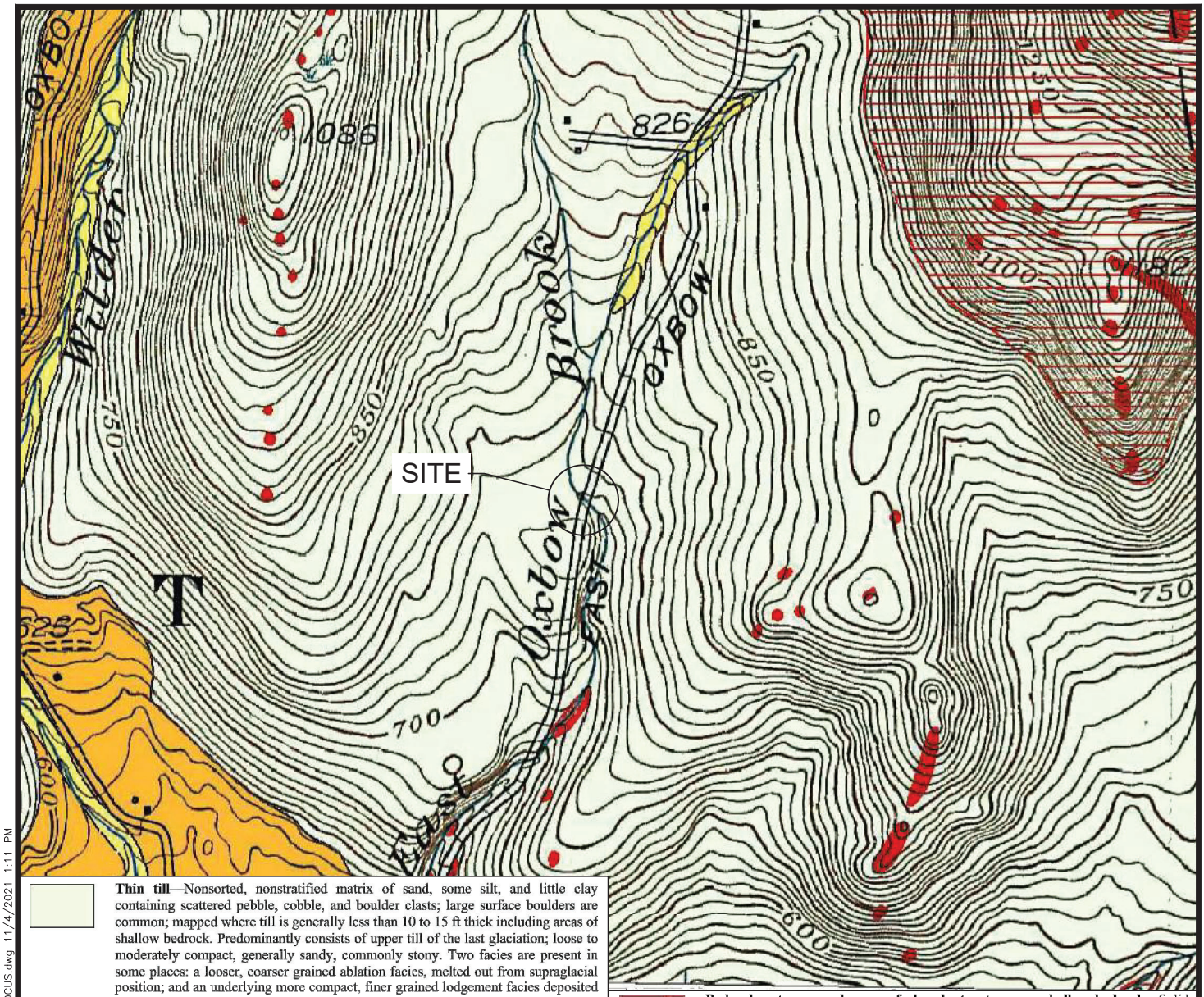
CHARLEMONT

EAST OXBOW ROAD OVER
OXBOW BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

SCALE: 1" = 20'-0" NOVEMBER 2021

BRIDGE NO. C-05-042



Thin till—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered pebble, cobble, and boulder clasts; large surface boulders are common; mapped where till is generally less than 10 to 15 ft thick including areas of shallow bedrock. Predominantly consists of upper till of the last glaciation; loose to moderately compact, generally sandy, commonly stony. Two facies are present in some places: a looser, coarser grained ablation facies, melted out from supraglacial position; and an underlying more compact, finer grained lodgement facies deposited subglacially. In general, both ablation and lodgement facies of upper till derived from fine-grained bedrock are finer grained, more compact, less stony and have fewer surface boulders than upper till derived from coarse-grained crystalline rocks. Fine-grained bedrock sources include the red Mesozoic sedimentary rocks of the Connecticut River lowland, marble in the western river valleys, and fine-grained schists in upland areas

Bedrock outcrops and areas of abundant outcrop or shallow bedrock—Solid color shows extent of individual bedrock outcrops; stipple pattern indicates areas of shallow bedrock ***or*** areas where small outcrops are too numerous to map individually; in areas of shallow bedrock, surficial materials are less than 5 to 10 ft thick. These units are not mapped consistently among all quadrangles; see Appendix for level of bedrock outcrop mapping in each quadrangle

NORTH

2010 USGS SURFICIAL GEOLOGIC MAP

"SURFICIAL GEOLOGIC MAP OF THE HEATH QUADRANGLE, MASSACHUSETTS" (STONE & DIGIACOMO-COHEN)

APPROXIMATE SCALE
1 INCH =1,000 FEET

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MASSACHUSETTS

QUADRANGLE LOCATION

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Massachusetts Department of Transportation
Highway Division

FIGURE 3
USGS SURFICIAL GEOLOGIC MAP
CHARLEMONT

EAST OXBOW ROAD OVER
OXBOW BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

NOVEMBER 2021

BRIDGE NO. C-05-042

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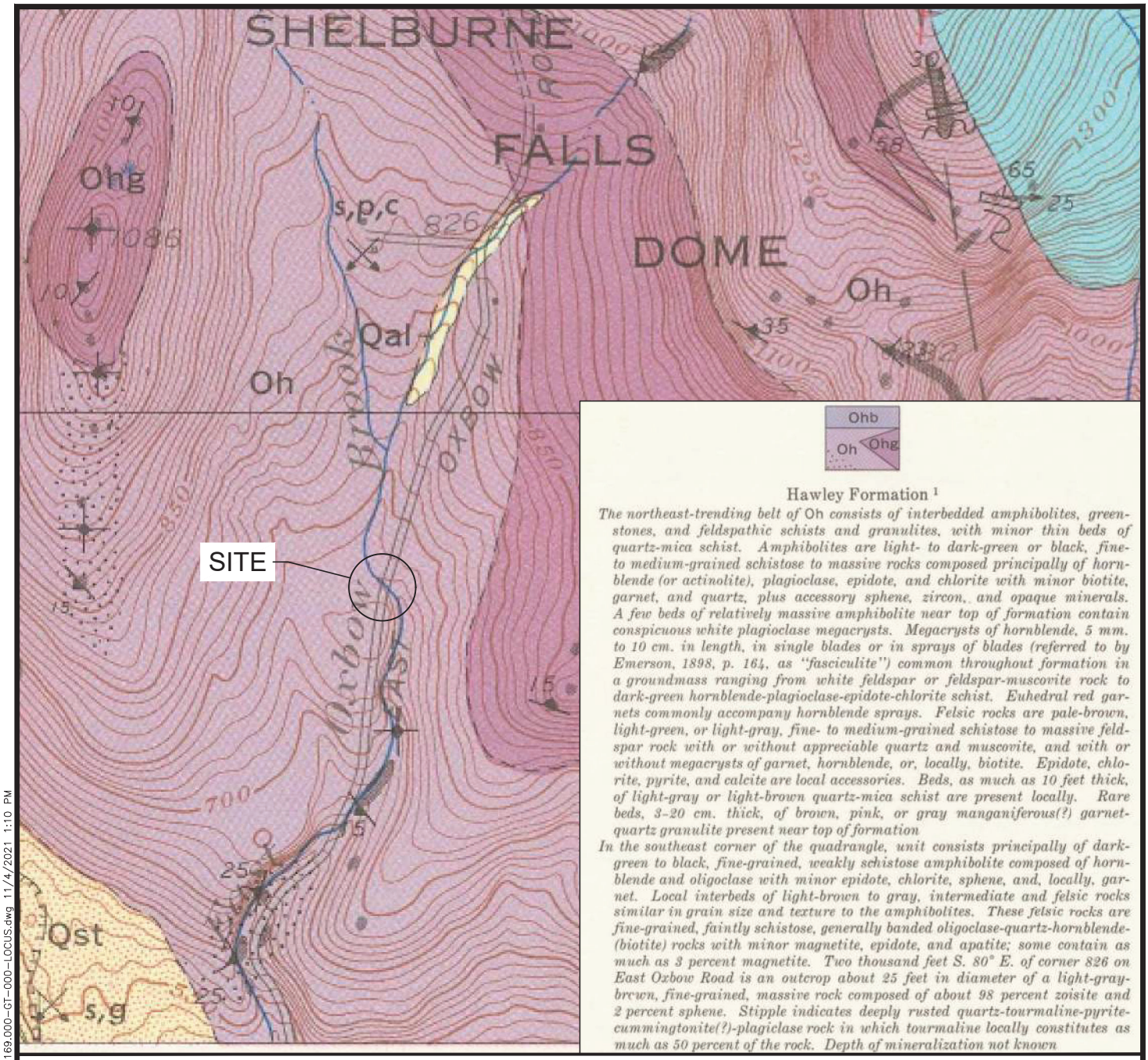

NORTH

1968 USGS BEDROCK GEOLOGIC MAP
"GEOLOGIC MAP OF THE HEATH QUADRANGLE, MASSACHUSETTS-VERMONT"
(HATCH JR., HARTSHORN)

APPROXIMATE SCALE
1 INCH =1,000 FEET

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QUADRANGLE LOCATION

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FIGURE 4
USGS BEDROCK GEOLOGIC MAP
CHARLEMONT
EAST OXBOW ROAD OVER
OXBOW BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

NOVEMBER 2021

BRIDGE NO. C-05-042

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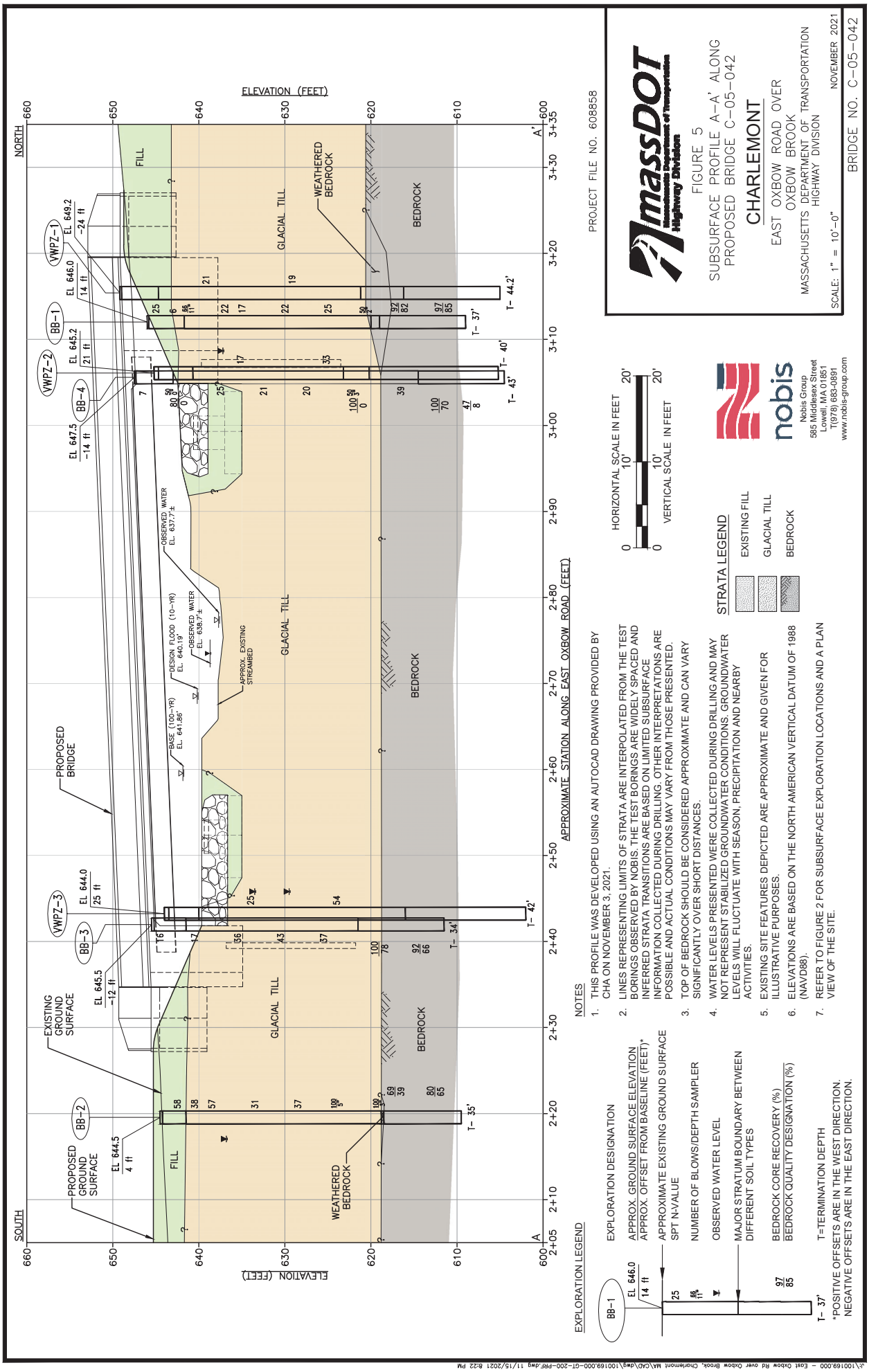

NOTES

1. THIS PROFILE WAS DEVELOPED USING AN AUTOCAD DRAWING PROVIDED BY CHA ON NOVEMBER 3, 2021.
2. LINES REPRESENTING LIMITS OF STRATA ARE INTERPOLATED FROM THE TEST BORINGS OBSERVED BY NOBIS. THE TEST BORINGS ARE WIDELY SPACED AND INFERRED STRATA TRANSITIONS ARE BASED ON LIMITED SUBSURFACE INFORMATION COLLECTED DURING DRILLING. OTHER INTERPRETATIONS ARE POSSIBLE AND ACTUAL CONDITIONS MAY VARY FROM THOSE PRESENTED.
3. TOP OF BEDROCK SHOULD BE CONSIDERED APPROXIMATE AND CAN VARY SIGNIFICANTLY OVER SHORT DISTANCES.
4. WATER LEVELS PRESENTED WERE COLLECTED DURING DRILLING AND MAY NOT REPRESENT STABILIZED GROUNDWATER CONDITIONS. GROUNDWATER LEVELS WILL FLUCTUATE WITH SEASON, PRECIPITATION AND NEARBY ACTIVITIES.
5. EXISTING SITE FEATURES DEPICTED ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
6. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
7. REFER TO FIGURE 2 FOR SUBSURFACE EXPLORATION LOCATIONS AND A PLAN VIEW OF THE SITE.

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MassDOT Massachusetts Department of Transportation Highway Division

FIGURE 5
SUBSURFACE PROFILE A–A' ALONG PROPOSED BRIDGE C–05–042

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

SCALE: 1" = 10'–0" NOVEMBER 2021

BRIDGE NO. C–05–042

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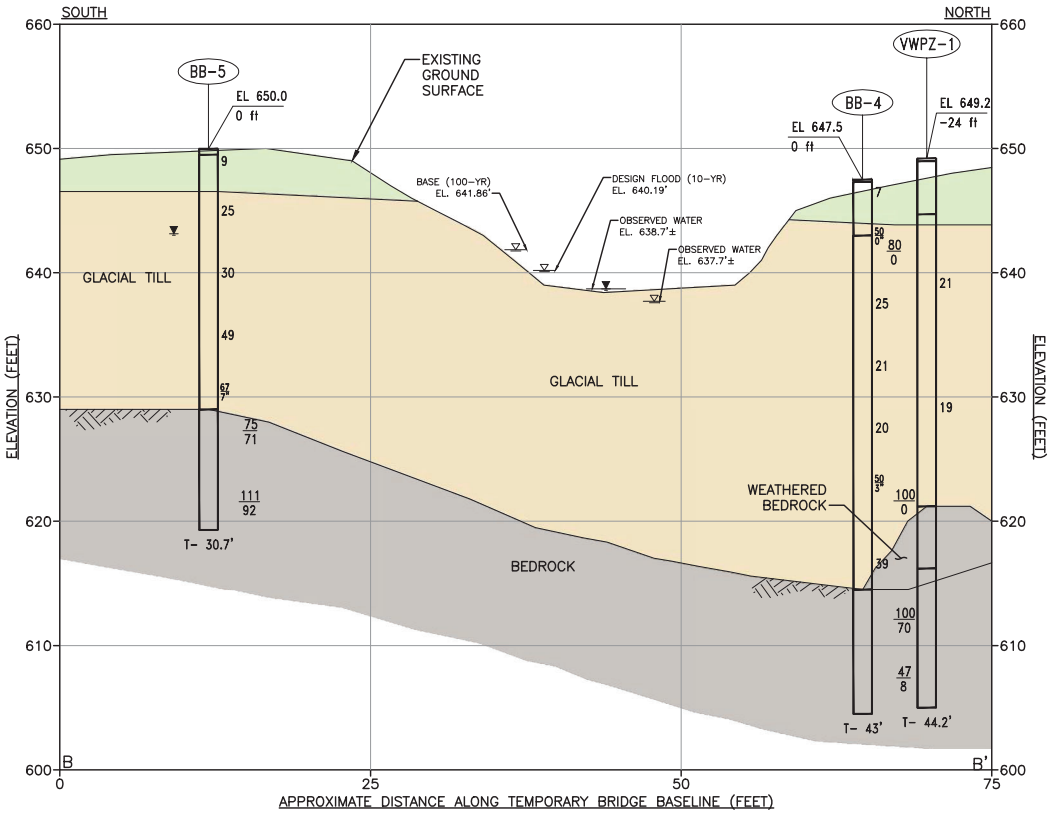

NOTES

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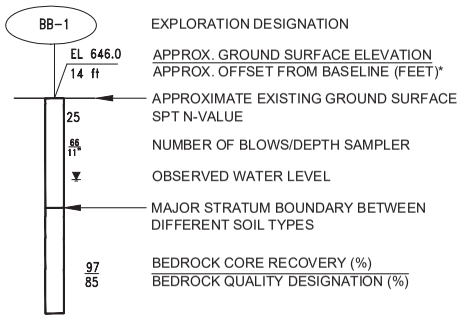
3. TOP OF BEDROCK SHOULD BE CONSIDERED APPROXIMATE AND CAN VARY SIGNIFICANTLY OVER SHORT DISTANCES.
4. WATER LEVELS PRESENTED WERE COLLECTED DURING DRILLING AND MAY NOT REPRESENT STABILIZED GROUNDWATER CONDITIONS. GROUNDWATER LEVELS WILL FLUCTUATE WITH SEASON, PRECIPITATION AND NEARBY ACTIVITIES.
5. EXISTING SITE FEATURES DEPICTED ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
6. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
7. REFER TO FIGURE 2 FOR SUBSURFACE EXPLORATION LOCATIONS AND A PLAN VIEW OF THE SITE.

EXPLORATION LEGEND



EXPLORATION DESIGNATION
APPROX. GROUND SURFACE ELEVATION
APPROX. OFFSET FROM BASELINE (FEET)*
APPROXIMATE EXISTING GROUND SURFACE
SPT N-VALUE
NUMBER OF BLOWS/DEPTH SAMPLER
OBSERVED WATER LEVEL
MAJOR STRATUM BOUNDARY BETWEEN DIFFERENT SOIL TYPES
BEDROCK CORE RECOVERY (%)
BEDROCK QUALITY DESIGNATION (%)
T=TERMINATION DEPTH

*POSITIVE OFFSETS ARE IN THE WEST DIRECTION.
NEGATIVE OFFSETS ARE IN THE EAST DIRECTION.

STRATA LEGEND

- EXISTING FILL
- GLACIAL TILL
- BEDROCK

HORIZONTAL SCALE IN FEET
0 10' 20'
0 10' 20'
VERTICAL SCALE IN FEET

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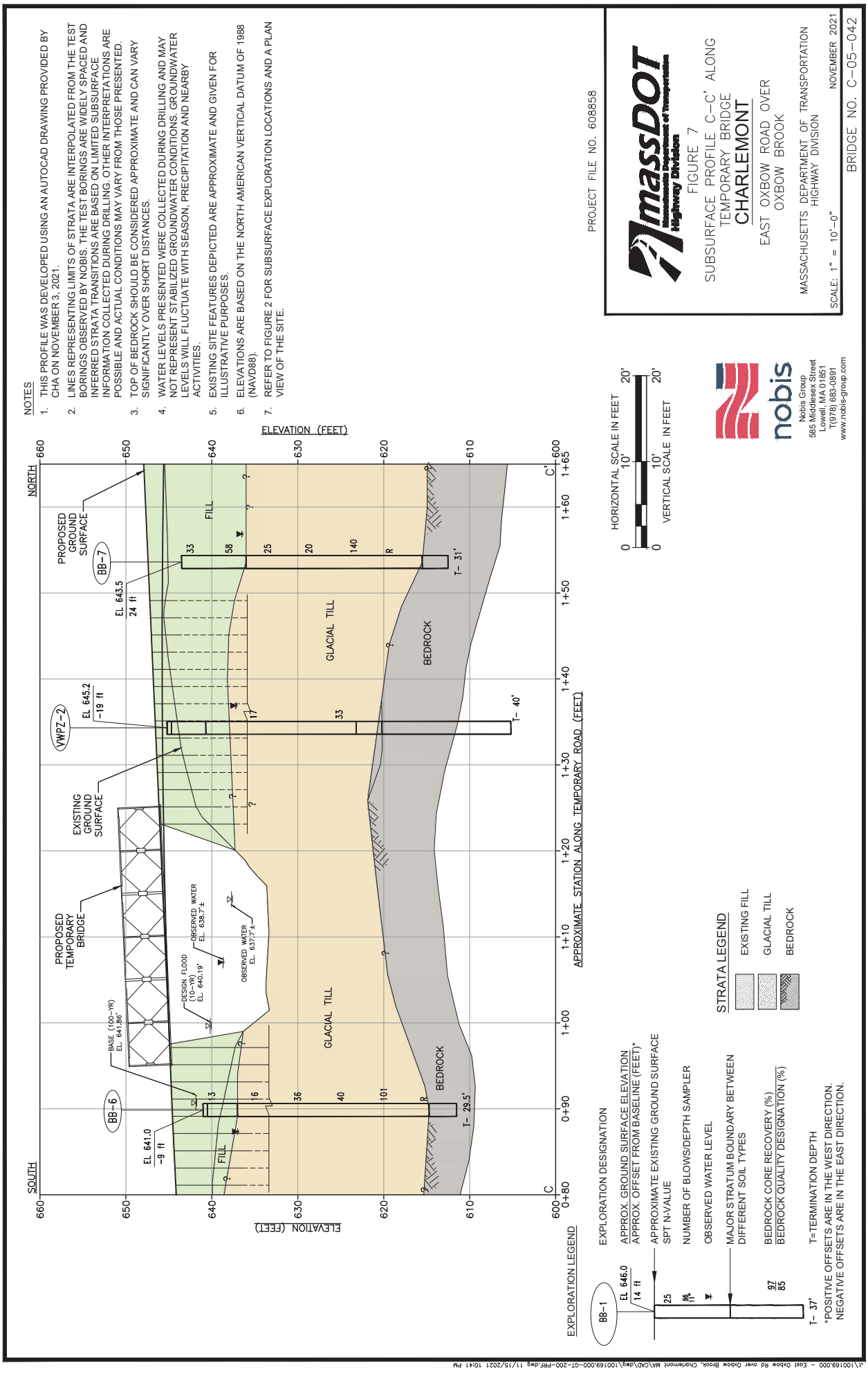
FIGURE 6
SUBSURFACE PROFILE B–B' ALONG PREVIOUS TEMPORARY BRIDGE LOCATION

CHARLEMONT

EAST OXBOW ROAD OVER OXBOW BROOK
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

SCALE: 1" = 10'-0" NOVEMBER 2021

BRIDGE NO. C-05-042


NOTES
1. THIS PROFILE WAS DEVELOPED USING AN AUTOCAD DRAWING PROVIDED BY CHA ON NOVEMBER 3, 2021.
2. LINES REPRESENTING LIMITS OF STRATA ARE INTERPOLATED FROM THE TEST BORINGS OBSERVED BY NOBIS. THE TEST BORINGS ARE WIDELY SPACED AND INFERRED STRATA TRANSITIONS ARE BASED ON LIMITED SUBSURFACE INFORMATION COLLECTED DURING DRILLING. OTHER INTERPRETATIONS ARE POSSIBLE AND ACTUAL CONDITIONS MAY VARY FROM THOSE PRESENTED.
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4. WATER LEVELS PRESENTED WERE COLLECTED DURING DRILLING AND MAY NOT REPRESENT STABILIZED GROUNDWATER CONDITIONS. GROUNDWATER LEVELS WILL FLUCTUATE WITH SEASON, PRECIPITATION AND NEARBY ACTIVITIES.
5. EXISTING SITE FEATURES DEPICTED ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
6. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
7. REFER TO FIGURE 2 FOR SUBSURFACE EXPLORATION LOCATIONS AND A PLAN VIEW OF THE SITE.
PROJECT FILE NO. 608858
MassDOT Highway Division
FIGURE 7
SUBSURFACE PROFILE C–C' ALONG TEMPORARY BRIDGE
CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
SCALE: 1" = 10'–0"
NOVEMBER 2021
BRIDGE NO. C–05–042
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HORIZONTAL SCALE IN FEET
VERTICAL SCALE IN FEET
ELEVATION (FEET)
APPROXIMATE STATION ALONG TEMPORARY ROAD (FEET)
SOUTH
NORTH
C
C'
PROPOSED TEMPORARY BRIDGE
EXISTING GROUND SURFACE
PROPOSED GROUND SURFACE
BB-6
BB-7
VWPZ-2
EL 641.0 -9 ft
EL 643.5 24 ft
EL 645.2 -19 ft
BASE (100-YR) EL. 641.86'
DESIGN FLOOD (10-YR) EL. 640.19'
OBSERVED WATER EL. 638.7'±
OBSERVED WATER EL. 637.7'±
FILL
GLACIAL TILL
BEDROCK
T- 29.5'
T- 40'
T- 31'
STRATA LEGEND
EXISTING FILL
GLACIAL TILL
BEDROCK
EXPLORATION LEGEND
EXPLORATION DESIGNATION
APPROX. GROUND SURFACE ELEVATION
APPROX. OFFSET FROM BASELINE (FEET)*
APPROXIMATE EXISTING GROUND SURFACE
SPT N-VALUE
NUMBER OF BLOWS/DEPTH SAMPLER
OBSERVED WATER LEVEL
MAJOR STRATUM BOUNDARY BETWEEN DIFFERENT SOIL TYPES
BEDROCK CORE RECOVERY (%)
BEDROCK QUALITY DESIGNATION (%)
T=TERMINATION DEPTH
*POSITIVE OFFSETS ARE IN THE WEST DIRECTION.
NEGATIVE OFFSETS ARE IN THE EAST DIRECTION.

FIGURE 8
Piezometric Pressure Depth vs Time

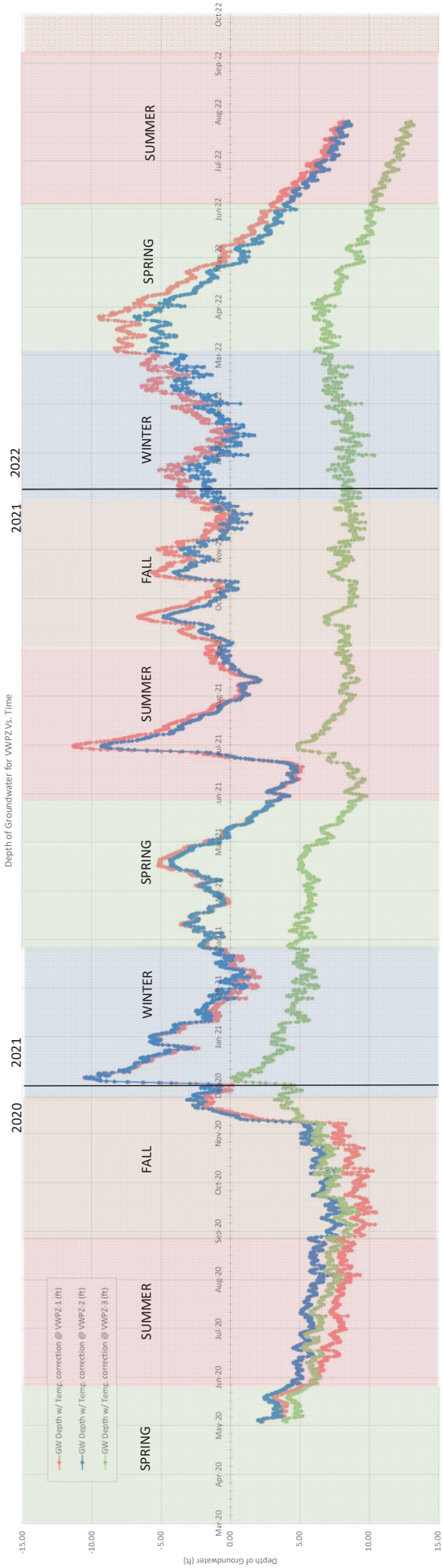
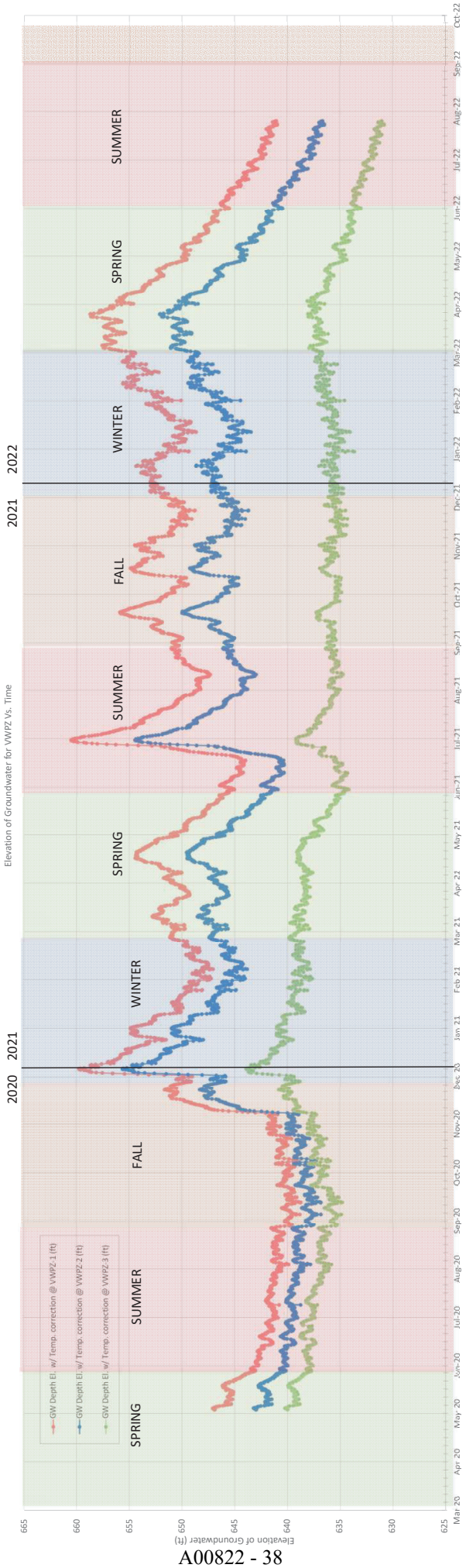


FIGURE 9
Piezometric Pressure Elevation vs Time



APPENDIX A – Limitations

GEOTECHNICAL LIMITATIONS

Explorations and Subsurface Conditions

1. The analyses and design recommendations submitted in this report are based in part upon the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

   In preparing this report, Nobis relied on certain information provided by the Client and other parties referenced therein which were made available to Nobis at the time of our evaluation. Nobis did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the exploration logs.

3. Water level readings have been made in the explorations at times and under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made. The water table encountered in the course of the work may differ from that indicated in the Report.

   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.

4. Nobis' geotechnical services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

Additional Services

5. Nobis recommends that we be retained to provide services during 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 recommendations, design concepts and/or opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design recommendations; and iv) assess the consequences of changes in technologies and/or regulations.

Use of Report

6. Nobis prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in our proposal 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). 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 Nobis.

   This report is for design purposes only and is not sufficient to prepare an accurate construction bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. Nobis' findings and conclusions are based on the work conducted as part of the scope of work set forth in our proposal 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 considering 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 project design has been altered in any way, Nobis shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

8. Nobis' 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.

Compliance with Codes and Regulations

9. Nobis 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.

Opinion of Cost

10. This report may contain or be based on comparative cost opinions for the purpose of evaluating alternative foundation schemes. These opinions may also involve approximate quantity evaluations. It should be noted that quantity estimates may not be accurate enough for construction bids. In addition, since we are not professional estimators of labor and materials cost, the evaluation of construction costs should be considered as approximate guidelines and could vary significantly from actual costs. Nobis does not guarantee the accuracy of our cost opinions as compared to contractor's bids for construction costs.

END OF LIMITATIONS

APPENDIX B – Boring Logs

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-1**
Boring Location: Near Prop. North Abut.
N: 3056895 E: 310630
Checked by: A. Jones
Date Start: December 17, 2018
Date Finish: December 18, 2018

Contractor: Seaboard Drilling, Inc.
Driller: M. Glynn
Nobis Rep.: P. Clarke

Rig Type / Model: ATV / Diedrich D-50 Turbo
Hammer Type: Automatic Hammer
Hammer Hoist: Automatic

Ground Surface Elev.: (+/-) 646
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
12/18/18	11:20	0 (Artesian)	17	37	0 minutes

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	Sample Description and Remarks (Classification System: Modified Burmister)	Notes
1	S-1	10	0-2	10 12 13 17					645.8 / 0.2 TOPSOIL	S-1A (2"): Medium dense, dark brown, fine to coarse SAND, some Silt, some fine Gravel, very few roots. moist. (TOPSOIL).	
2									FILL	S-1B (8"): Medium dense, dark gray-brown, fine to coarse GRAVEL and fine to coarse Sand, some Silt, very few asphalt particles and fragments. dry. (FILL).	
3	S-2	4	2-4	12 3						S-2: Loose, gray-brown, fine to coarse GRAVEL, some fine to coarse Sand, little Clay & Silt. dry. (FILL).	
4				3 4							1
5	S-3	7	4-5.4	13 16					641.7 / 4.3	S-3A (3"): Hard, brown, CLAY & SILT, some fine to coarse Sand, some fine Gravel, very few roots. moist. (FILL).	
6				50/5"						S-3B (4"): Very dense, dark gray-brown, inferred decomposed cobble/boulder particles and fragments. dry. (GLACIAL TILL).	
7											
8											
9	S-4	16	8-10	8 12						S-4: Very stiff, gray, CLAY & SILT, little fine to medium Sand, little fine Gravel. wet. (GLACIAL TILL). [Laboratory Test Performed - Grain Size Analysis (Sieve Only): Gravel = 15.8%, Sand = 14.4%, Silt & Clay = 69.8%].	2
10				10 12							3
11	S-5	15	10-12	4 5						S-5: Very stiff, gray, Silty CLAY, little fine Sand, trace fine Gravel. wet. (GLACIAL TILL).	
12				12 12							
13											
14											
15									GLACIAL TILL		
16	S-6	5	15-17	7 10						S-6: Very stiff, gray, CLAY & SILT, little fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL).	
17				12 14							
18											
19											
20											
21	S-7	13	20-22	13 10						S-7: Very stiff, gray, CLAY & SILT, some fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL).	
22				15 24							
23										Increased drilling resistance observed at approximately 22.5 feet below ground surface.	
24											
25											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Casing unable to be advanced beyond approximately 3 feet below ground surface due to obstruction(s) (inferred cobble/boulder). Boring offset approximately two (2) feet south for second attempt.
2) Oxbow Brook measured at approximately 8 feet below existing bridge deck surface prior to drilling.
3) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-1**
Boring Location: Near Prop. North Abut.
N: 3056895 E: 310630
Checked by: A. Jones
Date Start: December 17, 2018
Date Finish: December 18, 2018

Contractor: Seaboard Drilling, Inc.
Driller: M. Glynn
Nobis Rep.: P. Clarke

Rig Type / Model: ATV / Diedrich D-50 Turbo
Hammer Type: Automatic Hammer
Hammer Hoist: Automatic

Ground Surface Elev.: (+/-) 646
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
12/18/18	11:20	0 (Artesian)	17	37	0 minutes

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
26	S-8	8	25-25.7	31 50/2"					GLACIAL TILL 620.0 / 26.0	S-8: Hard, gray, CLAY & SILT, some fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL).	
27									WEATHERED BEDROCK 619.0 / 27.0	Inferred transition to less competent rock based on observed drilling behavior.	
28	C-1	55	27-32		92/82	3.2				C-1: Very Hard, fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to low-angle joints. Occasional thin beds of quartz-mica schist.	
29						4.5					
30						4.9					
31						4.5					
32						7					
33	C-2	58	32-37		97/85	3.7			BEDROCK	C-2: Very Hard, very slightly weathered to fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints. Occasional thin beds of quartz-mica schist.	
34						7.8					
35						5					
36						4					
37						4.5			609.0 / 37.0		
38										Boring terminated at 37 feet.	4
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

4) Artesian conditions observed after sampling bedrock. To control the pressure head and the upward flow of water, approximately 25 gallons of grout was tremied down borehole to create a seal. Upon departing the site, water was no longer flowing upward.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-2**
Boring Location: Near Prop.South Abut.
N: 3056814 E: 310611
Checked by: A. Jones
Date Start: December 19, 2018
Date Finish: December 19, 2018

Contractor: Seaboard Drilling, Inc.
Driller: M. Glynn
Nobis Rep.: P. Clarke

Rig Type / Model: Truck / B-53 Mobile
Hammer Type: Safety Hammer
Hammer Hoist: Wire Winch

Ground Surface Elev.: (+/-) 644.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 12/19/19	12:45	7.7	10	30	10 minutes

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1									644.2 / 0.3 ASPHALT	Asphalt (4").	
2	S-1	8	1-3	28					FILL	S-1: Very dense, brown, fine to coarse SAND, some Silt, little fine Gravel, pocket of CLAY & SILT. very few asphalt particles and fragments dry. (FILL).	
3				24 34 18					641.5 / 3.0		
4	S-2	18	3-5	15 19						S-2: Hard, gray, Silty CLAY, little fine Sand. moist. (GLACIAL TILL).	
5				19 19							
6	S-3	10	5-7	14 19						S-3: Hard, gray, Silty CLAY, trace fine Sand. moist. (GLACIAL TILL).	
7				38 35							
8							▼				
9											
10											
11	S-4	0	10-12	14 14						S-4: No Recovery.	
12				17 19							
13											
14											
15									GLACIAL TILL		
16	S-5	15	15-17	12 22						S-5A (13"): Hard, gray, CLAY & SILT, little fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL).	1
17				15 28						S-5B (2"): Hard, gray, CLAY & SILT, little fine to coarse Sand, inferred cobble/boulder particles. wet. (GLACIAL TILL).	
18											
19											
20											
21	S-6	4	20-20.4	100/5"						S-6: Hard, gray, CLAY, little fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL).	
22	C-1	36	21-25		75	2.5				C-1: Gray, CLAY & SILT, little fine to coarse Sand, trace fine Gravel, numerous inferred cobble/boulder fragments and pieces, wet (GLACIAL TILL).	
23						1.7					
24						0.8					
25						1					

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-2**
Boring Location: Near Prop.South Abut.
N: 3056814 E: 310611
Checked by: A. Jones
Date Start: December 19, 2018
Date Finish: December 19, 2018

Contractor: Seaboard Drilling, Inc.
Driller: M. Glynn
Nobis Rep.: P. Clarke

Rig Type / Model: Truck / B-53 Mobile
Hammer Type: Safety Hammer
Hammer Hoist: Wire Winch

Ground Surface Elev.: (+/-) 644.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 12/19/19	12:45	7.7	10	30	10 minutes

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
26	S-7	2	25-25.8	49 / 100/3"					GLACIAL TILL 618.8 / 25.7	S-7: Very dense, dark gray, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt. wet. (GLACIAL TILL). Increased drilling resistance observed at approximately 25 feet below ground surface.	
27	C-2	33	26-30		69/39	4			618.5 / 26.0 WEATHERED BEDROCK	Inferred transition to less competent rock based on observed drilling behavior.	
28						4				C-2: Very Hard, very slightly weathered to fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, low-angle to high-angle joints. Occasional thin beds of quartz-mica schist.	
29						4					
30						4					
31	C-3	48	30-35		80/65	3.5			BEDROCK	C-3: Very Hard, fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, low-angle to moderately-dipping joints. Occasional thin beds of quartz-mica schist.	
32						4					
33						3.5					
34						3.5					
35						3.5			609.5 / 35.0		
36										Boring terminated at 35 feet.	2
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
2) Borehole tremie-grouted and pavement restored using asphalt cold-patch.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-3**
Boring Location: Near Prop. South Abut.
N: 3056845 E: 310640
Checked by: A. Jones
Date Start: April 16, 2019
Date Finish: April 17, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: P. Clarke

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 645.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
04/17/19	15:00	0 (Artesian)	Out	34	5 hours

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	14	0-2	4 6 10 9					645.2 / 0.3 TOPSOIL	S-1A (4"): Medium dense, dark brown, SILT, little fine to coarse Sand, several roots. moist. (TOPSOIL).	
2									FILL	S-1B (10"): Medium dense, brown, fine to coarse GRAVEL, some fine to coarse Sand, little Silt, very few asphalt particles. moist. (FILL).	
3											
4									641.5 / 4.0		
5	S-2	11	4-6	9 7 10 11						S-2: Very stiff, gray, SILT & CLAY, little fine Sand, trace fine Gravel. wet. (GLACIAL TILL).	1
6											
7											
8											
9											
10	S-3	9	9-11	18 18 18 21						S-3: Hard, gray, Silty CLAY, little fine to coarse Sand. wet. (GLACIAL TILL).	
11											
12											
13											
14									GLACIAL TILL		
15	S-4	6	14-16	22 17 26 37						S-4: Hard, gray, Silty CLAY, some fine to coarse Sand. wet. (GLACIAL TILL).	
16											
17											
18											
19											
20	S-5	19	19-21	13 13 24 32						S-5: Hard, gray, Silty CLAY, some fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL). [Laboratory Test Performed - Grain Size Analysis (Sieve Only): Gravel = 6.1%, Sand = 28.8%, Silt & Clay = 65.1%].	
21											
22											
23											
24									621.5 / 24.0		
25	C-1	60	24-29		100/78	3			BEDROCK	C-1: Very Hard, fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, low-angle to moderately-dipping	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-3**
Boring Location: Near Prop. South Abut.
N: 3056845 E: 310640
Checked by: A. Jones
Date Start: April 16, 2019
Date Finish: April 17, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: P. Clarke

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 645.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
04/17/19	15:00	0 (Artesian)	Out	34	5 hours

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
26						4				joints. Occasional thin beds of quartz-mica schist.	
27						4					
28						6					
29						6					
30	C-2	55	29-34		92/66	4.5			BEDROCK	C-2: Very Hard, fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to low-angle joints. Occasional thin beds of quartz-mica schist.	
31						10.3					
32						10.5					
33						13					
34						13.5			611.5 / 34.0		
35										Boring terminated at 34 feet.	2
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
2) Artesian conditions observed after sampling bedrock. To control the pressure head and the upward flow of water, grout was tremied down borehole to create a seal. Upon departing the site, water was no longer flowing upward.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-4**
Boring Location: Near Prop. Temp. North Abut.
N: 3056908 E: 310666
Checked by: A. Jones
Date Start: April 17, 2019
Date Finish: April 18, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: P. Clarke

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 647.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
04/18/19	12:00	0 (Artesian)	Out	43	2 hours

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	12	0-2	1 2 5 10					647.3 / 0.2 TOPSOIL	S-1A (2"): Loose, dark brown, fine to coarse SAND and Silt. several roots. moist. (TOPSOIL). S-1B (10"): Loose, brown, fine to coarse SAND and Silt, little fine Gravel, pockets of Clayey SILT. moist. (FILL).	
2									FILL		
3											
4											
5	S-2 C-1	2 16	4-4.5 4.5-6.2	11 50/0"	80/0	6			643.0 / 4.5	S-2: Very dense, gray-brown, fine GRAVEL, some fine to coarse Sand, little Clayey Silt. wet. (FILL). C-1: Light gray BOULDER (GLACIAL TILL).	1
6						2					
7											
8											
9											
10	S-3	4	9-11	12 14 11 12						S-3: Very stiff, gray, Silty CLAY, little fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL).	
11											
12											
13											
14											
15	S-4	13	14-16	8 8 13 15					GLACIAL TILL	S-4: Very stiff, gray, Silty CLAY, some fine to coarse Sand, little fine to coarse Gravel. wet. (GLACIAL TILL). [Laboratory Test Performed - Grain Size Analysis (Sieve Only): Gravel = 18.3%, Sand = 30.8%, Silt & Clay = 50.9%].	
16											
17											
18											
19											
20	S-5	9	19-21	7 9 11 15						S-5: Very stiff, gray, Silty CLAY, trace fine to coarse Sand. wet. (GLACIAL TILL).	
21											
22											
23											
24											
25	S-6	6	24-24.8	6 50/3"						S-6: Hard, gray, Silty CLAY, some fine to coarse Sand, trace fine Gravel. wet. (GLACIAL TILL).	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-4**
Boring Location: Near Prop. Temp. North Abut.
N: 3056908 E: 310666
Checked by: A. Jones
Date Start: April 17, 2019
Date Finish: April 18, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: P. Clarke

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 647.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
04/18/19	12:00	0 (Artesian)	Out	43	2 hours

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
26	C-2	24	25-27		100/0	2.5				C-2: Light gray BOULDER (GLACIAL TILL).	
27						2.5					
28											
29									GLACIAL TILL		
30											
31	S-7	20	30-31.9	5 13 26 50/5"						S-7: Hard, gray, CLAY, little fine to coarse Sand, little fine to coarse Gravel. wet. (GLACIAL TILL).	
32											
33									614.5 / 33.0		
34	C-3	60	33-38		100/70	3				C-1: Very Hard, fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close, horizontal to moderately-dipping joints. Occasional thin beds of quartz-mica schist.	
35						2.5					
36						5					
37						5.5					
38						6					
39	C-4	28	38-43		47/8	2.5			BEDROCK	C-2: Very Soft to Hard, completely weathered to fresh, extremely to slightly fractured, light gray, very fine- to medium-grained, SCHIST, very close to close, horizontal to low-angle joints. Occasional thin beds of quartz-mica schist.	
40						5.5					
41						6.8					
42						2.2					
43						4			604.5 / 43.0		
44										Boring terminated at 43 feet.	2
45											
46											
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
2) Artesian conditions observed after sampling bedrock. To control the pressure head and the upward flow of water, grout was tremied down borehole to create a seal. Upon departing the site, water was no longer flowing upward.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-5**
Boring Location: Near Prop. Temp. South Abut.
N: 3056850.0904 E: 310663
Checked by: A. Jones
Date Start: April 16, 2019
Date Finish: April 16, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: P. Clarke

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 650
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 04/16/19	13:30	6.9	10	30.7	45 minutes

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	6	0-2	2 2					TOPSOIL 649.5 / 0.5	S-1: Loose, brown, fine to coarse SAND and Silt, some fine Gravel, several roots. dry. (TOPSOIL).	
2				7 7							
3											
4											
5	S-2	13	4-6	19 13						S-2: Very stiff, gray, SILT & CLAY and fine to coarse Sand, some fine Gravel. wet. (GLACIAL TILL).	1
6				12 12							
7							▼				
8											
9											
10	S-3	18	9-11	13 18						S-3: Very stiff, gray, Silty CLAY, some fine to medium Sand, trace fine Gravel. wet. (GLACIAL TILL). [Laboratory Test Performed - Grain Size Analysis (Sieve Only): Gravel = 3.4%, Sand = 26.9%, Silt & Clay = 69.7%].	
11				12 18					GLACIAL TILL		
12											
13											
14											
15	S-4	6	14-16	5 18						S-4: Hard, gray, Silty CLAY, little fine Sand. wet. (GLACIAL TILL).	
16				31 36							
17											
18											
19											
20	S-5	13	19-20.1	17 17						S-5: Hard, gray, Silty CLAY, some fine to coarse Sand, trace fine Gravel, inferred cobble fragment in split-spoon tip. wet. (GLACIAL TILL). Increased drilling resistance observed.	
21				50/1"					629.0 / 21.0		
22	C-1	45	21-26		75/71	1.7			BEDROCK	C-1: Very Hard, fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints. Occasional thin beds of quartz-mica schist.	
23						3.8					
24						4.3					
25						5.2					

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-5**
Boring Location: Near Prop. Temp. South Abut.
N: 3056850.0904 E: 310663
Checked by: A. Jones
Date Start: April 16, 2019
Date Finish: April 16, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: P. Clarke

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 650
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 04/16/19	13:30	6.9	10	30.7	45 minutes

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
26						9					
27	C-2	62	26-30.7		111/92	4				C-2: Very Hard, slightly weathered to fresh, moderately fractured to sound, light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints. Occasional thin beds of quartz-mica schist.	2
28						3.5			BEDROCK		
29						5.8					
30						3.2					
31						12			619.3 / 30.7		
32										Boring terminated at 30.7 feet.	3
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
2) Rock core recovery was greater than length of core run (i.e. REC% > 100%) likely due to rock core barrel sampling fractured rock advanced through, but not recovered in C-1.
3) Borehole tremie-grouted to ground surface on 4/17/19.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-6**
Boring Location: Near Temp. South Abut. (West)
N: 3056840 E: 310602
Checked by: A. Jones
Date Start: November 18, 2019
Date Finish: November 18, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: R. Clopper

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 641
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 11/18/19	11:00	4	0	29.5	<5 minutes

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	12	0-2	3 4 9 6			TOPSOIL 640.5 / 0.5	Topsoil (6").	
2								S-1 (6"): Medium dense, brown, fine to coarse SAND, little fine Gravel, little Silt, very few root fibers. Dry. (FILL).	
3							FILL		
4					▼		637.0 / 4.0		
5								Driller noted change in color and consistency of washings, possible strata change.	
6	S-2	14	5-7	9 8 8 12				S-2: Medium dense, gray, Clayey SILT, little fine to coarse Sand, little fine to coarse Gravel. Wet. (GLACIAL TILL).	1
7									
8									
9									
10									
11	S-3	14	10-12	14 19 17 13				S-3: Dense, gray, SILT & CLAY, little fine to coarse Sand, little fine to coarse Gravel. Wet. (GLACIAL TILL).	
12									
13									
14									
15							GLACIAL TILL		
16	S-4	10	15-17	13 16 24 21				S-4: Dense, gray, SILT & CLAY, some fine to coarse Sand, little fine to coarse Gravel. Wet. (GLACIAL TILL).	
17									
18									
19								Driller noted rollerbit chatter from 18.5' to 19' bgs, possible cobble.	
20									
21	S-5	18	20-22	24 31 70 58				S-5: Very dense, gray, SILT & CLAY, some fine to coarse Gravel, little fine to coarse Sand, a piece of gravel was stuck in the spoon tip. Wet. (GLACIAL TILL).	
22									
23									
24								Driller noted rollerbit chatter from 23' to 24.5' bgs, possible cobble.	
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Casing was advanced to 5 feet during drilling and then open-hole drilling technique was used thereafter.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-6**
Boring Location: Near Temp. South Abut. (West)
N: 3056840 E: 310602
Checked by: A. Jones
Date Start: November 18, 2019
Date Finish: November 18, 2019

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: R. Clopper

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 641
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 11/18/19	11:00	4	0	29.5	<5 minutes

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
26	S-6	4	25-26.3	41 45 100/4"			GLACIAL TILL 614.7 / 26.3	S-6: Very dense, gray, SILT & CLAY, little fine to coarse Sand, little fine to coarse Gravel. Wet. (GLACIAL TILL).	
27								Driller noted increase in rollerbit resistance at 26.3 feet, possible bedrock interface. Rollerbit was advanced to 29.5 feet to evaluate the presence of bedrock.	
28							INFERRED BEDROCK		
29							611.5 / 29.5		
30								Boring terminated at 29.5 feet.	
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
2) Artesian condition was not encountered. Borehole was backfilled with grout using tremie grouting techniques.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-7**
Boring Location: Near Temp. North Abut. (West)
N: 3056886 E: 310594
Checked by: A. Jones
Date Start: November 19, 2019
Date Finish: November 19, 2019

Contractor: New England Boring Contractors
Driller: M. Misiaszek
Nobis Rep.: R. Clopper

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 643.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 11/19/19	13:30	7	0	31	<5 minutes

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	10	0-2	2 3				S-1: Dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Wet. (FILL).	
2				30 6					
3									
4							FILL		
5	S-2	9	4.5-6.5	25				Driller noted rollerbit chatter from 4' to 4.5' bgs, possible cobble. S-2: Very dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Wet. (FILL).	
6				35 23					
7				30	▼				
8							636.0 / 7.5	Driller noted change in color and consistency of washings, possible strata change.	
9									
10	S-3	4	9-11	12 13				S-3: Medium dense, gray, CLAY & SILT, little fine to coarse Sand. Wet. (GLACIAL TILL).	1
11				12 15					
12									
13									
14									
15	S-4	16	14-15.6	9 8				S-4: Medium dense, gray, CLAY & SILT, little fine to coarse Sand. Wet. (GLACIAL TILL).	
16				12 50/1"				Driller noted rollerbit chatter from 15.6' to 17' bgs, possible cobble.	
17							GLACIAL TILL		
18									
19									
20	S-5	6	19-21	55 80				S-5: Very dense, gray, CLAY & SILT, some fine to coarse Gravel, some fine to coarse Sand. Wet. (GLACIAL TILL).	
21				60 59					
22									
23									
24									
25	S-6	4	24-24.3	100/4"				S-6: Very dense, gray, CLAY & SILT, little fine to coarse Sand, a piece of gravel was stuck in the spoon tip. Wet. (GLACIAL TILL).	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Casing was advanced to 9 feet during drilling and then open-hole drilling technique was used thereafter.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **BB-7**
Boring Location: Near Temp. North Abut. (West)
N: 3056886 E: 310594
Checked by: A. Jones
Date Start: November 19, 2019
Date Finish: November 19, 2019

Contractor: New England Boring Contractors
Driller: M. Misiaszek
Nobis Rep.: R. Clopper

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 643.5
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 11/19/19	13:30	7	0	31	<5 minutes

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
26							GLACIAL TILL		
27									
28							615.5 / 28.0		
29							INFERRED BEDROCK	Driller noted increase in rollerbit resistance at 28.0 feet, possible bedrock interface. Rollerbit was advanced to 31 feet to evaluate the presence of bedrock.	
30									
31							612.5 / 31.0		
32								Boring terminated at 31 feet.	
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
2) Artesian condition was not encountered. Borehole was backfilled with grout using tremie grouting techniques.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

APPENDIX C – Vibrating Wire Piezometer Logs

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **VWPZ-1**
Boring Location: Near Prop. Temp. North Abut.
N: 3056915 E: 310669
Checked by: A. Jones
Date Start: May 18, 2020
Date Finish: May 19, 2020

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: K. Kocia

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 649.2
Top of Riser Elev.: 0
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
05/20/20	08:00	1 (Artesian)	28	36	17 hr
05/20/20	11:00	0 (Artesian)	28	44.2	0 min

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	WELL DETAIL	NOTES
0								TOPSOIL			
1											
2								FILL			
3											
4											
5									Inferred change in stratum, due to increase in drilling resistance.		
6											
7											
8											
9											1
10	S-1	7	9-11	10 9 12 20					S-1: Very stiff, gray, Clayey SILT and fine to coarse Sand. wet. (GLACIAL TILL).		2
11											
12											
13											
14											
15								GLACIAL TILL			
16											
17										Grout seal poured through tremie tube	
18											
19											
20	S-2	17	19-21	6 7 12 13					S-2: Very stiff, gray, Clayey SILT, little fine to coarse Sand. wet. (GLACIAL TILL).		
21											
22											
23											
24											
25											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Oxbow Brook measured at approximately 8 feet below existing bridge deck surface prior to drilling.
2) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **VWPZ-1**
Boring Location: Near Prop. Temp. North Abut.
N: 3056915 E: 310669
Checked by: A. Jones
Date Start: May 18, 2020
Date Finish: May 19, 2020

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: K. Kocia

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 649.2
Top of Riser Elev.: 0
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
05/20/20	08:00	1 (Artesian)	28	36	17 hr
05/20/20	11:00	0 (Artesian)	28	44.2	0 min

Depth (ft.)	SAMPLE INFORMATION: Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Drilling Rate (min/ft)	Ground Water	LITHOLOGY: Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	WELL DETAIL	NOTES
26								GLACIAL TILL			
27											
28								621.2 / 28.0			
29					5				C-1: Soft to Very Hard, completely weathered to fresh, moderately fractured to slightly fractured, tan to light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to 45-degree angle joints. Occasional seams of sand and clayey silt.		
30					3.5						
31					3			WEATHERED BEDROCK			
32					5						
33					8.5			616.2 / 33.0			
34					9				C-2: Hard to Very Hard, very slightly weathered to fresh, moderately fractured to sound, light gray to gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints.	Bentonite Seal (approximately 1 foot thick)	
35					10						
36					12						
37					3.5				C-3: Hard to Very Hard, severely to slightly weathered, moderately fractured to slightly fractured, light gray to gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints. Occasional thin beds of quartz-mica schist.		3
38					4						
39					6.5			BEDROCK		Vibrating wire piezometer installed at a depth of 38.0 feet	4
40					9						
41					3				C-4: Hard to Very Hard, severely weathered to fresh, moderately fractured to slightly fractured, light gray to gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints.		
42					9						
43					10					Backfilled with filter sand	
44					8						
45					10			605.0 / 44.2			
46									Boring terminated at 44.2 feet.		
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
3) Artesian conditions observed after coring bedrock. To control the pressure head and the upward flow of water, approximately 25 gallons of grout was tremied down borehole to create a seal. Upon departing the site, water was no longer flowing upward.
4) Vibrating wire piezometer was installed at approximately 38 feet bgs.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **VWPZ-2**
Boring Location: Near Prop. North Abut.
N: 3056886 E: 310626
Checked by: A. Jones
Date Start: May 19, 2020
Date Finish: May 20, 2020

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: K. Kocia

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 645.2
Top of Riser Elev.: 0
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4 / 3	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 05/19/20	08:10	8	22	40	17 hr

Depth (ft.)	Sample Type & No.	Rec (in.)	Sample Depth (ft.)	Blows/ 6 in.	Drilling Rate (min/ft)	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	Sample Description and Remarks (Classification System: Modified Burmister)	Well Detail	Notes
0								TOPSOIL			
1											
2											
3								FILL			
4											
5											
6									Inferred change in stratum, due to increase in drilling resistance.		
7											
8						▼					
9											1
10	S-1	1	9-11	5 6					S-1: Very stiff, gray, Clayey SILT, trace fine to medium Sand. wet. (GLACIAL TILL).		2
11				11 11							
12											
13											
14								GLACIAL TILL		Grout seal poured through tremie tube	
15											
16											
17											
18											
19											
20	S-2	18	19-21	17 16					S-2: Very stiff, gray, Clayey SILT, some fine to medium Sand. wet. (GLACIAL TILL).		
21				17 19							
22								623.2 / 22.0			
23					3.5			WEATHERED BEDROCK	C-1: Soft to Very Hard, completely weathered to slightly weathered, extremely fractured to moderately fractured, tan to light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to 45-degree angle joints. Occasional seams of sand and clayey silt.		
24					2						
25					3			620.2 / 25.0			

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Oxbow Brook measured at approximately 8 feet below existing bridge deck surface prior to drilling.
2) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project:	East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location:	Charlemont, Massachusetts
Nobis Project No.:	94960.00 / MassDOT No. 608858
Boring No.:	**VWPZ-2**
Boring Location:	Near Prop. North Abut.
	N: 3056886 E: 310626
Checked by:	A. Jones
Date Start:	May 19, 2020
Date Finish:	May 20, 2020
Contractor:	New England Boring Contractors
Driller:	P. Lebossier
Nobis Rep.:	K. Kocia
Rig Type / Model:	Acker Soil Scout
Hammer Type:	Safety Hammer
Hammer Hoist:	Rope & Cathead
Ground Surface Elev.:	(+/-) 645.2
Top of Riser Elev.:	0
Datum:	NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4 / 3	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 05/19/20	08:10	8	22	40	17 hr

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	WELL DETAIL	NOTES
26					6				C-2: Hard to Very Hard, moderately weathered to fresh, moderately fractured to slightly fractured, tan to light gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints.		
27					7						
28					4					Bentonite Seal (approximately 1.5 foot thick)	
29					3.5						
30					4						
31					7				C-3: Hard to Very Hard, slightly weathered to fresh, moderately fractured to sound, light gray to gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to low-angle joints. Occasional thin beds of quartz-mica schist.		
32					3.5						
33					4			BEDROCK			
34					4						
35					13						
36					25				C-4: Hard to Very Hard, slightly weathered to fresh, moderately fractured to slightly fractured, light gray to gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints.		
37					17					Vibrating wire piezometer installed at a depth of 36.0 feet	3
38					20						
39					22					Backfilled with filter sand	
40					25			605.2 / 40.0			
41									Boring terminated at 40 feet.		
42											
43											
44											
45											
46											
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

3) No artesian conditions observed after coring bedrock. Vibrating wire piezometer was installed at approximately 36 feet bgs.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **VWPZ-3**
Boring Location: Near Temp. South Abut. (West)
N: 3056826 E: 310601
Checked by: A. Jones
Date Start: May 20, 2020
Date Finish: May 21, 2020

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: K. Kocia

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 644
Top of Riser Elev.: 0
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 05/21/20	08:10	14.5	19	21	17 hr
▼ 05/21/20	12:00	10.5	28	42	15 min

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Drilling Rate (min/ft)	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	WELL DETAIL	NOTES
0								TOPSOIL			
1											
2								FILL			1
3											
4											
5									Inferred change in stratum, due to increase in drilling resistance.		
6											
7											
8											
9											2
10	S-1	14	9-11	12 11					S-1: Medium dense, gray, SILT, some fine to coarse Sand, trace Clay. wet. (GLACIAL TILL).		3
11				14 12		▼					
12											
13											
14											
15						▼		GLACIAL TILL			
16											
17										Grout seal poured through tremie tube	
18											
19											
20	S-2	5	19-21	25 26					S-2: Very dense, gray, fine to coarse SAND, some Silt, few weathered rock fragments. wet. (GLACIAL TILL).		
21				28 30							
22											
23											
24											
25											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Casing unable to be advanced beyond approximately 2 feet below ground surface due to obstruction(s) (inferred cobble/boulder). Boring offset approximately two (2) feet south for second attempt.
2) Oxbow Brook measured at approximately 8 feet below existing bridge deck surface prior to drilling.
3) Water introduced to borehole during drive and wash drilling procedure.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: East Oxbow Road over Oxbow Brook - Bridge No. C-05-042
Location: Charlemont, Massachusetts
Nobis Project No.: 94960.00 / MassDOT No. 608858

Boring No.: **VWPZ-3**
Boring Location: Near Temp. South Abut. (West)
N: 3056826 E: 310601
Checked by: A. Jones
Date Start: May 20, 2020
Date Finish: May 21, 2020

Contractor: New England Boring Contractors
Driller: P. Lebossier
Nobis Rep.: K. Kocia

Rig Type / Model: Acker Soil Scout
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 644
Top of Riser Elev.: 0
Datum: NAVD88

	Drilling Method	Sampler
Type	Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Drive and Wash	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 05/21/20	08:10	14.5	19	21	17 hr
▼ 05/21/20	12:00	10.5	28	42	15 min

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Drilling Rate (min/ft)	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	WELL DETAIL	NOTES
26								GLACIAL TILL			
27											
28								616.0 / 28.0			
29					3.5				C-1: Hard to Very Hard, very slightly weathered to fresh, moderately fractured, light gray to gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to 45-degree angle joints.		
30					4						
31					8				42: Hard to Very Hard, very slightly weathered to fresh, moderately fractured to sound, light gray to dark gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to moderately-dipping joints. Occasional thin beds of quartz-mica schist.		
32					6						
33					3.5				C-2: Hard to Very Hard, very slightly weathered to fresh, moderately fractured to sound, light gray to dark gray, very fine- to medium-grained, SCHIST, close to moderately close, horizontal to slightly-dipping joints. Occasional thin beds of quartz-mica schist.	Bentonite Seal (approximately 1.5 foot thick)	
34					4						
35					3			BEDROCK			
36					3						
37					4					Vibrating wire piezometer installed at a depth of 36.2 feet	4
38					7						5
39					4						
40					8					Backfilled with filter sand	
41					9						
42					10			602.0 / 42.0			
43									Boring terminated at 42 feet.		
44											
45											
46											
47											
48											
49											
50											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
4) Vibrating wire piezometer was installed at approximately 36.2 feet bgs.
5) Artesian conditions observed after coring bedrock. To control the pressure head and the upward flow of water, approximately 25 gallons of grout was tremied down borehole to create a seal. Upon departing the site, water was no longer flowing upward.

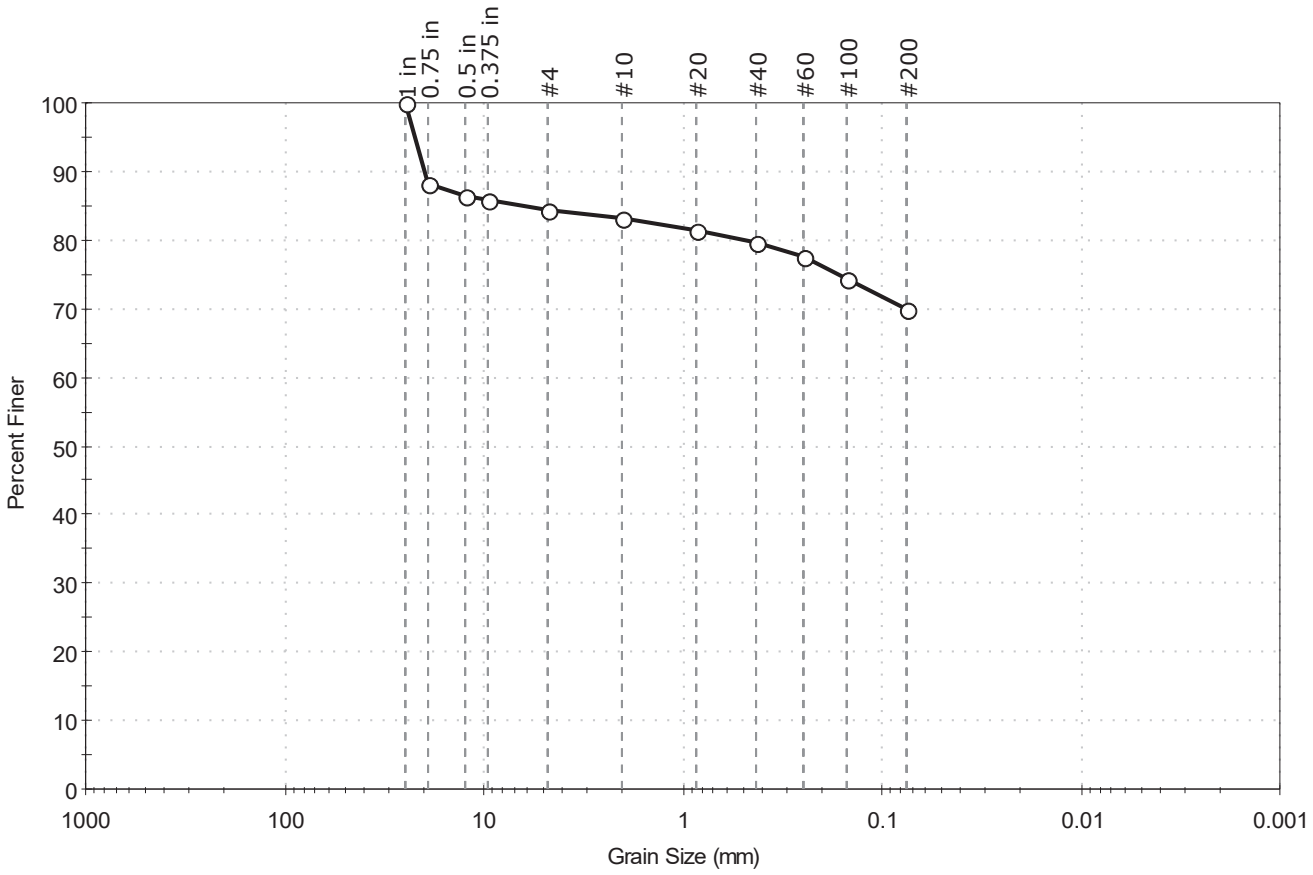
Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

APPENDIX D – Laboratory Test Data

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	BB-1	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-4	Test Date:	04/30/19	Checked By:	bfs
Depth :	8-10	Test Id:	501010		
Test Comment:	---				
Visual Description:	Moist, olive brown gravelly silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	15.8	14.4	69.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	88		
0.5 in	12.50	86		
0.375 in	9.50	86		
#4	4.75	84		
#10	2.00	83		
#20	0.85	81		
#40	0.42	80		
#60	0.25	78		
#100	0.15	74		
#200	0.075	70		

Coefficients

D_{85} = 6.4959 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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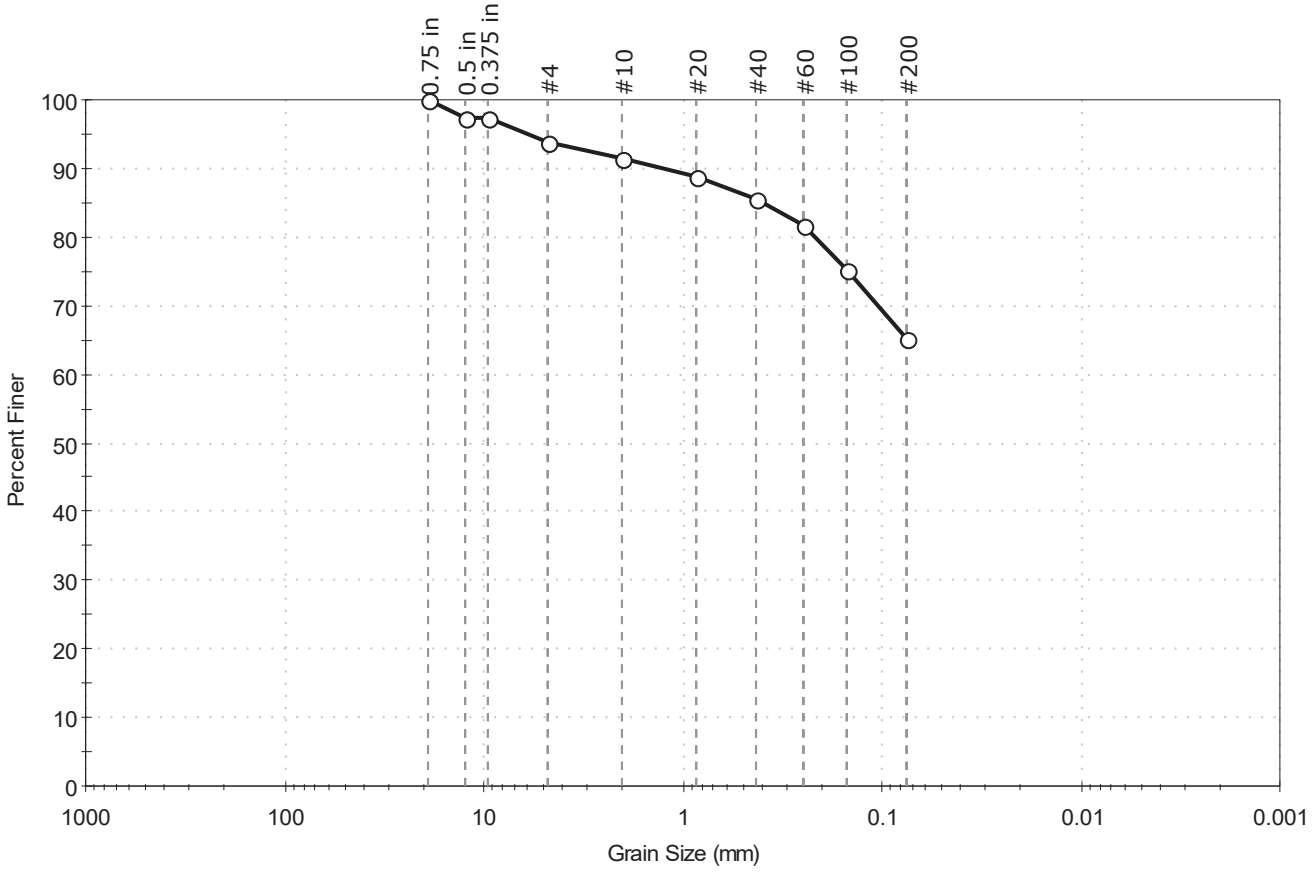
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	BB-3	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-5	Test Date:	04/30/19	Checked By:	bfs
Depth :	19-21	Test Id:	501011		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	6.1	28.8	65.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	97		
0.375 in	9.50	97		
#4	4.75	94		
#10	2.00	92		
#20	0.85	89		
#40	0.42	86		
#60	0.25	82		
#100	0.15	75		
#200	0.075	65		

Coefficients

D_{85} = 0.3871 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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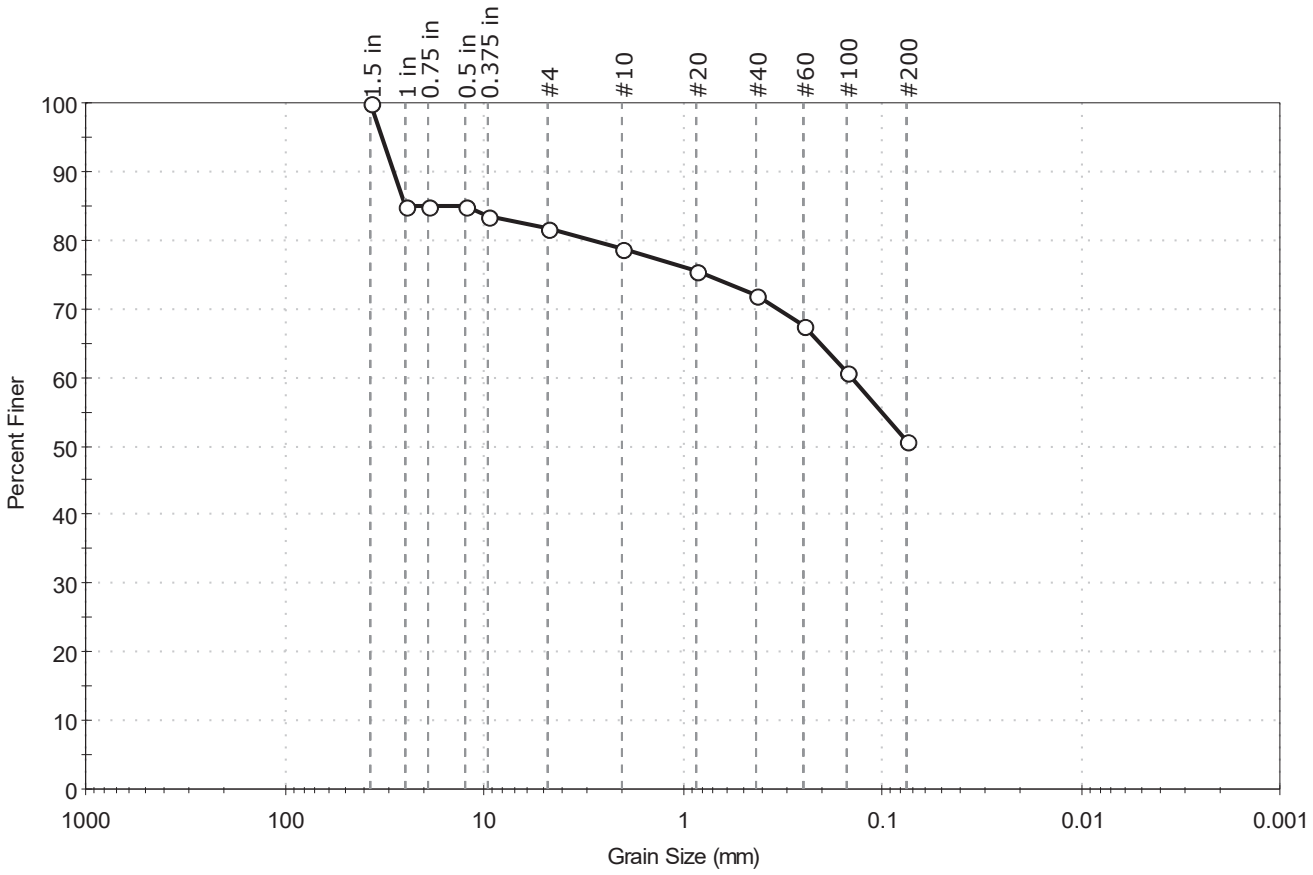
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	BB-4	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-4	Test Date:	04/30/19	Checked By:	bfs
Depth :	14-16	Test Id:	501012		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	18.3	30.8	50.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	85		
0.75 in	19.00	85		
0.5 in	12.50	85		
0.375 in	9.50	83		
#4	4.75	82		
#10	2.00	79		
#20	0.85	75		
#40	0.42	72		
#60	0.25	67		
#100	0.15	61		
#200	0.075	51		

Coefficients

D_{85} = 25.0241 mm	D_{30} = N/A
D_{60} = 0.1434 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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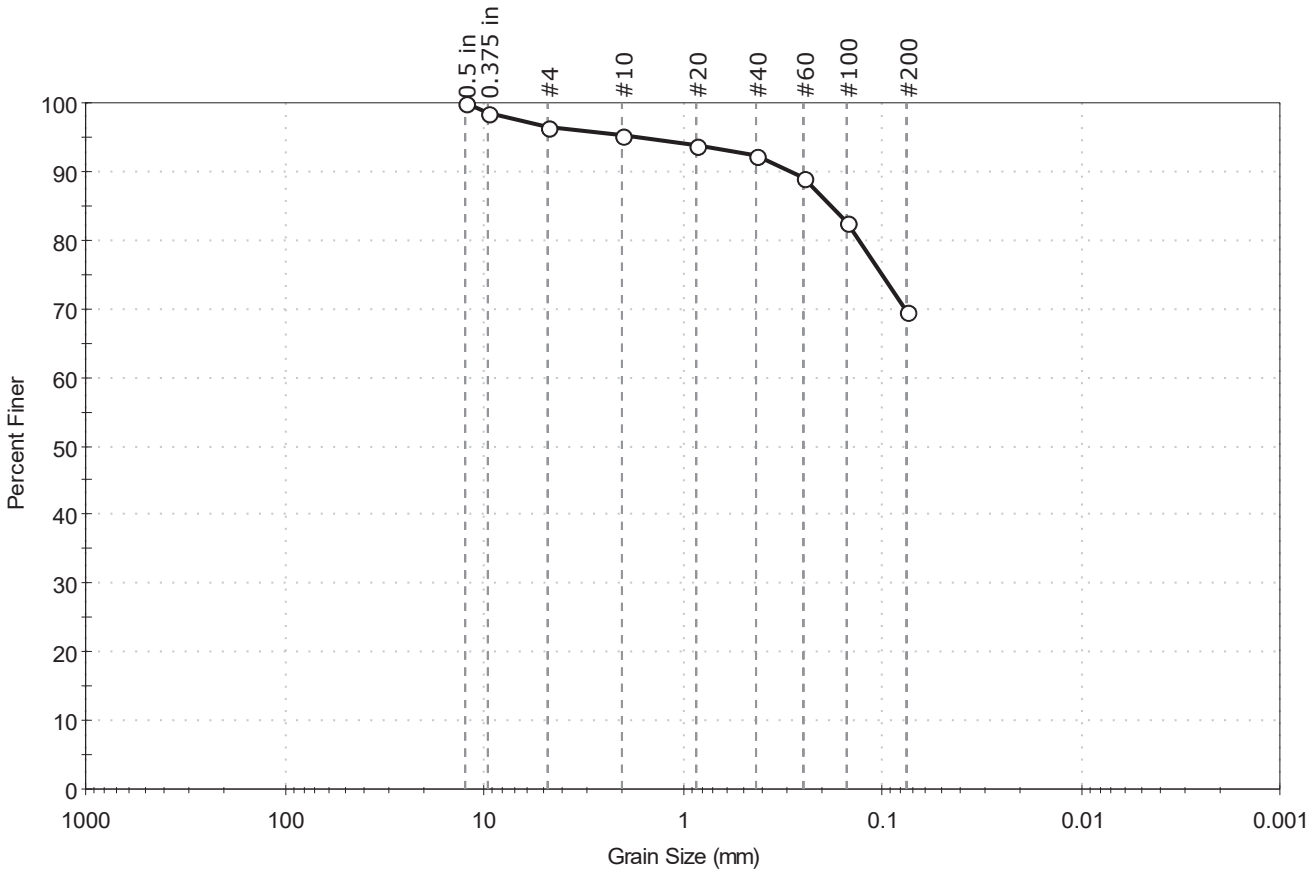
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	BB-5	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-3	Test Date:	04/30/19	Checked By:	bfs
Depth :	9-11	Test Id:	501013		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.4	26.9	69.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	97		
#10	2.00	95		
#20	0.85	94		
#40	0.42	92		
#60	0.25	89		
#100	0.15	82		
#200	0.075	70		

Coefficients

D_{85} = 0.1815 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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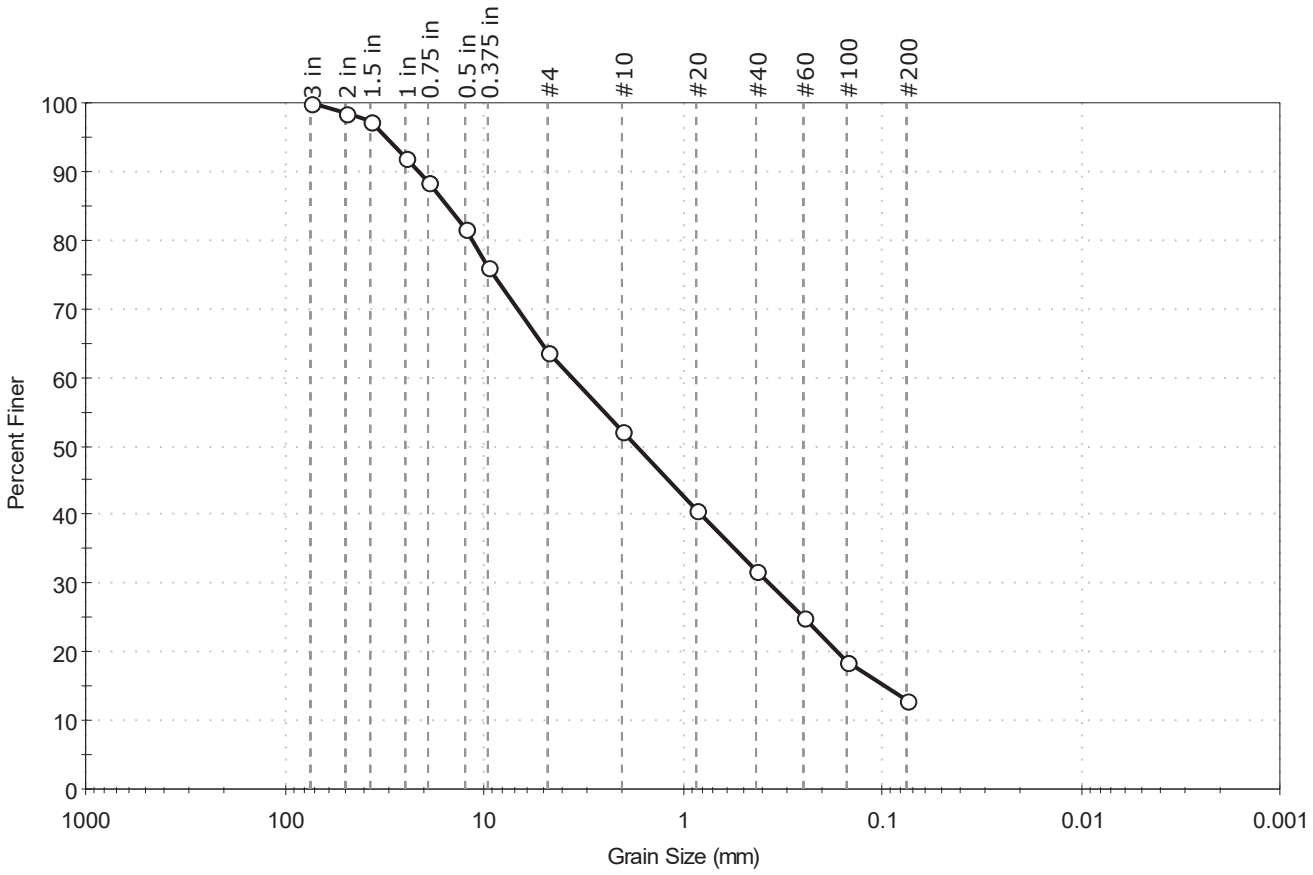
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	PC-1 to PC-4	Sample Type:	bucket	Tested By:	ckg
Sample ID:	Composite	Test Date:	05/03/19	Checked By:	emm
Depth :	0.4-2	Test Id:	502131		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	36.3	50.9	12.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	99		
1.5 in	37.50	97		
1 in	25.00	92		
0.75 in	19.00	89		
0.5 in	12.50	82		
0.375 in	9.50	76		
#4	4.75	64		
#10	2.00	52		
#20	0.85	41		
#40	0.42	32		
#60	0.25	25		
#100	0.15	19		
#200	0.075	13		

Coefficients

D_{85} = 15.2841 mm
D_{30} = 0.3689 mm
D_{60} = 3.5781 mm
D_{15} = 0.0970 mm
D_{50} = 1.6889 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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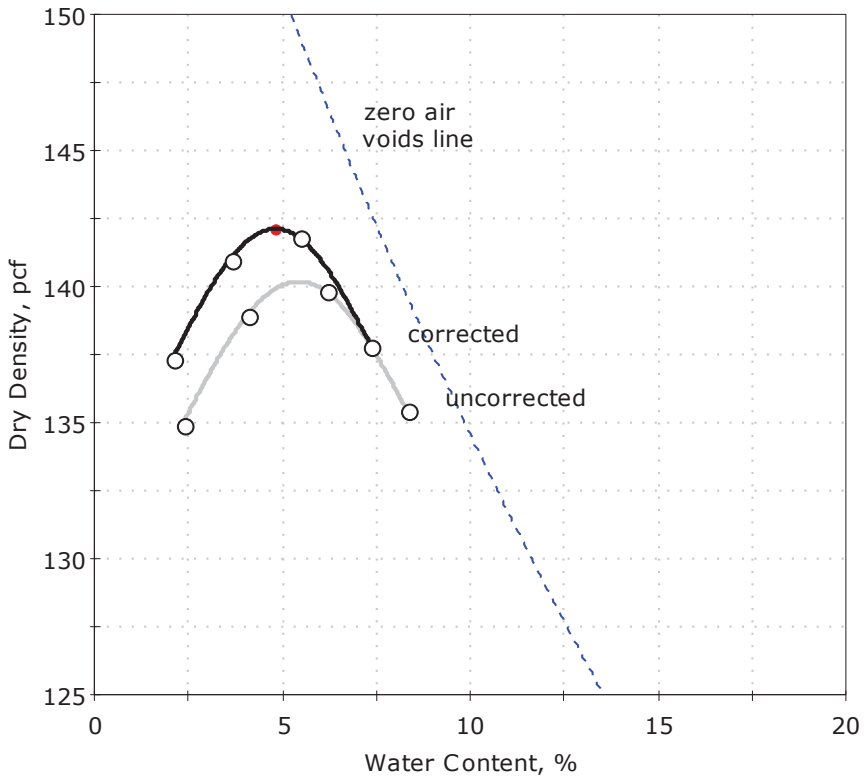
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	PC-1 to PC-4	Sample Type:	bucket	Tested By:	cwd
Sample ID:	Composite	Test Date:	05/03/19	Checked By:	bfs
Depth :	0.4-2	Test Id:	501014		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown silty sand with gravel				
Sample Comment:	---				

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	135.0	139.0	139.8	135.5
Moisture Content, %	2.4	4.1	6.2	8.3

Method : C

Preparation : WET

As received Moisture :4 %

Rammer : Mechanical

Zero voids line based on assumed specific gravity of 2.75

Maximum Dry Density= 140.2 pcf
Optimum Moisture= 5.5 %

Oversize Correction (11% > 3/4 inch Sieve)
Corrected Maximum Dry Density= 142.1 pcf
Corrected Optimum Moisture= 4.8 %
Assumed Average Bulk Specific Gravity = 2.55

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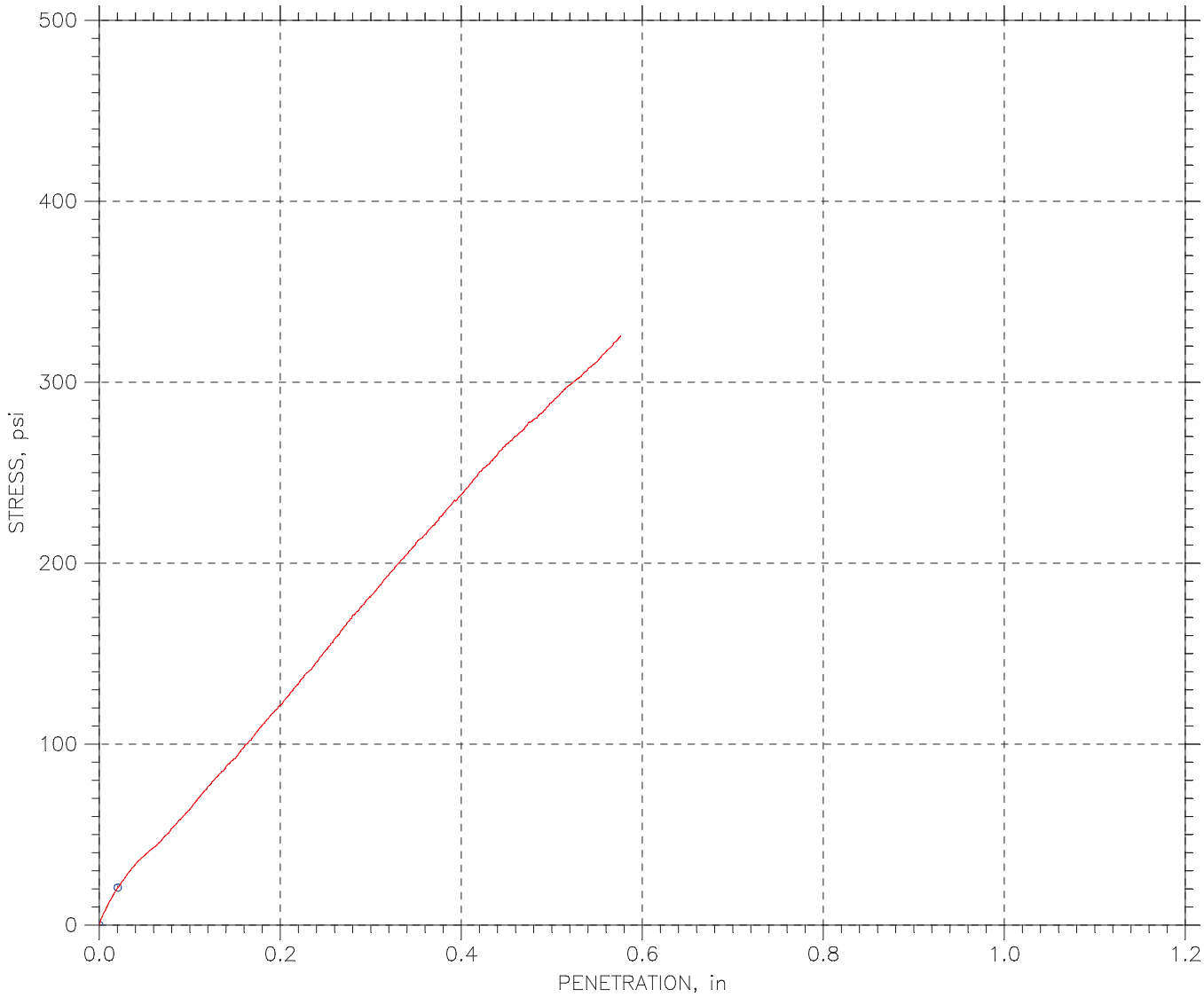
GeoTesting EXPRESS

CALIFORNIA BEARING RATIO TEST REPORT

by ASTM D1883



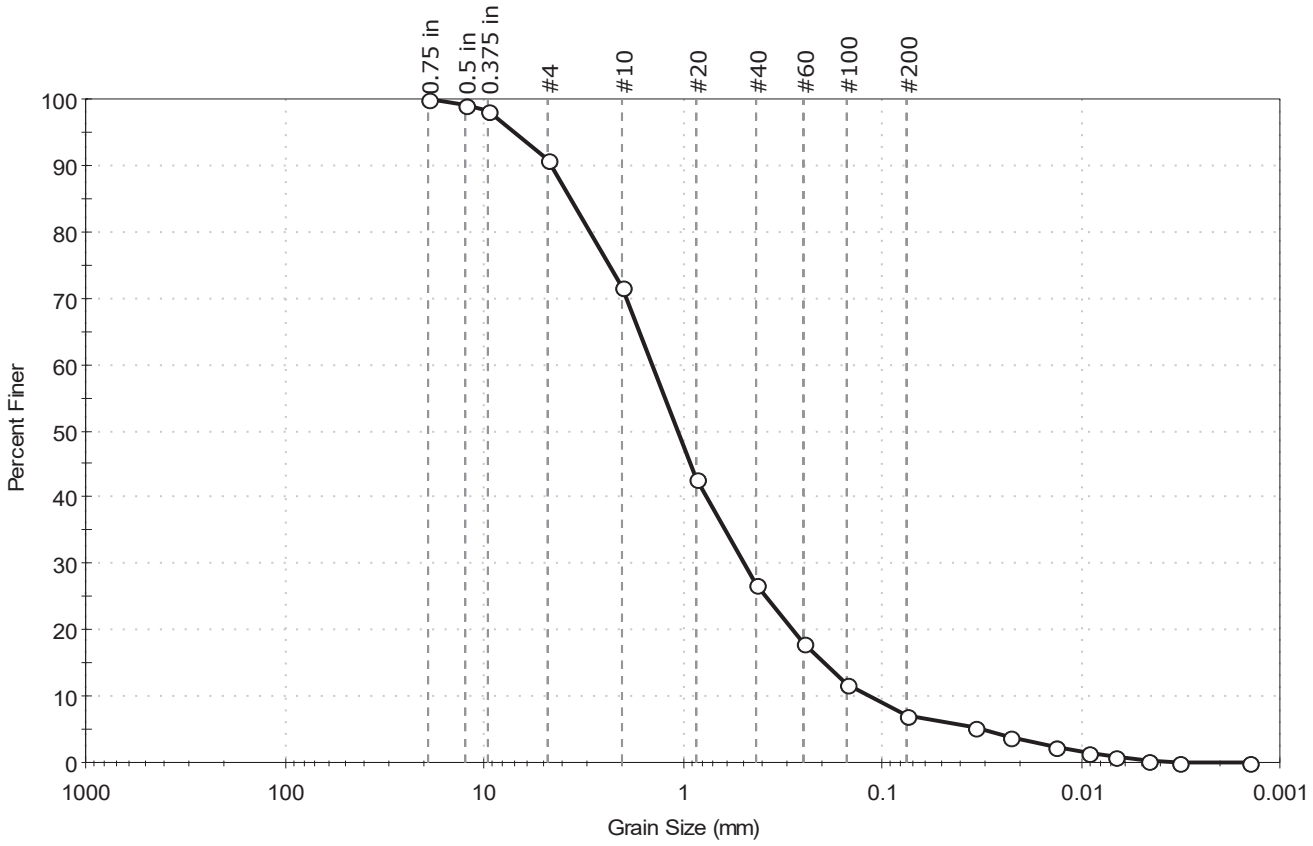
Sample Height: 4.58 in	California Bearing Ratio				
Sample Area: 28.274 in^2	at 0.1 in: 6	at 0.3 in: 10	at 0.5 in: 11		
Sample Volume: 0.07494 ft^3	at 0.2 in: 8	at 0.4 in: 10			
Sample Mass: 4661.8 gm					
Sample Condition: Soaked	Water Content		Before	Top	Average
Swell: 0.04 %	Tare ID		B2166	A3066	D2423
Surcharge: 4540 gm	Tare Mass, gm		8.38	8.27	8.3
Void Ratio: 0.27	Mass Tare + Wet Soil, gm		337.63	332.19	356.07
Wet Unit Weight: 137.14 pcf	Mass Tare + Dry Soil, gm		322.17	309.01	329.21
Dry Unit Weight: 130.7 pcf	Water Content, %		4.93	7.71	8.37

Project: E Oxbow Rd. / Oxbow Brook	Location: Charlemont, MA	Project No.: GTX-309523
Boring No.: PC-1 - PC-4	Tested By: cwd	Checked By: emm
Sample No.: S-Composite	Test Date: 5/10/19	Depth: 0.4-2
Test No.: CBR-1	Sample Type: remolded	Elevation: ---
Description: Moist, very dark grayish brown silty sand with gravel		
Remarks: Target Compaction: 92% of the maximum dry density (142.1 pcf) at the optimum moisture content (4.8%).		

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	SS-1	Sample Type:	bag	Tested By:	ckg
Sample ID:	North	Test Date:	02/18/19	Checked By:	emm
Depth :	0-0.5	Test Id:	493005		
Test Comment:	---				
Visual Description:	Moist, dark brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	9.2	83.6	7.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	99		
0.375 in	9.50	98		
#4	4.75	91		
#10	2.00	72		
#20	0.85	43		
#40	0.42	27		
#60	0.25	18		
#100	0.15	12		
#200	0.075	7.2		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0341	5		
---	0.0230	4		
---	0.0134	2		
---	0.0093	2		
---	0.0068	1		
---	0.0046	0		
---	0.0032	0		
---	0.0014	0		

Coefficients

D_{85} = 3.6507 mm	D_{30} = 0.4898 mm
D_{60} = 1.4149 mm	D_{15} = 0.1956 mm
D_{50} = 1.0538 mm	D_{10} = 0.1146 mm
C_u = 12.346	C_c = 1.480

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

Sample/Test Description

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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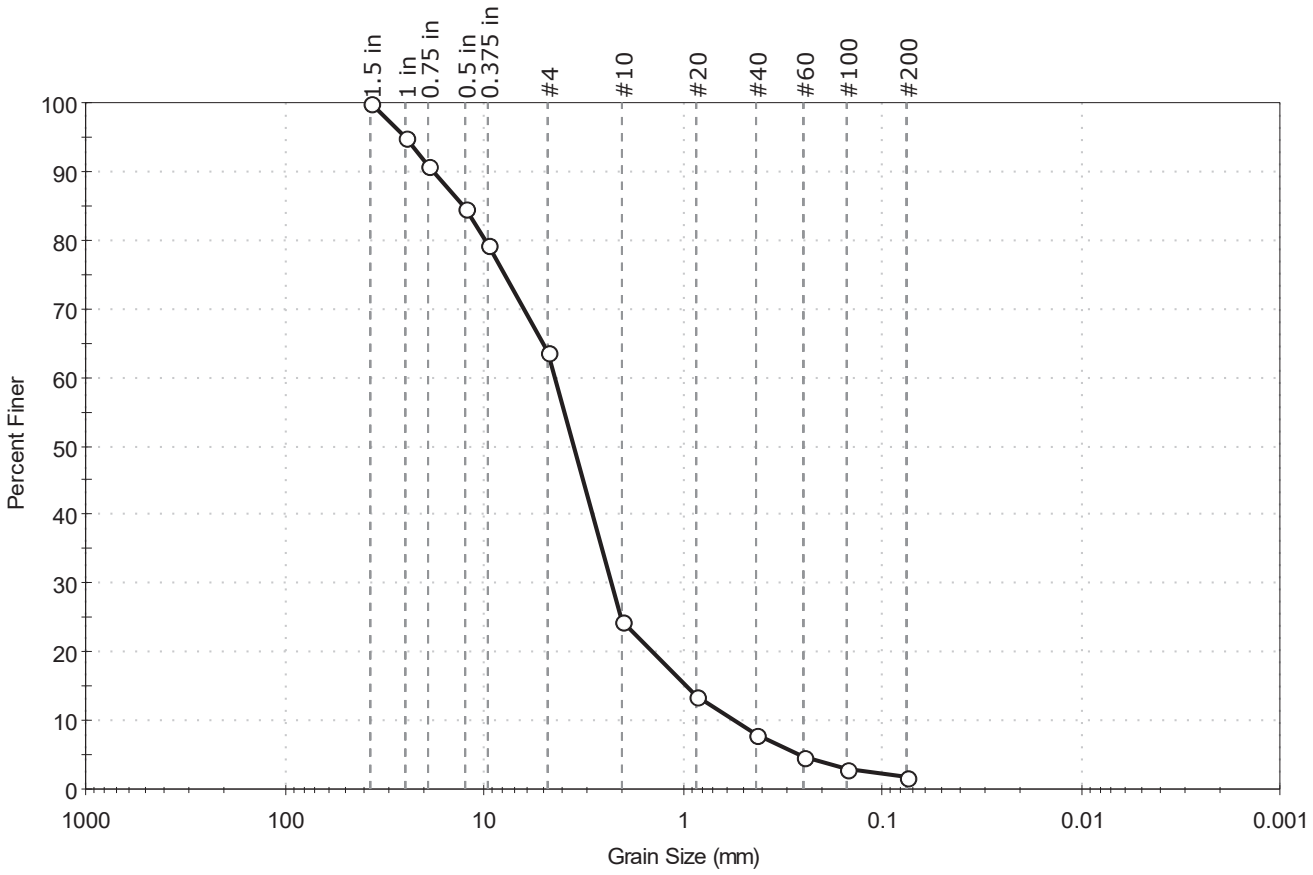
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	SS-2	Sample Type:	bag	Tested By:	ckg
Sample ID:	Middle	Test Date:	02/18/19	Checked By:	emm
Depth :	0-0.5	Test Id:	493006		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	36.2	62.0	1.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	95		
0.75 in	19.00	91		
0.5 in	12.50	85		
0.375 in	9.50	79		
#4	4.75	64		
#10	2.00	25		
#20	0.85	14		
#40	0.42	8		
#60	0.25	5		
#100	0.15	3		
#200	0.075	1.8		

Coefficients

D_{85} = 12.8185 mm	D_{30} = 2.2547 mm
D_{60} = 4.3697 mm	D_{15} = 0.9449 mm
D_{50} = 3.5048 mm	D_{10} = 0.5486 mm
C_u = 7.965	C_c = 2.121

Classification

ASTM — Well-graded SAND with Gravel (SW)

AASHTO — Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

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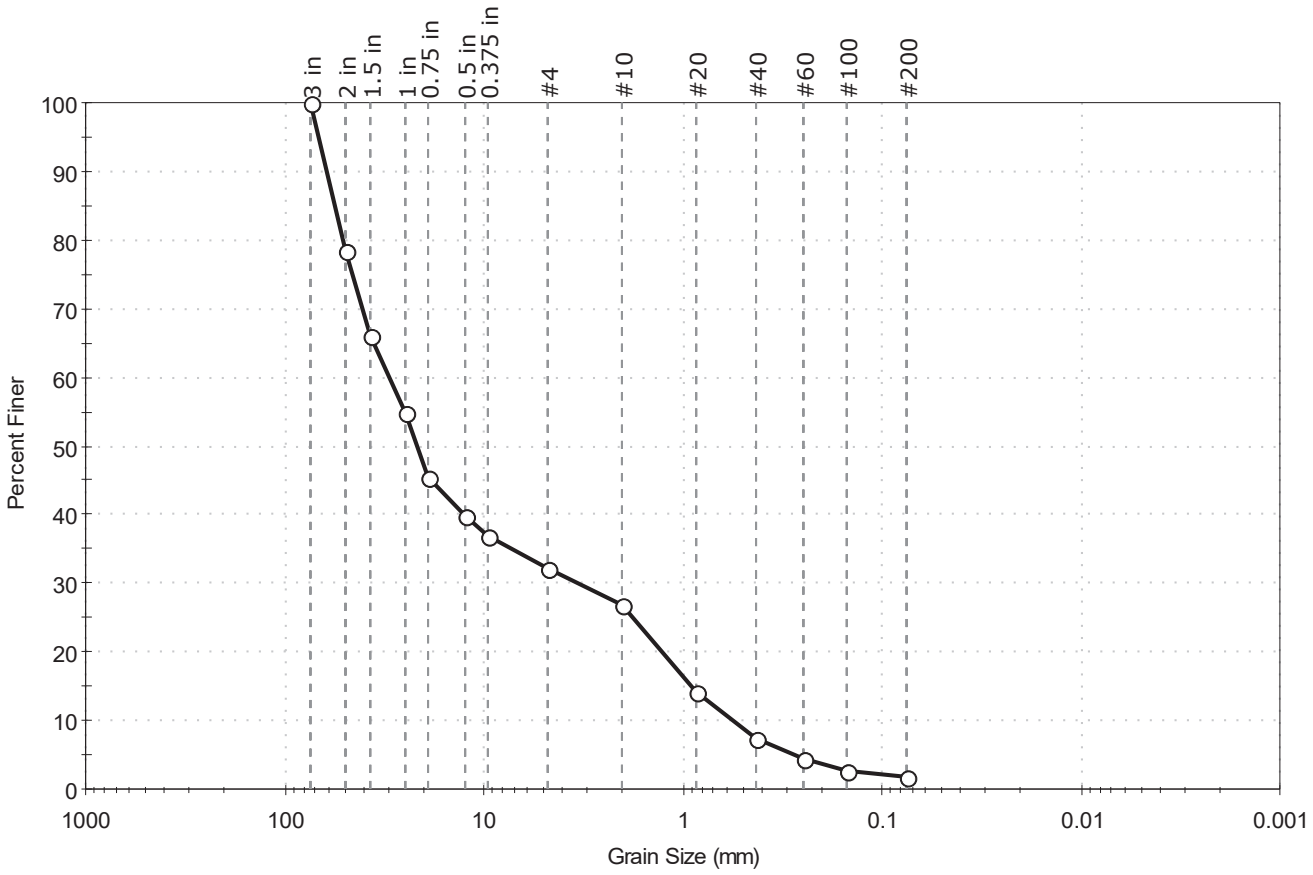
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	E. Oxbow Rd over Oxbow Brook				
Location:	Charlemont, MA			Project No:	GTX-309523
Boring ID:	SS-3	Sample Type:	bag	Tested By:	ckg
Sample ID:	South	Test Date:	02/18/19	Checked By:	emm
Depth :	0-0.5	Test Id:	493007		
Test Comment:	---				
Visual Description:	Moist, dark brown gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	67.8	30.6	1.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	78		
1.5 in	37.50	66		
1 in	25.00	55		
0.75 in	19.00	45		
0.5 in	12.50	40		
0.375 in	9.50	37		
#4	4.75	32		
#10	2.00	27		
#20	0.85	14		
#40	0.42	7		
#60	0.25	4		
#100	0.15	3		
#200	0.075	1.6		

Coefficients

D_{85} = 56.6451 mm	D_{30} = 3.3481 mm
D_{60} = 30.1517 mm	D_{15} = 0.8986 mm
D_{50} = 21.7350 mm	D_{10} = 0.5561 mm
C_u = 54.220	C_c = 0.669

Classification

ASTM — Poorly graded GRAVEL with Sand (GP)

AASHTO — Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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APPENDIX E – Calculations

East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: RAC Date: 11/19/2021

Bearing Resistance and Settlement Calculations for Temporary Bridge Abutments

Objective: Estimate bearing resistance and settlement for the proposed temporary bridge abutment on a cast-in-place concrete shallow foundation.

References:
1) AASHTO LRFD Bridge Design Specifications: 8th Edition (September 2017)
2) Borings observed by Nobis in December 2018 and April 2019.
3) Sketch plans provided to Nobis by CHA, dated 11/1/21.

Assumptions:
1) Soils and groundwater encountered in the borings observed by Nobis are representative of soil conditions beneath the proposed abutments.
2) The maximum eccentricity for the abutment is assumed to be B/6.
3) No scour was included in our analysses due to the temporary nature of the bridge.
4) The footing was assumed to be embedded 4 feet for frost protection.

Solution:

Bearing Soil Properties/Subsurface Information

Unit Weight of Bearing Soil (γ):	125	pcf	Estimated
Unit Weight of Soil Above Footing (γ):	120	pcf	Estimated, Gravel Borrow
Cohesion of Bearing Soil (c):	0	psf	
Friction Angle of Bearing Soil (ϕ'):	38	degrees	Estimated

Soil Description: Medium dense glacial till sands and gravels overlying bedrock.

Footing Elevation:	637	ft, NAVD 88	Assumed
Ground Surface (GS) Elevation:	641	ft, NAVD 88	Assumed 4-foot embedment
Groundwater Elevation:	641	ft, NAVD 88	Assumed at ground surface

Footing Geometry

Footing Depth (D_f):	4	ft	Assumed, no scour
Groundwater Depth Below GS:	0	ft	
Width (B):	5.5	ft	Reference No. 3
Length (L):	20	ft	Reference No. 3
Effective Width (B'):	3.7	ft	
Effective Length (L'):	20	ft	

Notes:
1) Example bearing resistance and settlement calculations can be found on pages 2 and 3, respectively.
2) This calculation assumes that the footing is bearing on medium dense to dense glacial till overlying bedrock and the subgrade is prepared in accordance with the recommendations of our geotechnical report.

East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: BW Date: 12/10/2019

Example Bearing Resistance Calculation

Factored Bearing Resistance: $q_R = q_n * \phi_b$			Eq. 10.6.3.1.1-1
Estimate bearing resistance and se	0.45		Tb. 11.5.7.1
Nominal Resistance (q_n) =			
$q_n = c*N_{cm} + \gamma*D_f*N_m*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$			Eq. 10.6.3.1.2a-1
$N_{qm} = N_q*s_q*d_q*i_q$			Eq. 10.6.3.1.2a-3
Bearing Capacity Factor (N_q)	48.9		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_q)	1.14	ft	Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_q)			
$i_q = [1-H/(V+cB'L'\cot\phi_f)]^n$	1.00		Not used per C10.6.3.1.2a
$n = [(2+L'/B')/(1+L'/B')]\cos^2\theta$	1.85		Eq. 10.6.3.1.2a-9
$+ [(2+B'/L')/(1+B'/L')]\sin^2\theta$			
Load Angle (θ)	90	degrees	Assumed to be 90°
Depth Correction Factor (d_q)	1.0		Tb. 10.6.3.1.2a-4
N_{qm}=	55.90		
$N_{cm} = N_c*s_c*i_c$			Eq. 10.6.3.1.2a-2
Bearing Capacity Factor (N_c)	61.4		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_c)	1.15		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_c)			
$i_c = i_q - [(1-i_q)/(N_q-1)]$	1.00		Not used per C10.6.3.1.2a
N_{cm} =	70.37		
$N_{\gamma m} = N_\gamma*s_\gamma*i_\gamma$			Eq. 10.6.3.1.2a-4
Bearing Capacity Factor (N_γ)	78		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_γ)	0.93		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_γ)			
$i_\gamma = [1-H/(V+cB'L'\cot\phi_f)]^{n+1}$	1.00		Not used per C10.6.3.1.2a
$N_{\gamma m}$=	72.28		
Groundwater Coefficients			Tb. 10.6.3.1.2a-2
(C_{wq})	0.50		
($C_{w\gamma}$)	0.50		
q_n=	**21.7 ksf**		
q_R=	**9.8 ksf**		

East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: BW Date: 12/10/2019

Example Settlement (Elastic) Calculation

$$S_e = \frac{(q_o(1-\nu^2)(A)^{0.5}}{144*E_s*\beta_z}$$ Eq. 10.6.2.4.2-1

Poisson's Ratio (v)	0.45		Tb. C10.4.6.3-1
Young's modulus of elasticity (E_s)	8	ksi	Tb. C10.4.6.3-1 for very stiff cla
Flexible or Rigid	Rigid		
Shape Factor (β_z)	1.18		Tb. 10.6.2.4.2-1
Width (B)	5.5	ft	
Area of Footing (A)	110	ft^2	B* L

Assumed Settlement, S_e (in)	Stress, q_o (ksf) Service Limit State
0.5	6.75
0.75	10.13
1.0	13.50
1.25	16.88
1.5	20.25

East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
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East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: BW Date: 12/10/2019

$$N1 = C_N N \qquad (10.4.6.2.4\text{-}1)$$

$N1$ = *SPT* blow count corrected for overburden pressure, σ'_v (blows/ft)

C_N = $[0.77 \log_{10}(40/\sigma'_v)]$, and $C_N < 2.0$

σ'_v = vertical effective stress (ksf)

N = uncorrected *SPT* blow count (blows/ft)

Table 10.6.2.4.2-1—Elastic Shape and Rigidity Factors, EPRI (1983)

L/B	Flexible, β_z (average)	β_z Rigid
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)

ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

Table 10.6.3.1.2a-3—Shape Correction Factors s_c, s_γ, s_q

Factor	Friction Angle	Cohesion Term (s_c)	Unit Weight Term (s_γ)	Surcharge Term (s_q)
Shape Factors s_c, s_γ, s_q	$\phi_f = 0$	$1+\left(\frac{B}{5L}\right)$	1.0	1.0
	$\phi_f > 0$	$1+\left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$	$1-0.4\left(\frac{B}{L}\right)$	$1+\left(\frac{B}{L}\tan\phi_f\right)$

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East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: BW Date: 12/10/2019

Table 10.6.3.1.2a-4—Depth Correction Factor d_q

Friction Angle, ϕ_f (degrees)	D_f/B	d_q
32	1	1.20
	2	1.30
	4	1.35
	8	1.40
37	1	1.20
	2	1.25
	4	1.30
	8	1.35
42	1	1.15
	2	1.20
	4	1.25
	8	1.30

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive	0.347–2.08	0.4–0.5 (undrained)
Medium stiff to stiff	2.08–6.94	
Very stiff	6.94–13.89	
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand:		
Loose	1.11–1.67	0.25
Medium dense	1.67–2.78	
Dense	2.78–4.17	
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	
Dense	6.94–11.11	0.30–0.40
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	
Dense	13.89–27.78	0.30–0.40

Estimating E_s from *SPT N* Value	
Soil Type	E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures	$0.056\ N1_{60}$
Clean fine to medium sands and slightly silty sands	$0.097\ N1_{60}$
Coarse sands and sands with little gravel	$0.139\ N1_{60}$
Sandy gravel and gravels	$0.167\ N1_{60}$

Estimating E_s from q_c (static cone resistance)	
Sandy soils	$0.028q_c$

For $\phi_f = 0$:

$$i_c = 1 - (nH/cBLN_c) \qquad (10.6.3.1.2a\text{-}5)$$

For $\phi_f > 0$:

$$i_c = i_q - [(1 - i_q)/(N_q - 1)] \qquad (10.6.3.1.2a\text{-}6)$$

in which:

$$i_q = \left[1 - \frac{H}{(V + cBL\cot\phi_f)}\right]^n \qquad (10.6.3.1.2a\text{-}7)$$

$$i_\gamma = \left[1 - \frac{H}{V + cBL\cot\phi_f)}\right]^{(n+1)} \qquad (10.6.3.1.2a\text{-}8)$$

c = cohesion, taken as undrained shear strength (ksf)

N_c = cohesion term (undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

N_q = surcharge (embedment) term (drained or undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

N_γ = unit weight (footing width) term (drained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

γ = total (moist) unit weight of soil above or below the bearing depth of the footing (kcf)

D_f = footing embedment depth (ft)

B = footing width (ft)

$C_{wq}, C_{w\gamma}$ = correction factors to account for the location of the groundwater table as specified in Table 10.6.3.1.2a-2 (dim)

s_c, s_γ, s_q = footing shape correction factors as specified in Table 10.6.3.1.2a-3 (dim)

d_q = correction factor to account for the shearing resistance along the failure surface passing through cohesionless material above the bearing elevation as specified in Table 10.6.3.1.2a-4 (dim)

i_c, i_γ, i_q = load inclination factors determined from Eqs. 10.6.3.1.2a-5 or 10.6.3.1.2a-6, and 10.6.3.1.2a-7 and 10.6.3.1.2a-8 (dim)

$$S_e = \frac{\left[q_o\left(1-\nu^2\right)\sqrt{A'}\right]}{144\ E_s \beta_z} \qquad (10.6.2.4.2\text{-}1)$$

where:

q_o = applied vertical stress (ksf)

A' = effective area of footing (ft^2)

E_s = Young's modulus of soil taken as specified in Article 10.4.6.3 if direct measurements of E_s are not available from the results of in situ or laboratory tests (ksi)

β_z = shape factor taken as specified in Table 10.6.2.4.2-1 (dim)

ν = Poisson's Ratio, taken as specified in Article 10.4.6.3 if direct measurements of ν are not available from the results of in situ or laboratory tests (dim)

$$q_n = cN_{cm} + \gamma D_f N_{qm} C_{wq} + 0.5\gamma \quad BN_{\gamma m} C_{w\gamma} \qquad (10.6.3.1.2a\text{-}1)$$

$$N_{cm} = N_c s_c i_c \qquad (10.6.3.1.2a\text{-}2)$$

$$N_{qm} = N_q s_q d_q i_q \qquad (10.6.3.1.2a\text{-}3)$$

$$N_\gamma m = N_\gamma s_\gamma i_\gamma \qquad (10.6.3.1.2a\text{-}4)$$

Table 10.6.3.1.2a-2—Coefficients C_{wq} and $C_{w\gamma}$ for Various Groundwater Depths

D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State

Method/Soil/Condition			Resistance Factor
Bearing Resistance	φ_b	Theoretical method (Munfakh et al., 2001), in clay	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *CPT*	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *SPT*	0.45
		Semi-empirical methods (Meyerhof, 1957), all soils	0.45
		Footings on rock	0.45
		Plate Load Test	0.55
Sliding	φ_τ	Precast concrete placed on sand	0.90
		Cast-in-Place Concrete on sand	0.80
		Cast-in-Place or precast Concrete on Clay	0.85
		Soil on soil	0.90
	φ_{ep}	Passive earth pressure component of sliding resistance	0.50

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East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: BW Date: 12/10/2019

Table 11.5.7-1—Resistance Factors for Permanent Retaining Walls

Wall-Type and Condition		Resistance Factor
Nongravity Cantilevered and Anchored Walls		
Axial compressive resistance of vertical elements		Article 10.5 applies
Passive resistance of vertical elements		0.75
Pullout resistance of anchors [1]	• Cohesionless (granular) soils • Cohesive soils • Rock	0.65 [1] 0.70 [1] 0.50 [1]
Pullout resistance of anchors [2]	• Where proof tests are conducted	1.0 [2]
Tensile resistance of anchor tendon	• Mild steel (e.g., ASTM A615 bars) • High strength steel (e.g., ASTM A722 bars)	0.90 [3] 0.80 [3]
Flexural capacity of vertical elements		0.90
Mechanically Stabilized Earth Walls, Gravity Walls, and Semigravity Walls		
Bearing resistance	• Gravity and semigravity walls • MSE walls	0.55 0.65
Sliding		1.0
Tensile resistance of metallic reinforcement and connectors	Strip reinforcements [4] • Static loading Grid reinforcements [4] [5] • Static loading	0.75 0.65
Tensile resistance of geosynthetic reinforcement and connectors	• Static loading	0.90
Pullout resistance of tensile reinforcement	• Static loading	0.90
Prefabricated Modular Walls		
Bearing		Article 10.5 applies
Sliding		Article 10.5 applies
Passive resistance		Article 10.5 applies

(1) Apply to presumptive ultimate unit bond stresses for preliminary design only in Article C11.9.4.2.

(2) Apply where proof test(s) are conducted on every production anchor to a load of 1.0 or greater times the factored load on the anchor.

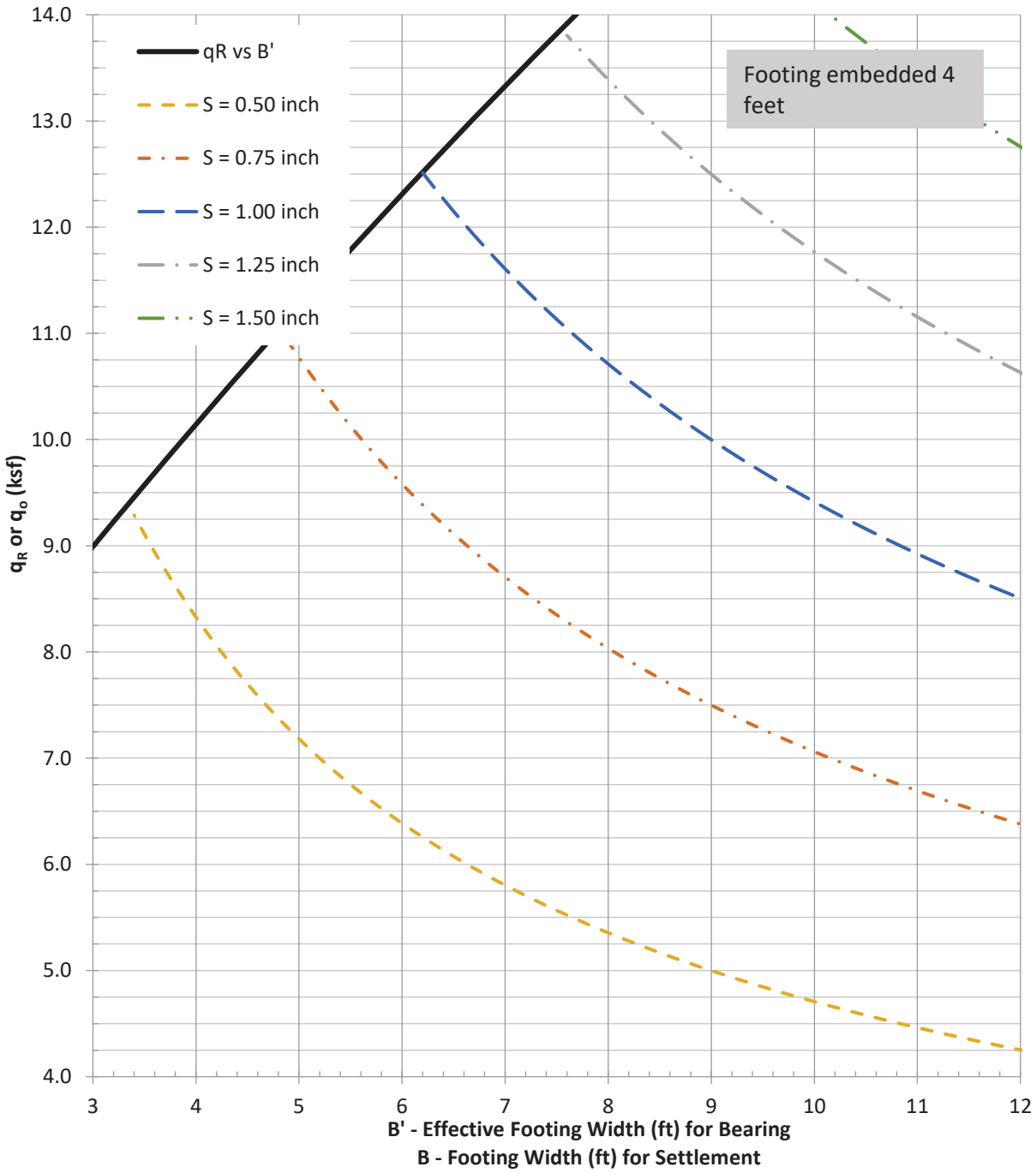
(3) Apply to maximum proof test load for the anchor. For mild steel apply resistance factor to F_y. For high-strength steel apply the resistance factor to guaranteed ultimate tensile strength.

(4) Apply to gross cross-section less sacrificial area. For sections with holes, reduce gross area in accordance with Article 6.8.3 and apply to net section less sacrificial area.

(5) Applies to grid reinforcements connected to a rigid facing element, e.g., a concrete panel or block. For grid reinforcements connected to a flexible facing mat or which are continuous with the facing mat, use the resistance factor for strip reinforcements.

East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: BW Date: 12/10/2019



Notes:

q_R = Factored Bearing Resistance - Strength Limit State (enter graph with B' and read q_R)

q_0 = Maximum Bearing Pressure - Service Limit State (enter graph with q_0 and read settlement at B')

1. Preliminary q_R vs B' line and settlement curves developed using test boring information performed by Nobis.
2. Bearing capacity and settlements are based on bearing conditions provided on page 1.

East Oxbow Road over
Oxbow Brook
Charlemont, Massachusetts
Project No. 94960

Calculated by: AJ Date: 12/9/2019
Checked by: BW Date: 12/10/2019

shall be corrected for the effects of overburden pressure determined as:

$$N1 = C_N N \qquad (10.4.6.2.4\text{-}1)$$

$N1$ = *SPT* blow count corrected for overburden pressure, σ'_v (blows/ft)
C_N = $[0.77 \log_{10}(40/\sigma'_v)]$, and $C_N < 2.0$
σ'_v = vertical effective stress (ksf)
N = uncorrected *SPT* blow count (blows/ft)

SPT N values should also be corrected for hammer efficiency, if applicable to the design method or correlation being used, determined as:

$$N_{60} = (ER/60\%)N \qquad (10.4.6.2.4\text{-}2)$$

where:

$N60$ = *SPT* blow count corrected for hammer efficiency (blows/ft)
ER = hammer efficiency expressed as percent of theoretical free fall energy delivered by the hammer system actually used
N = uncorrected *SPT* blow count (blows/ft)

When *SPT* blow counts have been corrected for both overburden effects and hammer efficiency effects, the resulting corrected blow count shall be denoted as $N1_{60}$, determined as:

$$N1_{60} = C_N N_{60} \qquad (10.4.6.2.4\text{-}3)$$

The drained friction angle of granular deposits should be determined based on the following

Use phi = 38 degrees, conservative estimate

Table 10.4.6.2.4-1—Correlation of *SPT* $N1_{60}$ Values to Drained Friction Angle of Granular Soils (modified after Bowles, 1977)

$N1_{60}$	ϕ_f
<4	25–30
4	27–32
10	30–35
30	35–40
50	38–43

Based on the seismic site classification calculations, the N-values averages were determined for each boring within the glacial till layer.

BB-1 N = 22
BB-2 N = 41
BB-3 N = 33
BB-4 N = 26
BB-5 N = 35
BB-6 N = 59
BB-7 N = 71

The combined average is 41. Based on the table indicated above, we recommend a friction angle of 38 degrees be used for the bearing resistance calculations for the GRS-IBS Reinforces Soil Foundation (RSF).

full grain size range of the soil to be included in the specimen. This may not always be possible, and if not possible, it should be recognized that the shear strength measured would likely be conservative.

A method using the results of *SPT* testing is presented. Other in-situ tests such as *CPT* and *DMT* may be used. For details on determination of ϕ_f from these tests, refer to Sabatini et al. (2002).

The use of automatic trip hammers is increasing. In order to use correlations based on standard rope and cathead hammers, the *SPT N* values must be corrected to reflect the greater energy delivered to the sampler by these systems.

Hammer efficiency (ER) for specific hammer systems used in local practice may be used in lieu of the values provided. If used, specific hammer system efficiencies shall be developed in general accordance with ASTM D4945 for dynamic analysis of driven piles or other accepted procedure.

The following values for ER may be assumed if hammer specific data are not available, e.g., from older boring logs:

ER = 60 percent for conventional drop hammer using rope and cathead
ER = 80 percent for automatic trip hammer

Corrections for rod length, hole size, and use of a liner may also be made if appropriate. In general, these are only significant in unusual cases or where there is significant variation from standard procedures. These corrections may be significant for evaluation of liquefaction. Information on these additional corrections may be found in Youd and Idriss (1997).

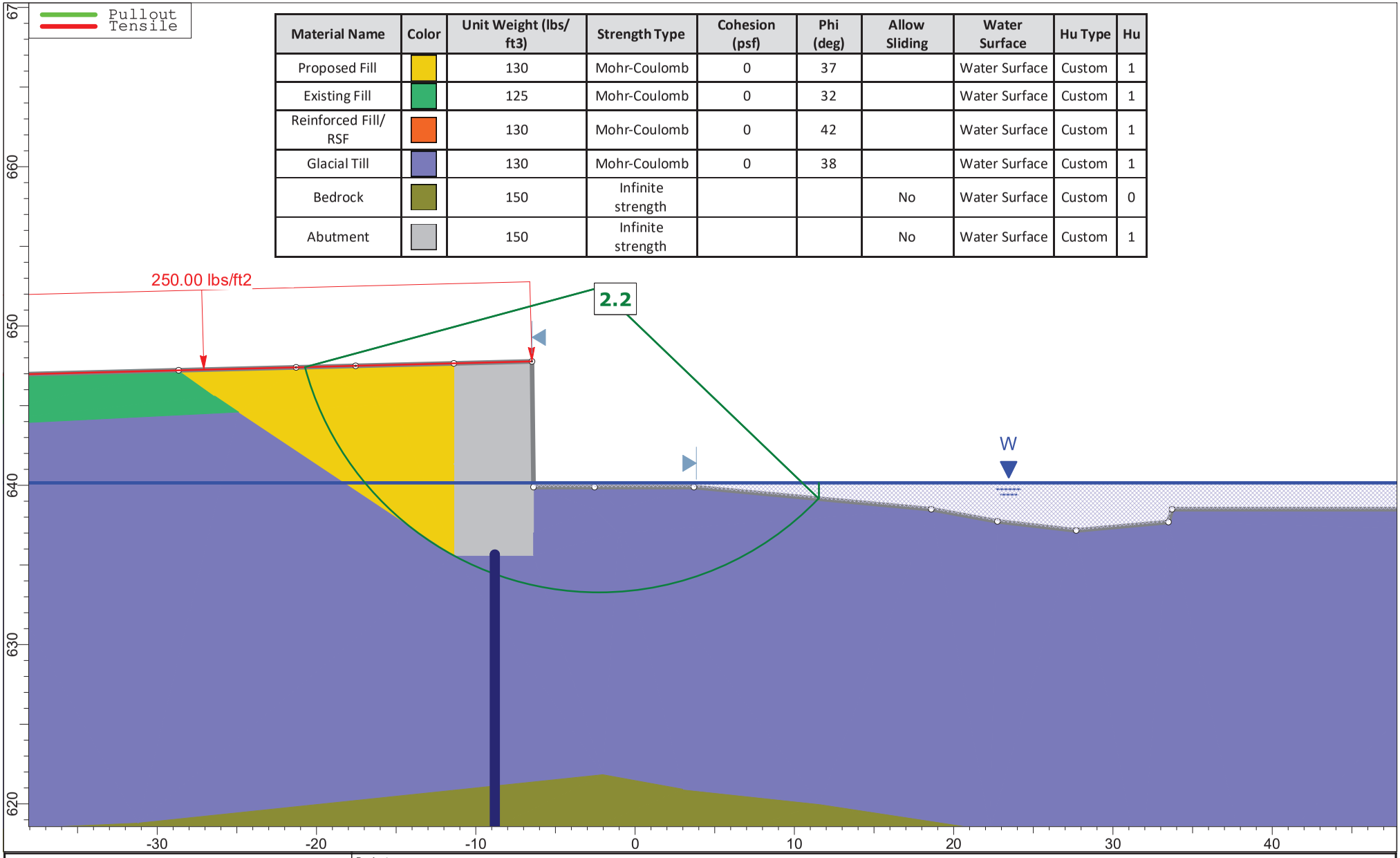
The $N1_{60}$-ϕ_f correlation used is modified after Bowles (1977). The correlation of Peck, Hanson, and Thornburn (1974) falls within the ranges specified. Experience should be used to select specific values within the ranges. In general, finer materials or materials with significant silt-sized material will fall in the lower portion of the range. Coarser materials with less than five percent fines will fall in the upper portion of the ranges. The geologic history and angularity of the particles may also need to be considered when selecting a value for ϕ_f.

Care should be exercised when using other correlations of *SPT* results to soil parameters. Some published correlations are based on corrected values ($N1_{60}$) and some are based on uncorrected values (N).

The designer should ascertain the basis of the correlation and use either $N1_{60}$ or N as appropriate.

Care should also be exercised when using *SPT* blow counts to estimate soil shear strength if in soils with coarse gravel, cobbles, or boulders. Large gravels, cobbles, or boulders could cause the *SPT* blow counts to be unrealistically high.

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding	Water Surface	Hu Type	Hu
Proposed Fill		130	Mohr-Coulomb	0	37		Water Surface	Custom	1
Existing Fill		125	Mohr-Coulomb	0	32		Water Surface	Custom	1
Reinforced Fill/ RSF		130	Mohr-Coulomb	0	42		Water Surface	Custom	1
Glacial Till		130	Mohr-Coulomb	0	38		Water Surface	Custom	1
Bedrock		150	Infinite strength			No	Water Surface	Custom	0
Abutment		150	Infinite strength			No	Water Surface	Custom	1



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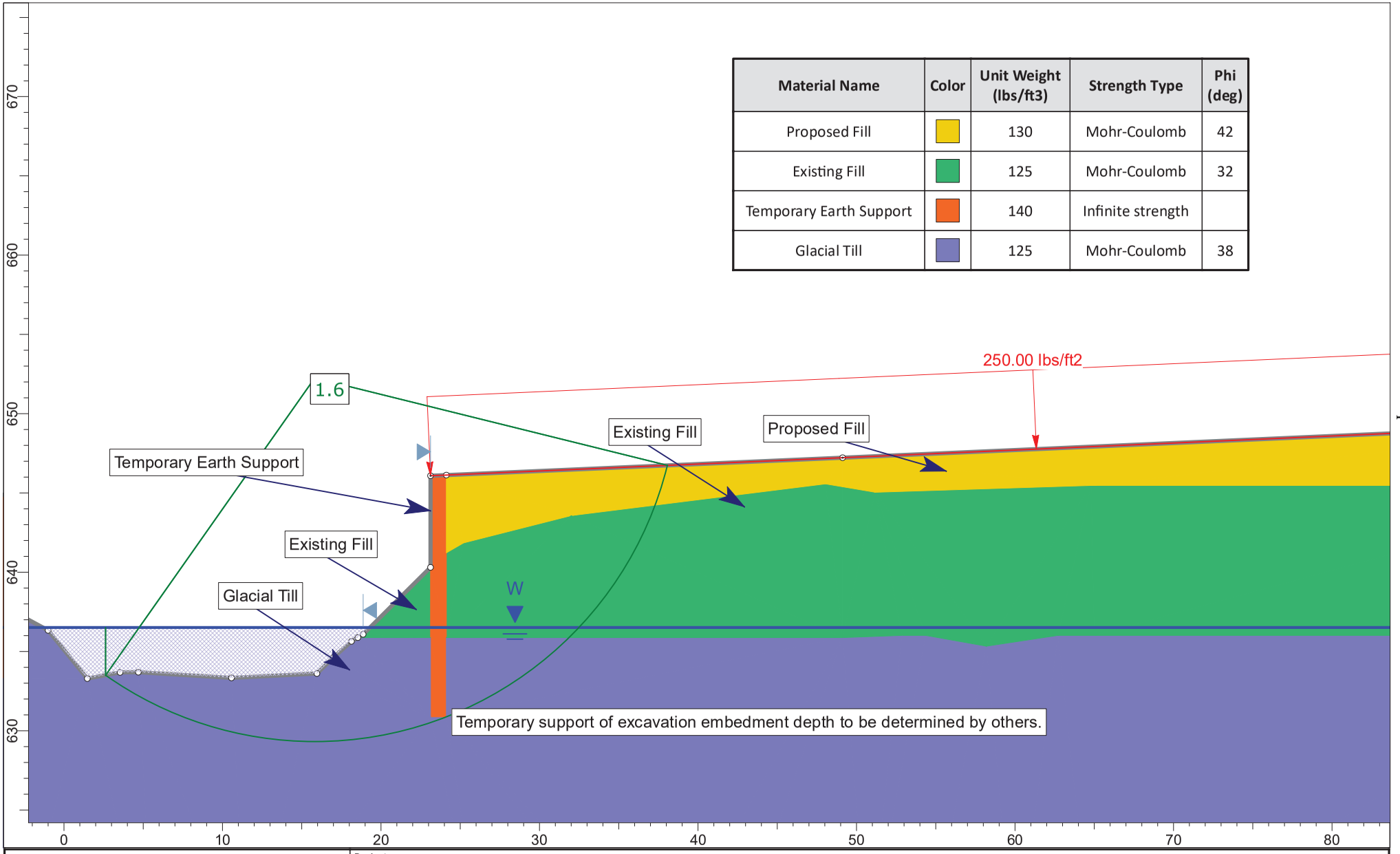
SLIDEINTERPRET 9.014

Project	94960 - E. Oxbow Rd Bridge, Charlemont, MA		
Group	South Abutment	Scenario	Master Scenario
Drawn By	DRN: R. Clopper CHK: B. Waterman	Company	Nobis Group
Date	11/19/2021	File Name	Proposed Bridge.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Phi (deg)
Proposed Fill		130	Mohr-Coulomb	42
Existing Fill		125	Mohr-Coulomb	32
Temporary Earth Support		140	Infinite strength	
Glacial Till		125	Mohr-Coulomb	38



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SLIDEINTERPRET 8.029

Project	94960 - E. Oxbow Rd Bridge, Charlemont, MA		
Analysis Description	Global Slope Stability Temp Bridge		
Drawn By DRN: J. Vanotti CHK: B. Waterman	Scale 1:100	Company	Nobis Group
Date 12/2/2019		File Name	Temporary Bridge.slmd

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Integral Abutment Analyses
East Oxbow Road over Oxbow Brook
Charlemont, MA

Calculated by: RAC Date: 9/27/2022
Checked by: BTW Date: 9/27/2022
Status: Revised

Purpose: To complete axial, lateral, and settlement analysis for the East Oxbow Road Bridge Integral Abutment, which will be utilizing Drilled Micropiles extending into bedrock.

References:
1) AASHTO LRFD Bridge Design Specifications, (2020).
2) Computer Program L-Pile User's Manual, Version 2022, by Ensoft, INC.
3) FHWA-NHI-05-039 Micropile Manual, (2005).
4) Loads used in this analysis were provided by CHA to Nobis via email, and are dated 8/16/2022.
5) Sketches provided by CHA to Nobis via email, dated 11/1/2021.
6) Boring Logs observed by Nobis Engineering (2018 to 2019).
7) Subsurface Profile A-A' by Nobis (2019).
8) Lab test information from GeoTesting.
9) Various email communications with design team.
10) MassDOT LRFD Bridge Manual, 2020.

Given:
1) The proposed abutment is integral.
2) Bottom of the N. and S. Abut. pile caps are El. 637.8' and 635.6', respectively, per Reference No. 5.
3) A single row of five (5) micropiles shall be utilized per abutment, per Reference No. 3 and 5.
4) The max. vertical load per pile is 201.2 kips (strength) and 143.1 kips (service), per Reference No. 3.
5) The max. horizontal displacement for the micropiles is 0.24-inches, per Reference No. 3.

Assumptions:
1) South Abutment was run for lateral analyses due to shorter micropile cased section (lower pile cap and higher bedrock)
2) 9.625-in OD micropiles with 0.545-in. thickness were evaluated
3) Structural engineer shall evaluate the structural adequacy of the micropiles.
4) Proposed Fill extends to the bottom of the pile cap, and glacial till below that.
5) The North and South Abutments are not susceptible to scour.
6) A fixed connection between the micropiles and micropile cap (micropiles can translate, but not rotate
7) Micropile casings are 80 ksi.

Solution:

Step 1: Soil Properties and Profile (South Abutment)

Nobis used subsurface information from Reference No. 6 to develop soil parameters in the table below. Depth datum was taken at Bottom of Pile Cap (BOC), Elevation 635.6 ft. (Reference No. 5). Soil unit weight (γmoist) and soil friction angle (ϕ) were estimated. Soil modulus parameters (k) were determined using Table 3.7 from Reference No. 2. Uniaxial Compressive Strength (U.C.S.) of rock was assumed. Overburden soil above the bottom of pile cap was ignored per the MassDOT Bridge Manual, 2020. Groundwater was modeled above the bottom of pile cap.

Soil Layer	Elevation (ft)	Depth (ft)	γ_{moist} (pcf)	ϕ (°)	k (pci)	U.C.S. (psi)	RQD (%)	k_rm (dims)
Glacial Till	635.6 to 621.5	0 to 14	130	38	125	-	-	-
Bedrock	> 621.5	> 14	165	-	-	5,000	-	-

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Integral Abutment Analyses
East Oxbow Road over Oxbow Brook
Charlemont, MA

Calculated by: RAC Date: 9/27/2022
Checked by: BTW Date: 9/27/2022
Status: Revised

Step 2: Micropile Properties

9.625-inch OD with 0.545-inch thickness Micropile Section

Micropile Cased (corrosion): micropile strength after reduction due to corrosion (1/16-inch)

Section Length:	14 ft			
Outside Diameter:	9.625 in			
Casing Thickness:	0.545 in			
Yield Stress of Casing:	80 ksi			
Loss of casing thickness (corrosion):	0.0625 in			
Elastic modulus of Casing:	29000 ksi			
Center Bar:	# 14 bar	Area of Casing (A_c):	**13.7 in^2**	
Yield Stress of Center Bar:	60 ksi	Area of Bar (A_b):	**2.25 in^2**	
Grout Compressive Strength:	4 ksi	Area of Grout (A_g):	**55.0 in^2**	

Micropile Cased (100%): micropile strength before reduction due to corrosion

Section Length:	14 ft		
Outside Diameter:	9.625 in		
Casing Thickness:	0.545 in		
Yield Stress of Casing:	80 ksi		
Elastic modulus of Casing:	29000 ksi		
Center Bar:	# 14 bar	Area of Casing (A_{ct}):	**15.5 in^2**
Yield Stress of Center Bar:	60 ksi	Area of Bar (A_b):	**2.25 in^2**
Grout Compressive Strength:	4 ksi	Area of Grout (A_g):	**55.0 in^2**

Micropile Uncased: micropile strength with no casing (inside rock socket)

Section Length:	5 ft		
Outside Diameter :	8.535 in		
Center Bar:	# 14 bar		
Yield Stress of Center Bar:	60 ksi	Area of Bar (A_b):	**2.25 in^2**
Grout Compressive Strength:	4 ksi	Area of Grout (A_g):	**55.0 in^2**

Step 3: Axial Analysis

Load Case	Resistance Factors				
	Structural		Geotechnical		
	Comp.	Tension	Comp.	Tension	
Strength	**0.75**	**0.8**	**0.7**	**0.7**	Tb. 10.5.5.2.5-2
Service	**1**	**1**	**1**	**1**	Section 10.5.5.1
Extreme	**1**	**0.8**	**1**	**0.8**	Section 10.5.5.3

Load Demand (from Loads)		
Load Case	Comp. (kips)	Tension (kips)
Strength	**201.1**	**0**
Service	**143.1**	**0**
Extreme	**0**	**0**

9.625-inch OD with 0.545-inch thichness, 80 KSI, Micropile Section

Evaluate the structural resistance of the micropile for axial load only (negating lateral loads).

For micropile cased section (corrosion):

Nominal axial compressive structural resistance (R_n):	**970.7 kips**	Eq. 10.9.3.10.2a-2
Nominal axial tension structural resistance (R_n):	**955.1 kips**	Eq. 10.9.3.10.3a-2

For micropile cased section (100% section):

Nominal axial compressive structural resistance (R_n):	**1066.5 kips**	Eq. 10.9.3.10.2a-2
Nominal axial tension structural resistance (R_n):	**1067.8 kips**	Eq. 10.9.3.10.3a-2

For micropile uncased section:

Nominal axial compressive structural resistance (R_n):	**273.6 kips**	Eq. 10.9.3.10.2b-2
Nominal axial tension structural resistance (R_n):	**135.0 kips**	Eq. 10.9.3.10.3b-2

Evaluate the geotechnical resistance of the micropile for axial loads.

Grout-to-ground bond strength in Bedrock:	**28.8 ksf**	Table C10.9.3.5.2-1
Minimum Rock Socket Length:	**5 feet**	assumption
Total Nominal grout-to-ground bond resistance:	**322 Kips**	Eq. 10.9.3.5.2-1

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Integral Abutment Analyses
East Oxbow Road over Oxbow Brook
Charlemont, MA

Calculated by: RAC Date: 9/27/2022
Checked by: BTW Date: 9/27/2022
Status: Revised

9.625-inch OD with 0.545-inch thichness, 80 KSI, Micropile Section

Check to verify that a 5 foot rock socket is adequate based on the maximum factored axial load

Geotechnical					
Load Case	Compression (kips)		Tension (kips)		
	Factored Resistance	Max. Factored Axial Load	Factored Resistance	Max. Factored Axial Load	
Strength I	225	201.1	225	0	OK
Service II	322	143.1	322	0	
Extreme I	322	0	257	0	

Check to verify that the cased micropile is *adequate based on the maximum factored axial load (negating lateral lo

Structural (cased): Check the strucural resistance of the micropile					
Load Case	Compression (kips)		Tension (kips)		
	Factored Resistance	Max. Factored Axial Load	Factored Resistance	Max. Factored Axial Load	
Strength I	728	201.1	764	0	OK
Service II	971	143.1	955	0	
Extreme I	971	0	764	0	

*Structural engineer shall evaluate the structural adequacy of the micropiles.

Check to verify that the uncased micropile is *adequate based on the maximum factored axial load (negating lateral loads) and to verify that a plunge length is not needed.

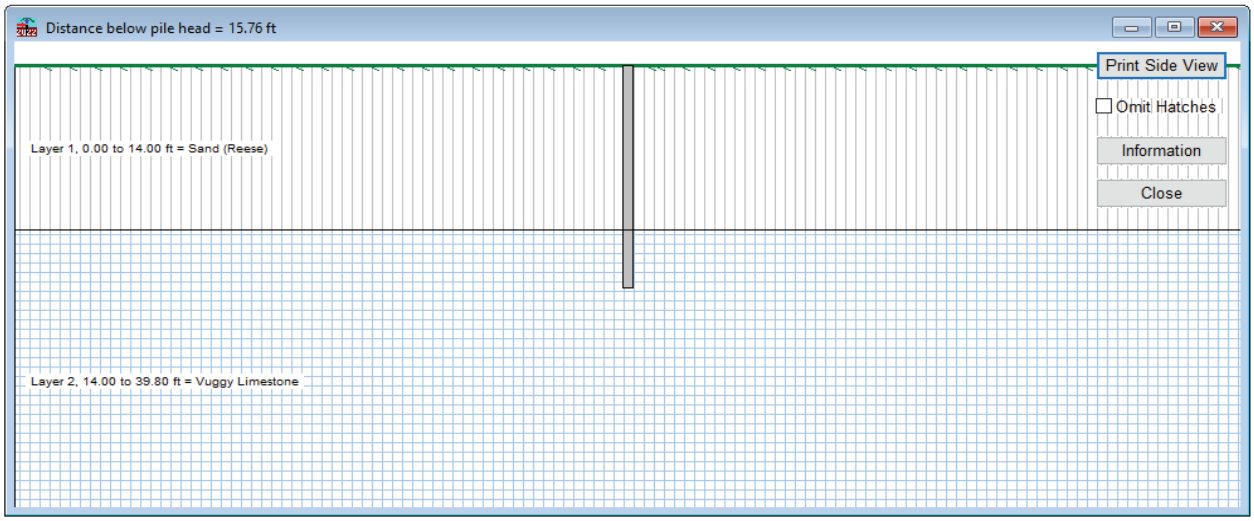
Structural (uncased)					
Load Case	Compression (kips)		Tension (kips)		
	Factored Resistance	Max. Factored Axial Load	Factored Resistance	Max. Factored Axial Load	
Strength I	205	201.1	108	0	OK
Service II	274	143.1	135	0	
Extreme I	274	0	108	0	

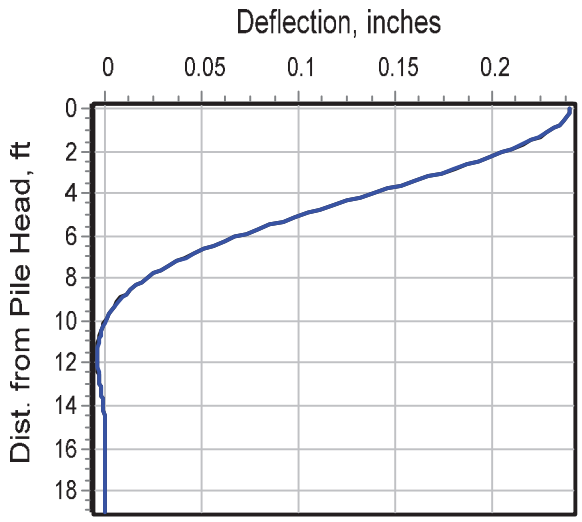
*Structural engineer shall evaluate the structural adequacy of the micropiles.

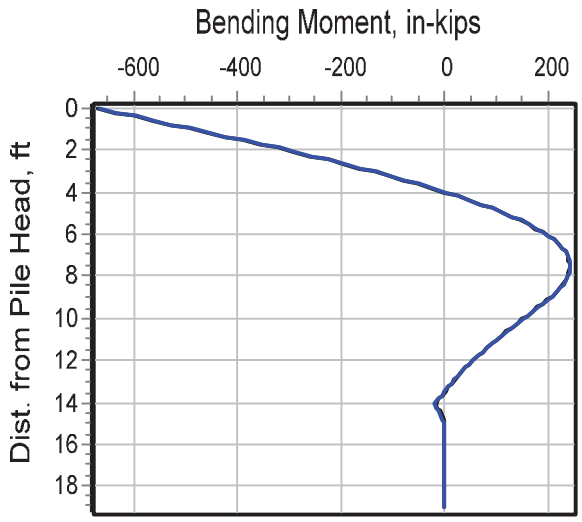
Step 4: Lateral Analysis

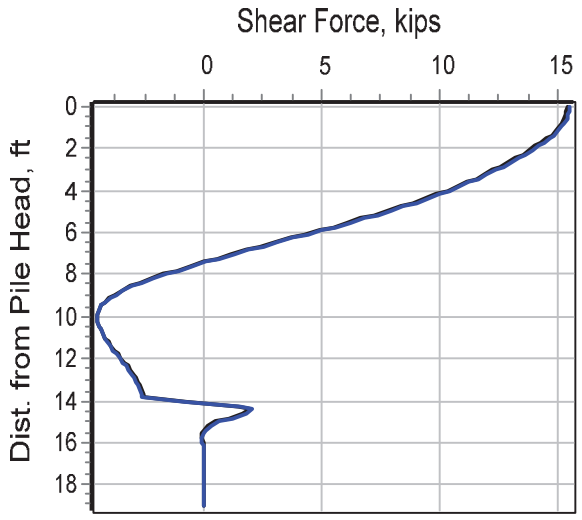
The Computer Program L-pile, version 2022 by Ensoft, INC. was used for the 2-D lateral analysis. A non-linear EI Micropile was assumed. A single micropile was analyzed with two loading conditions, a strength vertical load of 201.2 kips and a service vertical load of 143.1 kips. Both loading conditions were run with fixed head condition (free to translate, but cannot rotate), with a set lateral deflection of 0.24-inches.

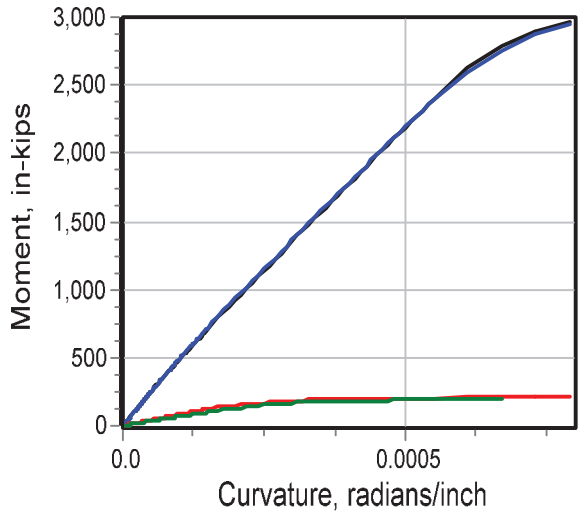
Results of Micropile Lateral Analyses of South Pier @ 0.24-inch lateral deflection (per micropile)						
Micropile Section	Corrosion of 1/16-inch	Load Case	Axial Load (kips)	Max Moment at Pile Cap Interface (kip*in)	Max Shear (kip)	Deflection (in.)
9.625-in. OD @ 0.545-in (80 ksi)	Yes	Strength	201.2	669	15.4	0.24
	Yes	Service	143.1	667	15.5	0.24
	No	Strength	201.2	724	16.3	0.24
	No	Service	143.1	722	16.4	0.24

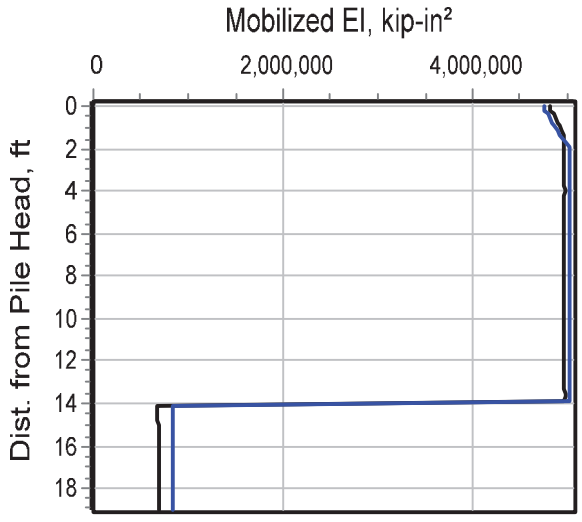


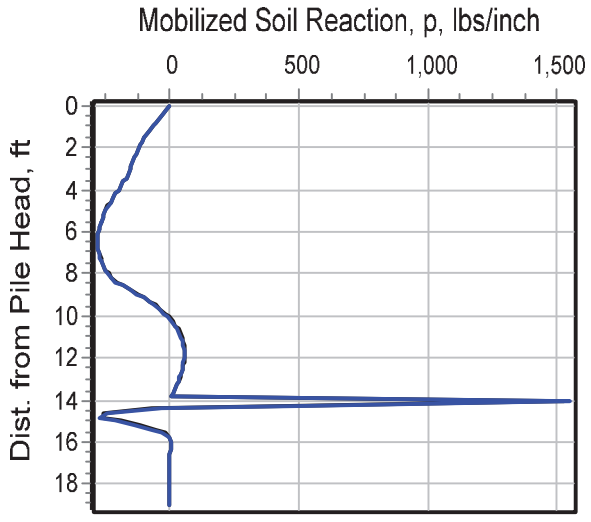

Deflection, inches
0
0.05
0.1
0.15
0.2
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


Bending Moment, in-kips
-600
-400
-200
0
200
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


Shear Force, kips
0
5
10
15
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


3,000
2,500
2,000
1,500
1,000
500
0
Moment, in-kips
0.0
0.0005
Curvature, radians/inch


Mobilized EI, kip-in²
0
2,000,000
4,000,000
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


Mobilized Soil Reaction, p, lbs/inch
0
500
1,000
1,500
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18

```
==========================================================================

                    LPile for Windows, Version 2022-12.005

                Analysis of Individual Piles and Drilled Shafts
               Subjected to Lateral Loading Using the p-y Method
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==========================================================================

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--------------------------------------------------------------------------
                           Files Used for Analysis
--------------------------------------------------------------------------

Path to file locations:
\Users\rclopper\Desktop\Micropile Integral Abutment\

Name of input data file:
9.625-inch, 80 KSI, Corrosion - NO Overburden.lp12d

Name of output report file:
9.625-inch, 80 KSI, Corrosion - NO Overburden.lp12o

Name of plot output file:
9.625-inch, 80 KSI, Corrosion - NO Overburden.lp12p

Name of runtime message file:
9.625-inch, 80 KSI, Corrosion - NO Overburden.lp12r



--------------------------------------------------------------------------
                          Date and Time of Analysis
```

Date: September 28, 2022 Time: 10:12:29

Problem Title

Project Name: East Oxbow Road in Charlemont, MA

Job Number: 100169.00

Client: CHA

Engineer: Rob Clopper

Description: Micropile for Integral Abutment Bridge-9.625 w/80KSI, NC

Program Options and Settings

Computational Options:
- Conventional Analysis

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 19.000 ft
Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	9.5000
2	14.000	9.5000
3	14.000	8.6250
4	19.000	8.6250

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a drilled shaft with permanent casing
   Length of section = 14.000000 ft
   Casing outside diameter = 9.500000 in

Pile Section No. 2:

   Section 2 is a round drilled shaft, bored pile, or CIDH pile
   Length of section = 5.000000 ft
   Shaft Diameter = 8.625000 in

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	14.000000 ft
Effective unit weight at top of layer	=	67.600000 pcf
Effective unit weight at bottom of layer	=	67.600000 pcf
Friction angle at top of layer	=	38.000000 deg.
Friction angle at bottom of layer	=	38.000000 deg.
Subgrade k at top of layer	=	125.000000 pci
Subgrade k at bottom of layer	=	125.000000 pci

Layer 2 is strong rock (vuggy limestone)

Distance from top of pile to top of layer	=	14.000000 ft
Distance from top of pile to bottom of layer	=	39.800000 ft
Effective unit weight at top of layer	=	100.000000 pcf
Effective unit weight at bottom of layer	=	100.000000 pcf
Uniaxial compressive strength at top of layer	=	5000. psi
Uniaxial compressive strength at bottom of layer	=	5000. psi

(Depth of the lowest soil layer extends 20.800 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	Uniaxial qu psi	kpy pci
1	Sand	0.00	67.6000	38.0000	--	125.0000
	(Reese, et al.)	14.0000	67.6000	38.0000	--	125.0000
2	Strong Rock	14.0000	100.0000	--	5000.	--
	(Vuggy Limestone)	39.8000	100.0000	--	5000.	--

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	5	y = 0.240000 in	S = 0.0000 in/in	201200.	N.A.	Yes
2	5	y = 0.240000 in	S = 0.0000 in/in	143100.	N.A.	Yes

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Permanent Casing:

Length of Section	=	14.000000 ft
Outer Diameter of Casing	=	9.500000 in
Concrete Cover Thickness Inside Casing	=	3.000000 in
Casing Wall Thickness	=	0.480000 in
Moment of Inertia of Steel Casing	=	138.723121 in^4
Yield Stress of Casing	=	80000. psi
Elastic Modulus of Casing	=	29000000. psi

Number of Reinforcing Bars = 1 bar
Area of Single Reinforcing Bar = 2.250000 sq. in.
Edge-to-Edge Bar Spacing = -1.69300 in
Maximum Concrete Aggregate Size = 0.250000 in
Ratio of Bar Spacing to Aggregate Size = -6.77
Offset of Center of Rebar Cage from Center of Pile = 0.0000 in
Yield Stress of Reinforcing Bars = 60000. psi
Modulus of Elasticity of Reinforcing Bars = 29000000. psi
Gross Area of Pile = 70.882184 sq. in.
Area of Concrete = 55.030345 sq. in.
Cross-sectional Area of Steel Casing = 13.601840 sq. in.
Area of All Steel (Casing and Bars) = 15.851840 sq. in.
Area Ratio of All Steel to Gross Area of Pile = 22.36 percent

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 1410.250 kips
Tensile Load for Cracking of Concrete = -75.924 kips
Nominal Axial Tensile Capacity = -1223.147 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.693000	2.250000	0.00000	0.00000

NOTE: The positions of the above rebars were computed by LPile

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34165 psi
Compression Strain at Peak Stress = 0.001886
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.250000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	143.100

2 201.200

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 143.100 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.00000125	6.2742182	5019375.	173.0839608	0.0002164	0.0002045	0.8647515	6.1313780	6.2725717	
0.00000250	12.5459067	5018363.	88.9177952	0.0002223	0.0001985	0.8867917	6.1607089	6.4430964	
0.00000375	18.8175891	5018024.	60.8627729	0.0002282	0.0001926	0.9087593	6.1900797	6.6136609	
0.00000500	25.0892626	5017853.	46.8355364	0.0002342	0.0001867	0.9306542	6.2194903	6.7842653	
0.00000625	31.3609240	5017748.	38.4194142	0.0002401	0.0001807	0.9524764	6.2489407	6.9549095	
0.00000750	37.6325704	5017676.	32.8088491	0.0002461	0.0001748	0.9742258	6.2784310	7.1255935	
0.00000875	43.9041987	5017623.	28.8014596	0.0002520	0.0001689	0.9959024	6.3079610	7.2963173	
0.00001000	50.1758059	5017581.	25.7960548	0.0002580	0.0001630	1.0175061	6.3375309	7.4670809	
0.00001125	56.4473891	5017546.	23.4586398	0.0002639	0.0001570	1.0390368	6.3671406	7.6378844	
0.00001250	62.7189451	5017516.	21.5888176	0.0002699	0.0001511	1.0604945	6.3967902	7.8087277	
0.00001375	68.9904710	5017489.	20.0590630	0.0002758	0.0001452	1.0818791	6.4264795	7.9796108	
0.00001500	75.2619637	5017464.	18.7843590	0.0002818	0.0001393	1.1031907	6.4562087	8.1505337	
0.00001625	81.5334202	5017441.	17.7058479	0.0002877	0.0001333	1.1244290	6.4859777	8.3214965	
0.00001750	87.8048376	5017419.	16.7814882	0.0002937	0.0001274	1.1455942	6.5157866	8.4924991	
0.00001875	94.0762127	5017398.	15.9804498	0.0002996	0.0001215	1.1666861	6.5456352	8.6635415	
0.00002000	100.3475426	5017377.	15.2796098	0.0003056	0.0001156	1.1877046	6.5755237	8.8346237	
0.00002125	106.6188243	5017356.	14.6612862	0.0003116	0.0001097	1.2086498	6.6054520	9.0057458	
0.00002250	112.8900546	5017336.	14.1117262	0.0003175	0.0001038	1.2295215	6.6354202	9.1769077	
0.00002375	119.1612307	5017315.	13.6200726	0.0003235	0.00009785	1.2503197	6.6654282	9.3481094	
0.00002500	125.4323495	5017294.	13.1776392	0.0003294	0.00009194	1.2710443	6.6954759	9.5193509	
0.00002625	131.7034079	5017273.	12.7773946	0.0003354	0.00008603	1.2916954	6.7255636	9.6906323	
0.00002750	137.9744030	5017251.	12.4135859	0.0003414	0.00008012	1.3122728	6.7556910	9.8619535	
0.00002875	144.2453317	5017229.	12.0814604	0.0003473	0.00007422	1.3327765	6.7858583	10.0333146	
0.00003000	150.5161910	5017206.	11.7770579	0.0003533	0.00006831	1.3532064	6.8160654	10.2047154	

0.00003125	156.7869779	5017183.	11.4970515	0.0003593	0.00006241	1.3735625	6.8463124	10.3761561
0.00003250	163.0576894	5017160.	11.2386264	0.0003653	0.00005651	1.3938447	6.8765992	10.5476367
0.00003375	169.3283225	5017135.	10.9993845	0.0003712	0.00005060	1.4140530	6.9069258	10.7191570
0.00003500	175.5988740	5017111.	10.7772706	0.0003772	0.00004470	1.4341873	6.9372922	10.8907172
0.00003625	181.8693411	5017085.	10.5705128	0.0003832	0.00003881	1.4542476	6.9676985	11.0623173
0.00003750	188.1397206	5017059.	10.3775754	0.0003892	0.00003291	1.4742337	6.9981447	11.2339572
0.00003875	194.4100097	5017033.	10.1971211	0.0003951	0.00002701	1.4941457	7.0286306	11.4056369
0.00004000	200.6802051	5017005.	10.0279796	0.0004011	0.00002112	1.5139835	7.0591564	11.5773564
0.00004125	206.9503040	5016977.	9.8691223	0.0004071	0.00001523	1.5337471	7.0897220	11.7491158
0.00004250	213.2203033	5016948.	9.7196419	0.0004131	0.00000933	1.5534363	7.1203275	11.9209150
0.00004375	219.4902000	5016919.	9.5787346	0.0004191	0.00000344	1.5730511	7.1509728	12.0927541
0.00004500	225.7599911	5016889.	9.4456861	0.0004251	-0.00000244	1.5925916	7.1816580	12.2646330
0.00004625	232.0296735	5016858.	9.3198591	0.0004310	-0.00000833	1.6120575	7.2123830	12.4365517
0.00004750	238.2992442	5016826.	9.2006834	0.0004370	-0.00001422	1.6314489	7.2431478	12.6085103
0.00004875	244.5687002	5016794.	9.0876475	0.0004430	-0.00002010	1.6507657	7.2739525	12.7805087
0.00005125	257.1072304	5016726.	8.8781979	0.0004550	-0.00003187	1.6891753	7.3356811	13.1246249
0.00005375	269.6448081	5016648.	8.6883311	0.0004670	-0.00004363	1.7272854	7.3975643	13.4688956
0.00005625	282.1805098	5016542.	8.5154300	0.0004790	-0.00005538	1.7650944	7.4595922	13.8133110
0.00005875	294.7133486	5016397.	8.3573224	0.0004910	-0.00006713	1.8026008	7.5217538	14.1578600
0.00006125	307.2423899	5016202.	8.2121906	0.0005030	-0.00007888	1.8398029	7.5840381	14.5025318
0.00006375	319.7667937	5015950.	8.0785025	0.0005150	-0.00009062	1.8766995	7.6464348	14.8473161
0.00006625	332.2858223	5015635.	7.9549578	0.0005270	-0.000102	1.9132891	7.7089347	15.1922034
0.00006875	344.7988395	5015256.	7.8404456	0.0005390	-0.000114	1.9495706	7.7715293	15.5371855
0.00007125	354.1120006	4969993.	7.7156132	0.0005497	-0.000127	1.9815956	7.7961953	15.8442391 C
0.00007375	365.8743941	4961009.	7.6126755	0.0005614	-0.000139	2.0163281	7.8495880	16.1800192 C
0.00007625	377.5765294	4951823.	7.5161419	0.0005731	-0.000151	2.0506811	7.9022159	16.5150346 C
0.00007875	389.2234069	4942519.	7.4254240	0.0005848	-0.000163	2.0846616	7.9541278	16.8493341 C
0.00008125	400.8201395	4933171.	7.3400086	0.0005964	-0.000175	2.1182772	8.0053800	17.1829737 C
0.00008375	412.3718716	4923843.	7.2594472	0.0006080	-0.000188	2.1515358	8.0560358	17.5160170 C
0.00008625	423.8769770	4914516.	7.1832967	0.0006196	-0.000200	2.1844340	8.1060429	17.8484116 C
0.00008875	435.3393800	4905232.	7.1112004	0.0006311	-0.000212	2.2169776	8.1554430	18.1801992 C
0.00009125	446.7690752	4896099.	7.0428875	0.0006427	-0.000224	2.2491840	8.2044008	18.5115445 C
0.00009375	458.1709511	4887157.	6.9780864	0.0006542	-0.000236	2.2810626	8.2530007	18.8425319 C
0.00009625	469.5306518	4878241.	6.9164159	0.0006657	-0.000249	2.3125858	8.3009431	19.1728619 C
0.00009875	480.8666146	4869535.	6.8577590	0.0006772	-0.000261	2.3437880	8.3485734	19.5028796 C
0.0001013	492.1797532	4861035.	6.8018986	0.0006887	-0.000273	2.3746715	8.3959094	19.8326032 C
0.0001038	503.4587800	4852615.	6.7485461	0.0007002	-0.000285	2.4052132	8.4426916	20.1617728 C
0.0001063	514.7275837	4844495.	6.6976906	0.0007116	-0.000298	2.4354614	8.4894313	20.4909000 C
0.0001088	525.9583748	4836399.	6.6489599	0.0007231	-0.000310	2.4653590	8.5354982	20.8193544 C
0.0001113	537.1850700	4828630.	6.6024465	0.0007345	-0.000322	2.4949760	8.5816528	21.1478966 C
0.0001138	548.3759828	4820888.	6.5577781	0.0007459	-0.000335	2.5242460	8.6271490	21.4757803 C
0.0001163	559.5629276	4813445.	6.5150575	0.0007574	-0.000347	2.5532365	8.6727350	21.8037537 C
0.0001188	570.7217330	4806078.	6.4739881	0.0007688	-0.000359	2.5818950	8.7178126	22.1312188 C
0.0001213	581.8711776	4798938.	6.4345996	0.0007802	-0.000372	2.6102631	8.7628457	22.4586394 C
0.0001238	593.0051946	4791961.	6.3967442	0.0007916	-0.000384	2.6383267	8.8076691	22.7858504 C
0.0001263	604.1194154	4785104.	6.3602994	0.0008030	-0.000396	2.6660766	8.8521684	23.1127371 C
0.0001288	615.2296012	4778482.	6.3252931	0.0008144	-0.000409	2.6935481	8.8967542	23.4397104 C
0.0001313	626.3165282	4771935.	6.2915040	0.0008258	-0.000421	2.7206971	8.9408969	23.7662407 C
0.0001338	637.3937205	4765561.	6.2589597	0.0008371	-0.000433	2.7475552	8.9849685	24.0926997 C
0.0001363	648.4668511	4759390.	6.2276313	0.0008485	-0.000446	2.7741353	9.0291253	24.4192440 C

0.0001388	659.5170588	4753276.	6.1973160	0.0008599	-0.000458	2.8003931	9.0728165	24.7453227 C
0.0001413	670.5593981	4747323.	6.1680674	0.0008712	-0.000471	2.8263644	9.1164809	25.0713747 C
0.0001438	681.5976545	4741549.	6.1398563	0.0008826	-0.000483	2.8520581	9.1602295	25.3975107 C
0.0001463	692.6205637	4735867.	6.1125470	0.0008940	-0.000495	2.8774468	9.2037123	25.7233811 C
0.0001488	703.6301878	4730287.	6.0861088	0.0009053	-0.000508	2.9025362	9.2469928	26.0490491 C
0.0001588	747.5935586	4709251.	5.9886173	0.0009507	-0.000557	3.0000359	9.4198129	27.3514191 C
0.0001688	791.4245599	4689923.	5.9024850	0.0009960	-0.000607	3.0929343	9.5916770	28.6528333 C
0.0001788	835.1388778	4672106.	5.8258876	0.0010414	-0.000657	3.1812695	9.7630110	29.9537173 C
0.0001888	878.7427351	4655591.	5.7573342	0.0010867	-0.000706	3.2650555	9.9339491	31.2542053 C
0.0001988	922.2381898	4640192.	5.6956012	0.0011320	-0.000756	3.3442932	10.1044376	32.5542438 C
0.0002088	965.6494754	4625866.	5.6398699	0.0011773	-0.000806	3.4190418	10.2754537	33.8548099 C
0.0002188	1009.	4612396.	5.5892057	0.0012226	-0.000855	3.4892587	10.4462897	35.1551960 C
0.0002288	1052.	4599763.	5.5430850	0.0012680	-0.000905	3.5549915	10.6178811	36.4563374 C
0.0002388	1095.	4587812.	5.5008500	0.0013133	-0.000955	3.6162049	10.7896213	37.7576275 C
0.0002488	1138.	4576549.	5.4621899	0.0013587	-0.001004	3.6729455	10.9626641	39.0602203 C
0.0002588	1181.	4565796.	5.4265000	0.0014041	-0.001054	3.7251442	11.1355623	40.3626685 C
0.0002688	1224.	4555591.	5.3936344	0.0014495	-0.001104	3.7728535	11.3097771	41.6664333 C
0.0002788	1267.	4545862.	5.3632676	0.0014950	-0.001153	3.8160540	11.4851290	42.9713352 C
0.0002888	1310.	4536512.	5.3350325	0.0015405	-0.001203	3.8547087	11.6607184	44.2764747 C
0.0002988	1353.	4527557.	5.3088412	0.0015860	-0.001252	3.8888417	11.8376384	45.5829446 C
0.0003088	1395.	4518958.	5.2844959	0.0016316	-0.001302	3.9184394	12.0158960	46.8907523 C
0.0003188	1438.	4510660.	5.2617670	0.0016772	-0.001351	3.9434786	12.1949747	48.1993809 C
0.0003288	1480.	4502631.	5.2405030	0.0017228	-0.001400	3.9639502	12.3748365	49.5087927 C
0.0003388	1523.	4494870.	5.2206328	0.0017685	-0.001450	3.9798520	12.5560574	50.8195636 C
0.0003488	1565.	4487353.	5.2020372	0.0018142	-0.001499	3.9911697	12.7386450	52.1317012 C
0.0003588	1607.	4480057.	5.1846104	0.0018600	-0.001548	3.9978890	12.9226071	53.4452134 C
0.0003688	1649.	4472949.	5.1682090	0.0019058	-0.001597	3.9993759	13.1074270	54.7595833 C
0.0003788	1692.	4466017.	5.1527648	0.0019516	-0.001647	3.9993189	13.2932469	56.0749531 C
0.0003888	1734.	4459258.	5.1382392	0.0019975	-0.001696	3.9996341	13.4804660	57.3917223 C
0.0003988	1775.	4452658.	5.1245639	0.0020434	-0.001745	3.9998006	13.6690927	58.7098989 C
0.0004088	1817.	4446203.	5.1116772	0.0020894	-0.001794	3.9998774	13.8591351	60.0294914 C
0.0004188	1859.	4439875.	5.0995272	0.0021354	-0.001843	3.9999002	14.0506504	61.3505567 C
0.0004288	1901.	4433655.	5.0880667	0.0021815	-0.001892	3.9998820	14.2436915	62.6731477 C
0.0004388	1943.	4427531.	5.0772209	0.0022276	-0.001940	3.9998120	14.4379067	63.9969130 C
0.0004488	1984.	4421499.	5.0669465	0.0022738	-0.001989	3.9996567	14.6332672	65.3218234 C
0.0004588	2026.	4415567.	5.0572312	0.0023200	-0.002038	3.9993595	14.8301072	66.6482134 C
0.0004688	2067.	4409737.	5.0480361	0.0023663	-0.002087	3.9988406	15.0283826	67.9760389 C
0.0004788	2108.	4404009.	5.0393248	0.0024126	-0.002136	3.9989743	15.2280424	69.3052487 C
0.0004888	2150.	4398377.	5.0310680	0.0024589	-0.002184	3.9999329	15.4290916	70.6358479 C
0.0004988	2191.	4392845.	5.0232338	0.0025053	-0.002233	3.9995239	15.6314646	71.9677709 C
0.0005088	2232.	4387419.	5.0157916	0.0025518	-0.002281	3.9985999	15.8350768	73.3009331 C
0.0005188	2273.	4382096.	5.0087158	0.0025983	-0.002330	3.9999925	16.0398853	74.6352915 C
0.0005288	2314.	4376867.	5.0019894	0.0026448	-0.002378	3.9995479	16.2459475	75.9709037 C
0.0005388	2355.	4371745.	4.9955820	0.0026914	-0.002427	3.9982555	16.4530922	77.3075984 C
0.0005488	2396.	4366722.	4.9894768	0.0027380	-0.002475	3.9999195	16.6613289	78.6453851 C
0.0006088	2625.	4311596.	4.9699516	0.0030255	-0.002758	3.9975844	18.1383669	80.0000000 CY
0.0006688	2789.	4170587.	4.9799181	0.0033303	-0.003023	3.9973078	20.1194141	80.0000000 CY
0.0007288	2895.	3971950.	4.9814535	0.0036302	-0.003293	3.9994835	21.9569838	80.0000000 CY
0.0007888	2968.	3762638.	4.9786642	0.0039269	-0.003566	3.9995522	23.7009625	80.0000000 CY

Axial Thrust Force = 201.200 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.00000125	6.2109366	4968749.	243.3348829	0.0003042	0.0002923	1.1858089	8.6779739	8.8191676	
0.00000250	12.4182748	4967310.	124.0432697	0.0003101	0.0002864	1.2066883	8.7073058	8.9896933	
0.00000375	18.6256068	4966828.	84.2797709	0.0003160	0.0002804	1.2274948	8.7366782	9.1602595	
0.00000500	24.8329297	4966586.	64.3983007	0.0003220	0.0002745	1.2482285	8.7660911	9.3308661	
0.00000625	31.0402403	4966438.	52.4696419	0.0003279	0.0002686	1.2688892	8.7955445	9.5015132	
0.00000750	37.2475357	4966338.	44.5173888	0.0003339	0.0002626	1.2894769	8.8250383	9.6722008	
0.00000875	43.4548127	4966264.	38.8373676	0.0003398	0.0002567	1.3099916	8.8545727	9.8429289	
0.00001000	49.6620683	4966207.	34.5774913	0.0003458	0.0002508	1.3304333	8.8841475	10.0136975	
0.00001125	55.8692994	4966160.	31.2643782	0.0003517	0.0002448	1.3508017	8.9137628	10.1845066	
0.00001250	62.0765029	4966120.	28.6139995	0.0003577	0.0002389	1.3710970	8.9434186	10.3553561	
0.00001375	68.2836758	4966086.	26.4456093	0.0003636	0.0002330	1.3913190	8.9731149	10.5262461	
0.00001500	74.4908149	4966054.	24.6387105	0.0003696	0.0002271	1.4114677	9.0028516	10.6971766	
0.00001625	80.6979173	4966026.	23.1098821	0.0003755	0.0002212	1.4315430	9.0326289	10.8681476	
0.00001750	86.9049799	4965999.	21.7995375	0.0003815	0.0002152	1.4515449	9.0624466	11.0391591	
0.00001875	93.1119995	4965973.	20.6639800	0.0003874	0.0002093	1.4714734	9.0923048	11.2102110	
0.00002000	99.3189731	4965949.	19.6704370	0.0003934	0.0002034	1.4913282	9.1222035	11.3813035	
0.00002125	105.5258977	4965925.	18.7938470	0.0003994	0.0001975	1.5111095	9.1521427	11.5524364	
0.00002250	111.7327702	4965901.	18.0147181	0.0004053	0.0001916	1.5308172	9.1821223	11.7236098	
0.00002375	117.9395875	4965877.	17.3176614	0.0004113	0.0001857	1.5504511	9.2121425	11.8948237	
0.00002500	124.1463466	4965854.	16.6903663	0.0004173	0.0001798	1.5700113	9.2422031	12.0660781	
0.00002625	130.3530443	4965830.	16.1228668	0.0004232	0.0001739	1.5894977	9.2723042	12.2373729	
0.00002750	136.5596776	4965806.	15.6070089	0.0004292	0.0001679	1.6089102	9.3024458	12.4087083	
0.00002875	142.7662434	4965782.	15.1360567	0.0004352	0.0001620	1.6282488	9.3326279	12.5800842	
0.00003000	148.9727387	4965758.	14.7043972	0.0004411	0.0001561	1.6475134	9.3628505	12.7515005	
0.00003125	155.1791603	4965733.	14.3073150	0.0004471	0.0001502	1.6667040	9.3931136	12.9229574	
0.00003250	161.3855053	4965708.	13.9408206	0.0004531	0.0001443	1.6858205	9.4234172	13.0944547	
0.00003375	167.5917706	4965682.	13.6015153	0.0004591	0.0001384	1.7048628	9.4537613	13.2659926	
0.00003500	173.7979530	4965656.	13.2864860	0.0004650	0.0001325	1.7238309	9.4841459	13.4375709	
0.00003625	180.0040495	4965629.	12.9932214	0.0004710	0.0001266	1.7427248	9.5145709	13.6091897	
0.00003750	186.2100571	4965602.	12.7195450	0.0004770	0.0001207	1.7615444	9.5450365	13.7808490	
0.00003875	192.4159726	4965573.	12.4635612	0.0004830	0.0001148	1.7802896	9.5755426	13.9525488	
0.00004000	198.6217931	4965545.	12.2236113	0.0004889	0.0001089	1.7989603	9.6060891	14.1242891	
0.00004125	204.8275154	4965516.	11.9982376	0.0004949	0.0001031	1.8175566	9.6366762	14.2960699	
0.00004250	211.0331364	4965486.	11.7861541	0.0005009	0.00009716	1.8360784	9.6673037	14.4678912	
0.00004375	217.2386531	4965455.	11.5862215	0.0005069	0.00009127	1.8545255	9.6979718	14.6397530	
0.00004500	223.4440624	4965424.	11.3974274	0.0005129	0.00008538	1.8728980	9.7286804	14.8116554	
0.00004625	229.6493613	4965392.	11.2188686	0.0005189	0.00007950	1.8911959	9.7594294	14.9835982	
0.00004750	235.8545466	4965359.	11.0497369	0.0005249	0.00007361	1.9094189	9.7902190	15.1555815	
0.00004875	242.0596153	4965325.	10.8893074	0.0005309	0.00006773	1.9275671	9.8210491	15.3276053	
0.00005125	254.4693907	4965256.	10.5920075	0.0005428	0.00005597	1.9636389	9.8828307	15.6717745	
0.00005375	266.8786628	4965184.	10.3224675	0.0005548	0.00004421	1.9994108	9.9447744	16.0161057	
0.00005625	279.2874071	4965109.	10.0769858	0.0005668	0.00003246	2.0348823	10.0068801	16.3605989	
0.00005875	291.6955989	4965031.	9.8524914	0.0005788	0.00002071	2.0700530	10.0691479	16.7052542	

0.00006125	304.1032137	4964950.	9.6464142	0.0005908	0.00000897	2.1049224	10.1315778	17.0500716
0.00006375	316.5102269	4964866.	9.4565877	0.0006029	-0.00000277	2.1394901	10.1941698	17.3950510
0.00006625	328.9166139	4964779.	9.2811720	0.0006149	-0.00001450	2.1737557	10.2569238	17.7401926
0.00006875	341.3223502	4964689.	9.1185952	0.0006269	-0.00002622	2.2077186	10.3198400	18.0854962
0.00007125	353.7274105	4964595.	8.9675057	0.0006389	-0.00003794	2.2413785	10.3829182	18.4309620
0.00007375	366.1316191	4964497.	8.8267346	0.0006510	-0.00004965	2.2747347	10.4461570	18.7765883
0.00007625	378.5344591	4964386.	8.6952646	0.0006630	-0.00006136	2.3077863	10.5095510	19.1223697
0.00007875	390.9352579	4964257.	8.5722067	0.0006751	-0.00007306	2.3405322	10.5730928	19.4682991
0.00008125	403.3333115	4964102.	8.4567809	0.0006871	-0.00008476	2.3729711	10.6367746	19.8143684
0.00008375	415.7279517	4963916.	8.3483007	0.0006992	-0.00009645	2.4051022	10.7005887	20.1605700
0.00008625	428.1185467	4963693.	8.2461591	0.0007112	-0.000108	2.4369241	10.7645275	20.5068963
0.00008875	438.9416095	4945821.	8.1427833	0.0007227	-0.000120	2.4667972	10.8104784	20.8352347 C
0.00009125	450.8489312	4940810.	8.0497834	0.0007345	-0.000132	2.4974998	10.8688973	21.1760410 C
0.00009375	462.6961369	4935425.	7.9615026	0.0007464	-0.000144	2.5278339	10.9266635	21.5161948 C
0.00009625	474.4871607	4929737.	7.8775847	0.0007582	-0.000156	2.5578039	10.9838054	21.8557241 C
0.00009875	486.2263233	4923811.	7.7977128	0.0007700	-0.000168	2.5874151	11.0403659	22.1946722 C
0.0001013	497.9182084	4917711.	7.7216043	0.0007818	-0.000180	2.6166735	11.0963953	22.5330891 C
0.0001038	509.5663962	4911483.	7.6490004	0.0007936	-0.000192	2.6455839	11.1519335	22.8710147 C
0.0001063	521.1577913	4905015.	7.5795804	0.0008053	-0.000204	2.6741287	11.2067544	23.2082232 C
0.0001088	532.7131004	4898511.	7.5132219	0.0008171	-0.000216	2.7023352	11.2611645	23.5450207 C
0.0001113	544.2372783	4892020.	7.4497417	0.0008288	-0.000228	2.7302107	11.3152387	23.8814825 C
0.0001138	555.7131988	4885391.	7.3888591	0.0008405	-0.000240	2.7577318	11.3686775	24.2173088 C
0.0001163	567.1584286	4878782.	7.3304889	0.0008522	-0.000252	2.7849225	11.4217579	24.5527766 C
0.0001188	578.5780759	4872236.	7.2744978	0.0008638	-0.000264	2.8117908	11.4745678	24.8879740 C
0.0001213	589.9530661	4865592.	7.2206367	0.0008755	-0.000276	2.8383091	11.5267486	25.2225424 C
0.0001238	601.3151802	4859113.	7.1689354	0.0008872	-0.000288	2.8645235	11.5788704	25.5570517 C
0.0001263	612.6318426	4852529.	7.1190976	0.0008988	-0.000301	2.8903868	11.6303182	25.8908869 C
0.0001288	623.9390191	4846128.	7.0711938	0.0009104	-0.000313	2.9159519	11.6817608	26.2247171 C
0.0001313	635.2054619	4839661.	7.0249534	0.0009220	-0.000325	2.9411727	11.7325887	26.5579324 C
0.0001338	646.4661435	4833392.	6.9804584	0.0009336	-0.000337	2.9661015	11.7834817	26.8912129 C
0.0001363	657.6845337	4827042.	6.9374248	0.0009452	-0.000349	2.9906835	11.8336969	27.2238157 C
0.0001388	668.8989638	4820893.	6.8959670	0.0009568	-0.000361	3.0149771	11.8840131	27.5565194 C
0.0001413	680.0794392	4814722.	6.8558459	0.0009684	-0.000373	3.0389364	11.9337934	27.8886872 C
0.0001438	691.2479825	4808682.	6.8171037	0.0009800	-0.000386	3.0625957	11.9835046	28.2207859 C
0.0001463	702.4002067	4802736.	6.7796450	0.0009915	-0.000398	3.0859481	12.0330417	28.5527105 C
0.0001488	713.5251406	4796808.	6.7433484	0.0010031	-0.000410	3.1089770	12.0821603	28.8842166 C
0.0001588	757.8948883	4774141.	6.6093529	0.0010492	-0.000459	3.1980818	12.2775245	30.2091308 C
0.0001688	802.0215145	4752720.	6.4906693	0.0010953	-0.000508	3.2823210	12.4701042	31.5312604 C
0.0001788	845.9492054	4732583.	6.3848890	0.0011413	-0.000557	3.3617729	12.6607345	32.8514407 C
0.0001888	889.7045864	4713667.	6.2900546	0.0011872	-0.000606	3.4364863	12.8499276	34.1701839 C
0.0001988	933.3063222	4695881.	6.2045792	0.0012332	-0.000655	3.5064957	13.0380598	35.4878660 C
0.0002088	976.7716295	4679146.	6.1271844	0.0012790	-0.000704	3.5718315	13.2255341	36.8048903 C
0.0002188	1020.	4663273.	6.0566905	0.0013249	-0.000753	3.6324808	13.4118964	38.1208026 C
0.0002288	1063.	4648293.	5.9923402	0.0013707	-0.000802	3.6884951	13.5981284	39.4365846 C
0.0002388	1106.	4634153.	5.9334302	0.0014166	-0.000852	3.7398936	13.7847039	40.7527101 C
0.0002488	1149.	4620643.	5.8791544	0.0014624	-0.000901	3.7866361	13.9705416	42.0680978 C
0.0002588	1192.	4607850.	5.8291800	0.0015083	-0.000950	3.8287768	14.1571760	43.3842822 C
0.0002688	1235.	4595605.	5.7829010	0.0015542	-0.000999	3.8662812	14.3436262	44.7002824 C
0.0002788	1278.	4583955.	5.7400696	0.0016000	-0.001048	3.8991792	14.5311042	46.0173104 C
0.0002888	1320.	4572739.	5.7001722	0.0016459	-0.001097	3.9274345	14.7183083	47.3340645 C

0.0002988	1363.	4562035.	5.6631063	0.0016919	-0.001146	3.9510767	14.9069040	48.6522103	C
0.0003088	1405.	4551706.	5.6284508	0.0017378	-0.001195	3.9700746	15.0955746	49.9704309	C
0.0003188	1448.	4541766.	5.5960601	0.0017837	-0.001244	3.9844344	15.2850903	51.2894965	C
0.0003288	1490.	4532210.	5.5657873	0.0018298	-0.001293	3.9941503	15.4760111	52.6099673	C
0.0003388	1532.	4522944.	5.5373272	0.0018758	-0.001342	3.9992050	15.6671804	53.9306866	C
0.0003488	1574.	4513976.	5.5105931	0.0019218	-0.001391	3.9997750	15.8592993	55.2523556	C
0.0003588	1616.	4505306.	5.4854861	0.0019679	-0.001440	3.9999858	16.0528409	56.5754472	C
0.0003688	1658.	4496905.	5.4618712	0.0020141	-0.001489	3.9989985	16.2477769	57.8999331	C
0.0003788	1700.	4488697.	5.4395114	0.0020602	-0.001538	3.9993550	16.4427991	59.2245054	C
0.0003888	1742.	4480716.	5.4184326	0.0021064	-0.001587	3.9995544	16.6392951	60.5505513	C
0.0003988	1784.	4472932.	5.3985443	0.0021527	-0.001635	3.9996474	16.8373331	61.8781393	C
0.0004088	1825.	4465328.	5.3797610	0.0021990	-0.001684	3.9996612	17.0369338	63.2072901	C
0.0004188	1867.	4457884.	5.3619716	0.0022453	-0.001733	3.9995998	17.2377089	64.5376152	C
0.0004288	1908.	4450581.	5.3450687	0.0022917	-0.001781	3.9994434	17.4391896	65.8686458	C
0.0004388	1950.	4443444.	5.3290518	0.0023381	-0.001830	3.9991508	17.6421393	67.2011456	C
0.0004488	1991.	4436469.	5.3138577	0.0023846	-0.001879	3.9986566	17.8465072	68.5350635	C
0.0004588	2032.	4429654.	5.2994284	0.0024311	-0.001927	3.9999761	18.0522369	69.8703431	C
0.0004688	2073.	4422988.	5.2857165	0.0024777	-0.001975	3.9998928	18.2593503	71.2070066	C
0.0004788	2114.	4416477.	5.2726688	0.0025243	-0.002024	3.9994823	18.4677457	72.5449519	C
0.0004888	2155.	4410099.	5.2601718	0.0025709	-0.002072	3.9986192	18.6763519	73.8831081	C
0.0004988	2196.	4403872.	5.2482556	0.0026176	-0.002121	3.9999891	18.8861241	75.2224303	C
0.0005088	2237.	4397783.	5.2368896	0.0026643	-0.002169	3.9995739	19.0971021	76.5629584	C
0.0005188	2278.	4391844.	5.2260311	0.0027110	-0.002217	3.9984031	19.3091221	77.9045284	C
0.0005288	2319.	4386045.	5.2156514	0.0027578	-0.002265	3.9999361	19.5221867	79.2471430	C
0.0005388	2360.	4379765.	5.2059827	0.0028047	-0.002313	3.9990932	19.7403388	80.0000000	CY
0.0005488	2399.	4372075.	5.1973916	0.0028521	-0.002361	3.9995706	19.9700318	80.0000000	CY
0.0006088	2603.	4276675.	5.1767839	0.0031514	-0.002632	3.9985344	21.7897412	80.0000000	CY
0.0006688	2761.	4128048.	5.1914029	0.0034718	-0.002881	3.9986567	24.2209135	80.0000000	CY
0.0007288	2874.	3943107.	5.2043725	0.0037927	-0.003130	3.9991986	26.6680993	80.0000000	CY
0.0007888	2950.	3739581.	5.2059386	0.0041062	-0.003387	3.9970399	28.8995766	80.0000000	CY

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
1	143.100	2604.454	0.00300000	-0.00273265
2	201.200	2500.129	0.00300000	-0.00249485

Note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	143.100000	2604.	93.015000	1693.	4465794.
2	0.65	201.200000	2500.	130.780000	1625.	4503542.
1	0.75	143.100000	2604.	107.325000	1953.	4425969.
2	0.75	201.200000	2500.	150.900000	1875.	4456411.
1	0.90	143.100000	2604.	128.790000	2344.	4373152.
2	0.90	201.200000	2500.	181.080000	2250.	4395932.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	= 5.000000	ft
Shaft Diameter	= 8.625000	in
Concrete Cover Thickness (to edge of long. rebar)	= 3.000000	in
Number of Reinforcing Bars	= 1	bar
Yield Stress of Reinforcing Bars	= 60000.	psi
Modulus of Elasticity of Reinforcing Bars	= 29000000.	psi
Gross Area of Shaft	= 58.426260	sq. in.
Total Area of Reinforcing Steel	= 2.250000	sq. in.
Area Ratio of Steel Reinforcement	= 3.85	percent
Edge-to-Edge Bar Spacing	= -1.69300	in
Maximum Concrete Aggregate Size	= 0.250000	in
Ratio of Bar Spacing to Aggregate Size	= -6.77	
Offset of Center of Rebar Cage from Center of Pile	= 0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	= 325.999	kips
Tensile Load for Cracking of Concrete	= -30.892	kips
Nominal Axial Tensile Capacity	= -135.000	kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.693000	2.250000	0.00000	0.00000

NOTE: The positions of the above rebars were computed by LPile

Concrete Properties:

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.34165 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.250000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	143.100
2	201.200

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 143.100 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
0.00000125	1.0552685	844215.	428.2579786	0.0005353	0.0005245	1.9480628	15.3977259	
0.00000250	2.1040410	841616.	216.2876300	0.0005407	0.0005192	1.9642600	15.4276016	
0.00000375	3.1527952	840745.	145.6319215	0.0005461	0.0005138	1.9804051	15.4575941	
0.00000500	4.2015220	840304.	110.3048729	0.0005515	0.0005084	1.9964980	15.4877035	
0.00000625	5.2502121	840034.	89.1092884	0.0005569	0.0005030	2.0125387	15.5179296	
0.00000750	6.2988562	839847.	74.9794359	0.0005623	0.0004977	2.0285268	15.5482727	
0.00000875	7.3474452	839708.	64.8871446	0.0005678	0.0004923	2.0444623	15.5787325	
0.00001000	8.3959698	839597.	57.3183291	0.0005732	0.0004869	2.0603450	15.6093092	
0.00001125	9.4444209	839504.	51.4318307	0.0005786	0.0004816	2.0761749	15.6400028	
0.00001250	10.4927891	839423.	46.7229544	0.0005840	0.0004762	2.0919516	15.6708132	
0.00001375	11.5410654	839350.	42.8705305	0.0005895	0.0004709	2.1076752	15.7017405	
0.00001500	12.5892404	839283.	39.6604459	0.0005949	0.0004655	2.1233454	15.7327846	
0.00001625	13.6373050	839219.	36.9444686	0.0006003	0.0004602	2.1389622	15.7639457	
0.00001750	14.6852499	839157.	34.6167183	0.0006058	0.0004549	2.1545253	15.7952236	
0.00001875	15.7330659	839097.	32.5995497	0.0006112	0.0004495	2.1700346	15.8266185	
0.00002000	16.7807437	839037.	30.8347288	0.0006167	0.0004442	2.1854900	15.8581302	
0.00002125	17.8282743	838978.	29.2777236	0.0006222	0.0004389	2.2008913	15.8897589	
0.00002250	18.8756482	838918.	27.8938982	0.0006276	0.0004336	2.2162384	15.9215046	
0.00002375	19.9228563	838857.	26.6559084	0.0006331	0.0004282	2.2315311	15.9533671	
0.00002500	20.9698894	838796.	25.5418789	0.0006385	0.0004229	2.2467693	15.9853467	
0.00002625	22.0167383	838733.	24.5341012	0.0006440	0.0004176	2.2619529	16.0174432	
0.00002750	23.0633936	838669.	23.6180863	0.0006495	0.0004123	2.2770816	16.0496567	
0.00002875	24.1098462	838603.	22.7818652	0.0006550	0.0004070	2.2921554	16.0819872	
0.00003000	25.1560867	838536.	22.0154638	0.0006605	0.0004017	2.3071741	16.1144348	
0.00003125	26.2021061	838467.	21.3105036	0.0006660	0.0003964	2.3221376	16.1469994	
0.00003250	27.2478950	838397.	20.6598953	0.0006714	0.0003911	2.3370457	16.1796811	
0.00003375	28.2934441	838324.	20.0575999	0.0006769	0.0003859	2.3518982	16.2124798	
0.00003500	29.3387443	838250.	19.4984409	0.0006824	0.0003806	2.3666950	16.2453957	
0.00003625	30.3837863	838173.	18.9779560	0.0006880	0.0003753	2.3814361	16.2784287	
0.00003750	31.4285607	838095.	18.4922779	0.0006935	0.0003700	2.3961211	16.3115788	
0.00003875	32.4730585	838014.	18.0380381	0.0006990	0.0003648	2.4107501	16.3448462	
0.00004000	33.5172703	837932.	17.6122893	0.0007045	0.0003595	2.4253227	16.3782307	
0.00004125	34.5611867	837847.	17.2124414	0.0007100	0.0003542	2.4398390	16.4117324	
0.00004250	35.6047987	837760.	16.8362092	0.0007155	0.0003490	2.4542987	16.4453513	
0.00004375	36.6480969	837671.	16.4815683	0.0007211	0.0003437	2.4687017	16.4790876	
0.00004500	37.6910720	837579.	16.1467196	0.0007266	0.0003385	2.4830478	16.5129411	
0.00004625	38.7337147	837486.	15.8300583	0.0007321	0.0003332	2.4973369	16.5469119	
0.00004750	39.7760159	837390.	15.5301486	0.0007377	0.0003280	2.5115689	16.5810001	
0.00004875	40.8179661	837292.	15.2457019	0.0007432	0.0003228	2.5257436	16.6152057	
0.00005125	42.9007766	837088.	14.7186718	0.0007543	0.0003123	2.5539205	16.6839691	
0.00005375	44.9820719	836876.	14.2409692	0.0007655	0.0003019	2.5818664	16.7532023	
0.00005625	47.0617777	836654.	13.8060173	0.0007766	0.0002914	2.6095802	16.8229057	
0.00005875	49.1398193	836422.	13.4083586	0.0007877	0.0002810	2.6370607	16.8930794	
0.00006125	51.2161223	836182.	13.0434268	0.0007989	0.0002706	2.6643066	16.9637238	
0.00006375	53.2906121	835931.	12.7073719	0.0008101	0.0002603	2.6913169	17.0348392	

0.00006625	55.3632138	835671.	12.3969250	0.0008213	0.0002499	2.7180903	17.1064258
0.00006875	57.4338527	835401.	12.1092925	0.0008325	0.0002395	2.7446256	17.1784841
0.00007125	59.5024540	835122.	11.8420731	0.0008437	0.0002292	2.7709217	17.2510142
0.00007375	61.5689426	834833.	11.5931911	0.0008550	0.0002189	2.7969773	17.3240166
0.00007625	63.6332434	834534.	11.3608430	0.0008663	0.0002086	2.8227913	17.3974917
0.00007875	65.6952814	834226.	11.1434543	0.0008775	0.0001983	2.8483624	17.4714397
0.00008125	67.7549812	833907.	10.9396442	0.0008888	0.0001881	2.8736895	17.5458610
0.00008375	69.8122674	833579.	10.7481969	0.0009002	0.0001778	2.8987713	17.6207562
0.00008625	71.8670647	833241.	10.5680376	0.0009115	0.0001676	2.9236066	17.6961255
0.00008875	73.9192974	832893.	10.3982126	0.0009228	0.0001574	2.9481943	17.7719694
0.00009125	75.9688898	832536.	10.2378725	0.0009342	0.0001472	2.9725332	17.8482883
0.00009375	78.0157662	832168.	10.0862588	0.0009456	0.0001370	2.9966219	17.9250827
0.00009625	80.0598505	831791.	9.9426916	0.0009570	0.0001268	3.0204594	18.0023530
0.00009875	82.1010667	831403.	9.8065600	0.0009684	0.0001167	3.0440443	18.0800997
0.0001013	84.1393387	831006.	9.6773133	0.0009798	0.0001065	3.0673756	18.1583233
0.0001038	86.1745901	830598.	9.5544541	0.0009913	0.00009643	3.0904518	18.2370243
0.0001063	88.2067445	830181.	9.4375316	0.0010027	0.00008633	3.1132720	18.3162032
0.0001088	90.2357252	829754.	9.3261366	0.0010142	0.00007625	3.1358347	18.3958605
0.0001113	92.2614556	829316.	9.2198965	0.0010257	0.00006618	3.1581387	18.4759968
0.0001138	94.2838588	828869.	9.1184716	0.0010372	0.00005613	3.1801829	18.5566126
0.0001163	96.3028577	828412.	9.0215516	0.0010488	0.00004610	3.2019661	18.6377085
0.0001188	98.3183752	827944.	8.9288519	0.0010603	0.00003608	3.2234868	18.7192850
0.0001213	100.3303339	827467.	8.8401118	0.0010719	0.00002608	3.2447441	18.8013428
0.0001238	102.3386563	826979.	8.7550915	0.0010834	0.00001610	3.2657365	18.8838825
0.0001263	104.3432648	826481.	8.6735700	0.0010950	0.00000613	3.2864628	18.9669047
0.0001288	106.3440815	825973.	8.5953438	0.0011067	-0.00000382	3.3069218	19.0504100
0.0001313	108.3409712	825455.	8.5202243	0.0011183	-0.00001375	3.3271121	19.1343973
0.0001338	110.3336852	824925.	8.4480361	0.0011299	-0.00002367	3.3470322	19.2188617
0.0001363	112.3219047	824381.	8.3786159	0.0011416	-0.00003357	3.3666803	19.3037962
0.0001388	114.3052801	823822.	8.3118120	0.0011533	-0.00004345	3.3860548	19.3891922
0.0001413	116.2834496	823246.	8.2474833	0.0011650	-0.00005332	3.4051537	19.4750407
0.0001438	118.2560839	822651.	8.1854987	0.0011767	-0.00006318	3.4239756	19.5613334
0.0001463	120.2228343	822036.	8.1257359	0.0011884	-0.00007302	3.4425186	19.6480614
0.0001488	122.1833401	821401.	8.0680805	0.0012001	-0.00008284	3.4607811	19.7352147
0.0001588	127.9830077	806192.	7.8414955	0.0012448	-0.000124	3.5275275	20.0188111 C
0.0001688	134.0959281	794643.	7.6453036	0.0012901	-0.000165	3.5906761	20.3197245 C
0.0001788	139.7086070	781587.	7.4688718	0.0013351	-0.000207	3.6488044	20.6092780 C
0.0001888	144.8651147	767497.	7.3091610	0.0013796	-0.000248	3.7020523	20.8880276 C
0.0001988	149.6182580	752796.	7.1638625	0.0014238	-0.000290	3.7505759	21.1572134 C
0.0002088	154.0231375	737835.	7.0311968	0.0014678	-0.000333	3.7945310	21.4186015 C
0.0002188	158.0726811	722618.	6.9092064	0.0015114	-0.000375	3.8339542	21.6707660 C
0.0002288	161.8379693	707488.	6.7969594	0.0015548	-0.000418	3.8690203	21.9168121 C
0.0002388	165.3376840	692514.	6.6932919	0.0015980	-0.000461	3.8998001	22.1571537 C
0.0002488	168.5869764	677737.	6.5972072	0.0016411	-0.000504	3.9263559	22.3920734 C
0.0002588	171.6005180	663190.	6.5078666	0.0016839	-0.000548	3.9487463	22.6218677 C
0.0002688	174.4080844	648960.	6.4247132	0.0017266	-0.000591	3.9670424	22.8480661 C
0.0002788	177.0132274	635025.	6.3470491	0.0017692	-0.000635	3.9812767	23.0704095 C
0.0002888	179.4340474	621417.	6.2744123	0.0018117	-0.000679	3.9914934	23.2898052 C
0.0002988	181.6876956	608160.	6.2064151	0.0018542	-0.000723	3.9977247	23.5072677 C
0.0003088	183.7892422	595269.	6.1427220	0.0018966	-0.000766	3.9999897	23.7238298 C

0.0003188	185.7419644	582720.	6.0830436	0.0019390	-0.000810	3.9997111	23.9405610	C
0.0003288	187.5135279	570383.	6.0266944	0.0019813	-0.000854	3.9999798	24.1544177	C
0.0003388	189.1580885	558400.	5.9739022	0.0020237	-0.000898	3.9993894	24.3705364	C
0.0003488	190.6647699	546709.	5.9241837	0.0020661	-0.000942	3.9997218	24.5871209	C
0.0003588	192.0393371	535301.	5.8772221	0.0021085	-0.000986	3.9998902	24.8035510	C
0.0003688	193.3128539	524238.	5.8330580	0.0021509	-0.001030	3.9999639	25.0226596	C
0.0003788	194.4630385	513434.	5.7911269	0.0021934	-0.001073	3.9999883	25.2406796	C
0.0003888	195.5292964	502969.	5.7516222	0.0022359	-0.001117	3.9999936	25.4617338	C
0.0003988	196.4972363	492783.	5.7141073	0.0022785	-0.001161	3.9999879	25.6828848	C
0.0004088	197.3815272	482891.	5.6785327	0.0023211	-0.001204	3.9999615	25.9052777	C
0.0004188	198.2056783	473327.	5.6449625	0.0023638	-0.001248	3.9998870	26.1313774	C
0.0004288	198.9317587	463981.	5.6127201	0.0024065	-0.001292	3.9997114	26.3545164	C
0.0004388	199.6131738	454959.	5.5822959	0.0024492	-0.001335	3.9993742	26.5820803	C
0.0004488	200.2361802	446209.	5.5533314	0.0024921	-0.001378	3.9987875	26.8110117	C
0.0004588	200.7866129	437682.	5.5255196	0.0025348	-0.001422	3.9999792	27.0384708	C
0.0004688	201.2985579	429437.	5.4991965	0.0025777	-0.001465	3.9997107	27.2700362	C
0.0004788	201.7730006	421458.	5.4741750	0.0026208	-0.001508	3.9990273	27.5044043	C
0.0004888	202.1788968	413665.	5.4499108	0.0026636	-0.001552	3.9999930	27.7349935	C
0.0004988	202.5513478	406118.	5.4268841	0.0027067	-0.001595	3.9996174	27.9694092	C
0.0005088	202.8984884	398818.	5.4049755	0.0027498	-0.001638	3.9985411	28.2069655	C
0.0005188	203.2064719	391723.	5.3839708	0.0027929	-0.001681	3.9998749	28.4454133	C
0.0005288	203.4652748	384804.	5.3636167	0.0028360	-0.001724	3.9989363	28.6816537	C
0.0005388	203.7026762	378102.	5.3442005	0.0028792	-0.001768	3.9999578	28.9207426	C
0.0005488	203.9154305	371600.	5.3256926	0.0029225	-0.001810	3.9990730	29.1630236	C
0.0006088	204.6671216	336209.	5.2284973	0.0031828	-0.002068	3.9979891	30.6358303	C
0.0006688	204.7273460	306134.	5.1506465	0.0034445	-0.002323	3.9991207	32.1455602	C
0.0007288	204.7273460	280929.	5.0873163	0.0037074	-0.002578	3.9987681	33.6912433	C
0.0007888	204.7273460	259559.	5.0577672	0.0039893	-0.002814	3.9982109	35.7892378	C

Axial Thrust Force = 201.200 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
0.00000125	0.8571550	685724.	639.6456584	0.0007996	0.0007888	2.6722224	23.0605293	
0.00000250	1.7044643	681786.	321.9818619	0.0008050	0.0007834	2.6852478	23.0904334	
0.00000375	2.5517522	680467.	216.0951805	0.0008104	0.0007780	2.6982203	23.1204735	
0.00000500	3.3990082	679802.	163.1527779	0.0008158	0.0007726	2.7111398	23.1506497	
0.00000625	4.2462214	679395.	131.3880868	0.0008212	0.0007673	2.7240061	23.1809619	
0.00000750	5.0933812	679117.	110.2122516	0.0008266	0.0007619	2.7368190	23.2114101	
0.00000875	5.9404768	678912.	95.0871911	0.0008320	0.0007565	2.7495784	23.2419943	
0.00001000	6.7874974	678750.	83.7438649	0.0008374	0.0007512	2.7622840	23.2727146	
0.00001125	7.6344324	678616.	74.9216948	0.0008429	0.0007458	2.7749359	23.3035709	
0.00001250	8.4812710	678502.	67.8643342	0.0008483	0.0007405	2.7875336	23.3345634	
0.00001375	9.3280024	678400.	62.0904713	0.0008537	0.0007352	2.8000772	23.3656919	
0.00001500	10.1746160	678308.	57.2792317	0.0008592	0.0007298	2.8125664	23.3969565	
0.00001625	11.0211010	678222.	53.2084716	0.0008646	0.0007245	2.8250011	23.4283571	
0.00001750	11.8674467	678140.	49.7195169	0.0008701	0.0007192	2.8373810	23.4598940	

0.00001875	12.7136423	678061.	46.6960066	0.0008756	0.0007138	2.8497060	23.4915669
0.00002000	13.5596770	677984.	44.0506698	0.0008810	0.0007085	2.8619760	23.5233760
0.00002125	14.4055402	677908.	41.7167700	0.0008865	0.0007032	2.8741908	23.5553213
0.00002250	15.2512210	677832.	39.6424012	0.0008920	0.0006979	2.8863501	23.5874028
0.00002375	16.0967087	677756.	37.7865847	0.0008974	0.0006926	2.8984539	23.6196204
0.00002500	16.9419927	677680.	36.1165378	0.0009029	0.0006873	2.9105020	23.6519744
0.00002625	17.7870620	677602.	34.6057220	0.0009084	0.0006820	2.9224941	23.6844645
0.00002750	18.6319064	677524.	33.2324240	0.0009139	0.0006767	2.9344301	23.7170903
0.00002875	19.4765142	677444.	31.9787066	0.0009194	0.0006714	2.9463099	23.7498531
0.00003000	20.3208752	677363.	30.8296224	0.0009249	0.0006661	2.9581333	23.7827522
0.00003125	21.1649785	677279.	29.7726155	0.0009304	0.0006609	2.9699002	23.8157877
0.00003250	22.0088134	677194.	28.7970614	0.0009359	0.0006556	2.9816102	23.8489595
0.00003375	22.8523691	677107.	27.8939100	0.0009414	0.0006503	2.9932633	23.8822678
0.00003500	23.6956348	677018.	27.0554039	0.0009469	0.0006451	3.0048593	23.9157126
0.00003625	24.5385997	676927.	26.2748556	0.0009525	0.0006398	3.0163981	23.9492938
0.00003750	25.3812530	676833.	25.5464694	0.0009580	0.0006346	3.0278794	23.9830116
0.00003875	26.2235839	676738.	24.8651974	0.0009635	0.0006293	3.0393031	24.0168659
0.00004000	27.0655817	676640.	24.2266226	0.0009691	0.0006241	3.0506690	24.0508568
0.00004125	27.9072355	676539.	23.6268635	0.0009746	0.0006188	3.0619769	24.0849843
0.00004250	28.7485345	676436.	23.0624953	0.0009802	0.0006136	3.0732267	24.1192485
0.00004375	29.5894679	676331.	22.5304844	0.0009857	0.0006084	3.0844182	24.1536494
0.00004500	30.4300249	676223.	22.0281345	0.0009913	0.0006031	3.0955513	24.1881871
0.00004625	31.2701946	676112.	21.5530407	0.0009968	0.0005979	3.1066257	24.2228615
0.00004750	32.1099662	675999.	21.1030511	0.0010024	0.0005927	3.1176412	24.2576728
0.00004875	32.9493289	675884.	20.6762347	0.0010080	0.0005875	3.1285978	24.2926210
0.00005125	34.6267842	675645.	19.8853393	0.0010191	0.0005771	3.1503333	24.3629282
0.00005375	36.3024735	675395.	19.1683672	0.0010303	0.0005667	3.1718308	24.4337834
0.00005625	37.9763099	675134.	18.5154621	0.0010415	0.0005563	3.1930888	24.5051872
0.00005875	39.6482064	674863.	17.9184457	0.0010527	0.0005460	3.2141060	24.5771400
0.00006125	41.3180759	674581.	17.3704746	0.0010639	0.0005357	3.2348811	24.6496420
0.00006375	42.9858309	674288.	16.8657790	0.0010752	0.0005253	3.2554125	24.7226940
0.00006625	44.6513842	673983.	16.3994601	0.0010865	0.0005151	3.2756990	24.7962962
0.00006875	46.3146482	673668.	15.9673316	0.0010978	0.0005048	3.2957391	24.8704493
0.00007125	47.9755352	673341.	15.5657947	0.0011091	0.0004945	3.3155313	24.9451538
0.00007375	49.6339574	673003.	15.1917388	0.0011204	0.0004843	3.3350745	25.0204101
0.00007625	51.2898268	672653.	14.8424609	0.0011317	0.0004741	3.3543670	25.0962189
0.00007875	52.9430553	672293.	14.5156015	0.0011431	0.0004639	3.3734075	25.1725807
0.00008125	54.5935546	671921.	14.2090916	0.0011545	0.0004537	3.3921946	25.2494963
0.00008375	56.2412363	671537.	13.9211090	0.0011659	0.0004435	3.4107268	25.3269660
0.00008625	57.8860118	671142.	13.6500428	0.0011773	0.0004334	3.4290028	25.4049908
0.00008875	59.5277923	670736.	13.3944639	0.0011888	0.0004233	3.4470211	25.4835711
0.00009125	61.1664887	670318.	13.1530995	0.0012002	0.0004132	3.4647803	25.5627077
0.00009375	62.8020121	669888.	12.9248128	0.0012117	0.0004031	3.4822790	25.6424014
0.00009625	64.4342729	669447.	12.7085850	0.0012232	0.0003930	3.4995157	25.7226527
0.00009875	66.0631818	668994.	12.5035004	0.0012347	0.0003830	3.5164890	25.8034626
0.00010113	67.6886488	668530.	12.3087339	0.0012463	0.0003730	3.5331974	25.8848317
0.00010338	69.3105841	668054.	12.1235399	0.0012578	0.0003630	3.5496395	25.9667609
0.00010563	70.9288974	667566.	11.9472429	0.0012694	0.0003530	3.5658139	26.0492510
0.00010888	72.5434984	667067.	11.7792297	0.0012810	0.0003430	3.5817190	26.1323028
0.00011113	74.1542965	666555.	11.6189420	0.0012926	0.0003331	3.5973535	26.2159172

0.0001138	75.7612007	666033.	11.4658707	0.0013042	0.0003231	3.6127158	26.3000951
0.0001163	77.3641200	665498.	11.3195505	0.0013159	0.0003132	3.6278045	26.3848373
0.0001188	78.9629630	664951.	11.1795554	0.0013276	0.0003034	3.6426182	26.4701449
0.0001213	80.5576380	664393.	11.0454943	0.0013393	0.0002935	3.6571552	26.5560188
0.0001238	82.1480533	663823.	10.9170079	0.0013510	0.0002836	3.6714142	26.6424599
0.0001263	83.7341167	663241.	10.7937652	0.0013627	0.0002738	3.6853937	26.7294693
0.0001288	85.3157357	662646.	10.6754612	0.0013745	0.0002640	3.6990921	26.8170479
0.0001313	86.8928178	662041.	10.5618138	0.0013862	0.0002542	3.7125080	26.9051969
0.0001338	88.4652698	661423.	10.4525622	0.0013980	0.0002444	3.7256399	26.9939173
0.0001363	90.0329985	660793.	10.3474647	0.0014098	0.0002347	3.7384862	27.0832102
0.0001388	91.5959103	660151.	10.2462971	0.0014217	0.0002250	3.7510454	27.1730766
0.0001413	93.1539114	659497.	10.1488510	0.0014335	0.0002152	3.7633160	27.2635179
0.0001438	94.7069076	658831.	10.0549324	0.0014454	0.0002056	3.7752965	27.3545351
0.0001463	96.2548042	658153.	9.9643608	0.0014573	0.0001959	3.7869853	27.4461294
0.0001488	97.7975065	657462.	9.8769677	0.0014692	0.0001862	3.7983810	27.5383021
0.0001588	103.9144634	654579.	9.5561825	0.0015170	0.0001478	3.8410004	27.9128014
0.0001688	109.9406315	651500.	9.2753285	0.0015652	0.0001097	3.8788034	28.2966587
0.0001788	115.8697650	648222.	9.0277214	0.0016137	0.00007199	3.9116883	28.6899646
0.0001888	121.6955135	644744.	8.8080949	0.0016625	0.00003456	3.9395510	29.0928170
0.0001988	127.4114128	641064.	8.6122438	0.0017117	-0.00000254	3.9622857	29.5053214
0.0002088	133.0099221	637173.	8.4367634	0.0017612	-0.00003929	3.9797837	29.9275514
0.0002188	138.4788609	633046.	8.2788420	0.0018110	-0.00007572	3.9919333	30.3593926
0.0002288	143.8040278	628651.	8.1361444	0.0018611	-0.000112	3.9986234	30.8006303
0.0002388	147.3907160	617343.	7.9962674	0.0019091	-0.000150	3.9999271	31.1786331 C
0.0002488	151.4589833	608880.	7.8727241	0.0019583	-0.000187	3.9999897	31.5933336 C
0.0002588	155.1527583	599624.	7.7585425	0.0020075	-0.000224	3.9999975	32.0066273 C
0.0002688	158.5099197	589804.	7.6527857	0.0020567	-0.000261	3.9999868	32.4193563 C
0.0002788	161.5530007	579562.	7.5545050	0.0021058	-0.000298	3.9999119	32.8311813 C
0.0002888	164.3079861	569032.	7.4628860	0.0021549	-0.000336	3.9996451	33.2417833 C
0.0002988	166.7999534	558326.	7.3772429	0.0022040	-0.000373	3.9999781	33.6510273 C
0.0003088	169.0530679	547540.	7.2969981	0.0022529	-0.000410	3.9995746	34.0589265 C
0.0003188	171.0933333	536763.	7.2216485	0.0023019	-0.000447	3.9998761	34.4655391 C
0.0003288	172.9459668	526071.	7.1507657	0.0023508	-0.000485	3.9999877	34.8710326 C
0.0003388	174.6315717	515518.	7.0840054	0.0023997	-0.000522	3.9993306	35.2759127 C
0.0003488	176.1715705	505151.	7.0210687	0.0024486	-0.000559	3.9993401	35.6807420 C
0.0003588	177.5537793	494923.	6.9613823	0.0024974	-0.000597	3.9993954	36.0828833 C
0.0003688	178.8089821	484906.	6.9048230	0.0025462	-0.000634	3.9993569	36.4838467 C
0.0003788	179.9706427	475170.	6.8513498	0.0025949	-0.000672	3.9992204	36.8859027 C
0.0003888	180.9985029	465591.	6.8002674	0.0026436	-0.000709	3.9990860	37.2838976 C
0.0003988	181.9487510	456298.	6.7518234	0.0026923	-0.000747	3.9999946	37.6827750 C
0.0004088	182.8039074	447227.	6.7056182	0.0027409	-0.000785	3.9999071	38.0800927 C
0.0004188	183.5808448	438402.	6.6615348	0.0027895	-0.000822	3.9996461	38.4763770 C
0.0004288	184.2870612	429824.	6.6194330	0.0028381	-0.000860	3.9991091	38.8717337 C
0.0004388	184.9279370	421488.	6.5791720	0.0028866	-0.000898	3.9999931	39.2660921 C
0.0004488	185.4980279	413366.	6.5405927	0.0029351	-0.000935	3.9997278	39.6589776 C
0.0004588	186.0309739	405517.	6.5037736	0.0029836	-0.000973	3.9989659	40.0529179 C
0.0004688	186.4845075	397834.	6.4681841	0.0030320	-0.001011	3.9999517	40.4422111 C
0.0004788	186.9174088	390428.	6.4343194	0.0030804	-0.001049	3.9993546	40.8348084 C
0.0004888	187.2852348	383192.	6.4015019	0.0031287	-0.001087	3.9999986	41.2226079 C
0.0004988	187.6143348	376169.	6.3700427	0.0031771	-0.001125	3.9994930	41.6110198 C

0.0005088	187.9334403	369402.	6.3399706	0.0032255	-0.001163	3.9997308	42.0016499 C
0.0005188	188.1720630	362741.	6.3106085	0.0032736	-0.001201	3.9994548	42.3855187 C
0.0005288	188.4018983	356316.	6.2824676	0.0033219	-0.001239	3.9999990	42.7710839 C
0.0005388	188.6154926	350098.	6.2555569	0.0033702	-0.001277	3.9992240	43.1595470 C
0.0005488	188.7697876	344000.	6.2291708	0.0034183	-0.001315	3.9999564	43.5407510 C
0.0006088	189.2931003	310954.	6.0892254	0.0037068	-0.001544	3.9978853	45.8309101 C
0.0006688	189.2931003	283055.	6.0103134	0.0040194	-0.001749	3.9989975	48.8177235 C

Summary of Results for Nominal Moment Capacity for Section 2

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
1	143.100	204.139	0.00300000	-0.00188705
2	201.200	186.185	0.00300000	-0.00098596

Note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318,
or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	143.100000	204.139246	93.015000	132.690510	797298.
2	0.65	201.200000	186.184735	130.780000	121.020078	645148.
1	0.75	143.100000	204.139246	107.325000	153.104435	740956.
2	0.75	201.200000	186.184735	150.900000	139.638552	632089.
1	0.90	143.100000	204.139246	128.790000	183.725322	595661.
2	0.90	201.200000	186.184735	181.080000	167.566262	554658.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	229955.
2	14.0000	14.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.240000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 201200.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2400	-669605.	15388.	0.00	0.00	4.82E+09	0.00	0.00	0.00
0.1900	0.2396	-634476.	15365.	-3.08E-04	0.00	4.82E+09	-9.402	89.4492	0.00
0.3800	0.2386	-599259.	15330.	-5.99E-04	0.00	4.86E+09	-20.791	198.6787	0.00
0.5700	0.2369	-564021.	15268.	-8.71E-04	0.00	4.88E+09	-33.412	321.5539	0.00
0.7600	0.2346	-528835.	15177.	-0.00113	0.00	4.90E+09	-46.483	451.7098	0.00
0.9500	0.2318	-493779.	15057.	-0.00136	0.00	4.92E+09	-59.521	585.5222	0.00
1.1400	0.2284	-458927.	14907.	-0.00158	0.00	4.94E+09	-71.742	716.1525	0.00
1.3300	0.2245	-424350.	14730.	-0.00179	0.00	4.96E+09	-83.668	849.5318	0.00
1.5200	0.2203	-390119.	14527.	-0.00197	0.00	4.96E+09	-94.465	977.8770	0.00
1.7100	0.2155	-356297.	14300.	-0.00215	0.00	4.96E+09	-104.146	1102.	0.00
1.9000	0.2105	-322941.	14054.	-0.00230	0.00	4.96E+09	-112.159	1215.	0.00
2.0900	0.2051	-290100.	13790.	-0.00244	0.00	4.97E+09	-119.513	1329.	0.00
2.2800	0.1993	-257820.	13510.	-0.00257	0.00	4.97E+09	-125.929	1440.	0.00

2.4700	0.1933	-226140.	13215.	-0.00268	0.00	4.97E+09	-132.657	1564.	0.00
2.6600	0.1871	-195101.	12904.	-0.00278	0.00	4.97E+09	-140.345	1710.	0.00
2.8500	0.1807	-164751.	12577.	-0.00286	0.00	4.97E+09	-146.255	1846.	0.00
3.0400	0.1741	-135127.	12239.	-0.00293	0.00	4.97E+09	-150.088	1966.	0.00
3.2300	0.1673	-106255.	11891.	-0.00298	0.00	4.97E+09	-154.951	2111.	0.00
3.4200	0.1605	-78165.	11526.	-0.00303	0.00	4.97E+09	-165.463	2351.	0.00
3.6100	0.1535	-50920.	11138.	-0.00305	0.00	4.97E+09	-175.399	2605.	0.00
3.8000	0.1465	-24575.	10727.	-0.00307	0.00	4.97E+09	-184.579	2872.	0.00
3.9900	0.1395	815.1347	10296.	-0.00308	0.00	4.97E+09	-193.384	3160.	0.00
4.1800	0.1325	25200.	9843.	-0.00307	0.00	4.97E+09	-204.105	3512.	0.00
4.3700	0.1255	48518.	9366.	-0.00305	0.00	4.97E+09	-214.325	3893.	0.00
4.5600	0.1186	70713.	8867.	-0.00303	0.00	4.97E+09	-223.965	4306.	0.00
4.7500	0.1117	91728.	8346.	-0.00299	0.00	4.97E+09	-232.947	4754.	0.00
4.9400	0.1049	111512.	7805.	-0.00294	0.00	4.97E+09	-241.199	5240.	0.00
5.1300	0.09829	130020.	7247.	-0.00289	0.00	4.97E+09	-248.650	5768.	0.00
5.3200	0.09177	147207.	6672.	-0.00282	0.00	4.97E+09	-255.235	6341.	0.00
5.5100	0.08541	163037.	6084.	-0.00275	0.00	4.97E+09	-260.893	6964.	0.00
5.7000	0.07922	177476.	5484.	-0.00268	0.00	4.97E+09	-265.567	7643.	0.00
5.8900	0.07321	190497.	4874.	-0.00259	0.00	4.97E+09	-269.208	8384.	0.00
6.0800	0.06741	202078.	4257.	-0.00250	0.00	4.97E+09	-271.768	9193.	0.00
6.2700	0.06181	212204.	3636.	-0.00241	0.00	4.97E+09	-273.208	10078.	0.00
6.4600	0.05644	220866.	3013.	-0.00231	0.00	4.97E+09	-273.492	11049.	0.00
6.6500	0.05130	228059.	2390.	-0.00220	0.00	4.97E+09	-272.592	12116.	0.00
6.8400	0.04639	233787.	1771.	-0.00210	0.00	4.97E+09	-270.484	13293.	0.00
7.0300	0.04173	238059.	1158.	-0.00199	0.00	4.97E+09	-267.149	14595.	0.00
7.2200	0.03732	240893.	554.4405	-0.00188	0.00	4.97E+09	-262.574	16039.	0.00
7.4100	0.03317	242311.	-37.588	-0.00177	0.00	4.97E+09	-256.750	17649.	0.00
7.6000	0.02926	242343.	-614.910	-0.00166	0.00	4.97E+09	-249.672	19452.	0.00
7.7900	0.02562	241027.	-1175.	-0.00155	0.00	4.97E+09	-241.339	21481.	0.00
7.9800	0.02222	238405.	-1714.	-0.00144	0.00	4.97E+09	-231.747	23782.	0.00
8.1700	0.01907	234528.	-2230.	-0.00133	0.00	4.97E+09	-220.894	26409.	0.00
8.3600	0.01617	229453.	-2713.	-0.00122	0.00	4.97E+09	-202.753	28591.	0.00
8.5500	0.01351	223276.	-3142.	-0.00112	0.00	4.97E+09	-173.224	29241.	0.00
8.7400	0.01108	216152.	-3505.	-0.00102	0.00	4.97E+09	-145.241	29891.	0.00
8.9300	0.00888	208227.	-3806.	-9.18E-04	0.00	4.97E+09	-118.906	30541.	0.00
9.1200	0.00689	199640.	-4049.	-8.24E-04	0.00	4.97E+09	-94.298	31190.	0.00
9.3100	0.00512	190520.	-4238.	-7.35E-04	0.00	4.97E+09	-71.478	31840.	0.00
9.5000	0.00354	180989.	-4377.	-6.49E-04	0.00	4.97E+09	-50.488	32490.	0.00
9.6900	0.00216	171158.	-4470.	-5.69E-04	0.00	4.97E+09	-31.355	33140.	0.00
9.8800	9.51E-04	161127.	-4522.	-4.92E-04	0.00	4.97E+09	-14.087	33790.	0.00
10.0700	-8.75E-05	150989.	-4536.	-4.21E-04	0.00	4.97E+09	1.3211	34439.	0.00
10.2600	-9.67E-04	140827.	-4518.	-3.54E-04	0.00	4.97E+09	14.8880	35089.	0.00
10.4500	-0.00170	130712.	-4471.	-2.91E-04	0.00	4.97E+09	26.6456	35739.	0.00
10.6400	-0.00230	120708.	-4399.	-2.34E-04	0.00	4.97E+09	36.6369	36389.	0.00
10.8300	-0.00276	110869.	-4306.	-1.80E-04	0.00	4.97E+09	44.9151	37039.	0.00
11.0200	-0.00312	101240.	-4196.	-1.32E-04	0.00	4.97E+09	51.5422	37688.	0.00
11.2100	-0.00337	91858.	-4072.	-8.74E-05	0.00	4.97E+09	56.5887	38338.	0.00
11.4000	-0.00352	82750.	-3939.	-4.73E-05	0.00	4.97E+09	60.1318	38988.	0.00
11.5900	-0.00358	73938.	-3800.	-1.13E-05	0.00	4.97E+09	62.2551	39638.	0.00
11.7800	-0.00357	65434.	-3657.	2.07E-05	0.00	4.97E+09	63.0475	40288.	0.00

11.9700	-0.00349	57244.	-3514.	4.88E-05	0.00	4.97E+09	62.6028	40937.	0.00
12.1600	-0.00335	49367.	-3373.	7.33E-05	0.00	4.97E+09	61.0187	41587.	0.00
12.3500	-0.00315	41797.	-3237.	9.42E-05	0.00	4.97E+09	58.3968	42237.	0.00
12.5400	-0.00292	34522.	-3107.	1.12E-04	0.00	4.97E+09	54.8419	42887.	0.00
12.7300	-0.00264	27524.	-2987.	1.26E-04	0.00	4.97E+09	50.4621	43537.	0.00
12.9200	-0.00234	20784.	-2878.	1.37E-04	0.00	4.97E+09	45.3684	44186.	0.00
13.1100	-0.00202	14274.	-2781.	1.45E-04	0.00	4.97E+09	39.6749	44836.	0.00
13.3000	-0.00168	7968.	-2698.	1.50E-04	0.00	4.97E+09	33.4991	45486.	0.00
13.4900	-0.00133	1834.	-2629.	1.52E-04	0.00	4.97E+09	26.9617	46136.	0.00
13.6800	-9.84E-04	-4160.	-2575.	1.52E-04	0.00	4.97E+09	20.1873	46786.	0.00
13.8700	-6.39E-04	-10048.	-2537.	1.49E-04	0.00	4.97E+09	13.3047	47435.	0.00
14.0600	-3.06E-04	-15865.	-779.215	1.20E-04	0.00	6.78E+08	1529.	1.14E+07	0.00
14.2500	-9.36E-05	-13711.	1497.	7.00E-05	0.00	6.78E+08	468.0960	1.14E+07	0.00
14.4400	1.33E-05	-9103.	1955.	3.16E-05	0.00	6.78E+08	-66.739	1.14E+07	0.00
14.6300	5.06E-05	-4827.	1590.	8.22E-06	0.00	6.79E+08	-252.830	1.14E+07	0.00
14.8200	5.08E-05	-1859.	1012.	-2.99E-06	0.00	6.81E+08	-254.187	1.14E+07	0.00
15.0100	3.69E-05	-208.722	511.9629	-6.45E-06	0.00	6.86E+08	-184.649	1.14E+07	0.00
15.2000	2.14E-05	481.7305	179.2559	-5.99E-06	0.00	6.86E+08	-107.199	1.14E+07	0.00
15.3900	9.60E-06	614.1837	2.3186	-4.17E-06	0.00	6.86E+08	-48.009	1.14E+07	0.00
15.5800	2.42E-06	496.1301	-66.205	-2.33E-06	0.00	6.86E+08	-12.099	1.14E+07	0.00
15.7700	-1.00E-06	314.4233	-74.292	-9.78E-07	0.00	6.86E+08	5.0051	1.14E+07	0.00
15.9600	-2.04E-06	158.2557	-56.968	-1.92E-07	0.00	6.86E+08	10.1914	1.14E+07	0.00
16.1500	-1.88E-06	54.8256	-34.658	1.62E-07	0.00	6.86E+08	9.3790	1.14E+07	0.00
16.3400	-1.30E-06	0.06790	-16.569	2.54E-07	0.00	6.86E+08	6.4886	1.14E+07	0.00
16.5300	-7.19E-07	-20.960	-5.073	2.19E-07	0.00	6.86E+08	3.5955	1.14E+07	0.00
16.7200	-2.99E-07	-23.264	0.7327	1.45E-07	0.00	6.86E+08	1.4969	1.14E+07	0.00
16.9100	-5.60E-08	-17.752	2.7587	7.72E-08	0.00	6.86E+08	0.2802	1.14E+07	0.00
17.1000	5.27E-08	-10.756	2.7774	2.98E-08	0.00	6.86E+08	-0.264	1.14E+07	0.00
17.2900	8.00E-08	-5.114	2.0209	3.45E-09	0.00	6.86E+08	-0.400	1.14E+07	0.00
17.4800	6.85E-08	-1.543	1.1748	-7.62E-09	0.00	6.86E+08	-0.342	1.14E+07	0.00
17.6700	4.52E-08	0.2503	0.5269	-9.77E-09	0.00	6.86E+08	-0.226	1.14E+07	0.00
17.8600	2.39E-08	0.8681	0.1329	-7.91E-09	0.00	6.86E+08	-0.119	1.14E+07	0.00
18.0500	9.14E-09	0.8636	-0.05541	-5.03E-09	0.00	6.86E+08	-0.04572	1.14E+07	0.00
18.2400	9.41E-10	0.6201	-0.113	-2.57E-09	0.00	6.86E+08	-0.00470	1.14E+07	0.00
18.4300	-2.56E-09	0.3512	-0.104	-9.52E-10	0.00	6.86E+08	0.01281	1.14E+07	0.00
18.6200	-3.40E-09	0.1483	-0.06965	-1.22E-10	0.00	6.86E+08	0.01701	1.14E+07	0.00
18.8100	-3.12E-09	0.03364	-0.03248	1.80E-10	0.00	6.86E+08	0.01559	1.14E+07	0.00
19.0000	-2.58E-09	0.00	0.00	2.36E-10	0.00	6.86E+08	0.01290	5700000.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.24000000 inches

Computed slope at pile head = 0.000000 radians
Maximum bending moment = -669605. inch-lbs
Maximum shear force = 15388. lbs
Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 7
Number of zero deflection points = 5

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.240000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 143100.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2400	-667437.	15503.	0.00	0.00	4.75E+09	0.00	0.00	0.00
0.1900	0.2396	-632064.	15481.	-3.12E-04	0.00	4.75E+09	-9.401	89.4502	0.00
0.3800	0.2386	-596641.	15446.	-6.06E-04	0.00	4.79E+09	-20.790	198.6872	0.00
0.5700	0.2369	-561234.	15385.	-8.81E-04	0.00	4.81E+09	-33.410	321.5832	0.00
0.7600	0.2346	-525913.	15294.	-0.00114	0.00	4.84E+09	-46.478	451.7796	0.00
0.9500	0.2317	-490753.	15173.	-0.00138	0.00	4.86E+09	-59.512	585.6572	0.00
1.1400	0.2283	-455827.	15023.	-0.00160	0.00	4.89E+09	-71.727	716.3789	0.00
1.3300	0.2244	-421205.	14846.	-0.00180	0.00	4.92E+09	-83.645	849.8781	0.00
1.5200	0.2201	-386953.	14643.	-0.00199	0.00	4.94E+09	-94.433	978.3694	0.00
1.7100	0.2153	-353135.	14417.	-0.00216	0.00	4.97E+09	-104.103	1102.	0.00
1.9000	0.2102	-319805.	14170.	-0.00231	0.00	5.02E+09	-112.106	1216.	0.00
2.0900	0.2048	-287010.	13906.	-0.00245	0.00	5.02E+09	-119.449	1330.	0.00
2.2800	0.1990	-254793.	13627.	-0.00257	0.00	5.02E+09	-125.851	1442.	0.00
2.4700	0.1930	-223193.	13332.	-0.00268	0.00	5.02E+09	-132.566	1566.	0.00
2.6600	0.1868	-192249.	13021.	-0.00278	0.00	5.02E+09	-140.239	1712.	0.00
2.8500	0.1804	-162006.	12694.	-0.00286	0.00	5.02E+09	-146.134	1847.	0.00
3.0400	0.1738	-132498.	12357.	-0.00292	0.00	5.02E+09	-149.953	1967.	0.00
3.2300	0.1671	-103750.	12010.	-0.00298	0.00	5.02E+09	-154.804	2113.	0.00
3.4200	0.1602	-75792.	11645.	-0.00302	0.00	5.02E+09	-165.307	2353.	0.00
3.6100	0.1533	-48681.	11256.	-0.00305	0.00	5.02E+09	-175.235	2606.	0.00
3.8000	0.1463	-22474.	10846.	-0.00306	0.00	5.02E+09	-184.410	2874.	0.00
3.9900	0.1393	2777.	10416.	-0.00307	0.00	5.02E+09	-193.214	3162.	0.00
4.1800	0.1323	27024.	9963.	-0.00306	0.00	5.02E+09	-203.939	3514.	0.00
4.3700	0.1254	50206.	9487.	-0.00304	0.00	5.02E+09	-214.169	3895.	0.00
4.5600	0.1185	72268.	8987.	-0.00302	0.00	5.02E+09	-223.824	4308.	0.00
4.7500	0.1116	93155.	8467.	-0.00298	0.00	5.02E+09	-232.827	4756.	0.00

4.9400	0.1049	112819.	7926.	-0.00293	0.00	5.02E+09	-241.106	5242.	0.00
5.1300	0.09825	131212.	7368.	-0.00288	0.00	5.02E+09	-248.593	5769.	0.00
5.3200	0.09177	148293.	6794.	-0.00281	0.00	5.02E+09	-255.221	6341.	0.00
5.5100	0.08543	164026.	6205.	-0.00274	0.00	5.02E+09	-260.930	6964.	0.00
5.7000	0.07927	178378.	5605.	-0.00266	0.00	5.02E+09	-265.665	7642.	0.00
5.8900	0.07329	191323.	4995.	-0.00258	0.00	5.02E+09	-269.374	8380.	0.00
6.0800	0.06751	202838.	4378.	-0.00249	0.00	5.02E+09	-272.013	9187.	0.00
6.2700	0.06193	212910.	3756.	-0.00240	0.00	5.02E+09	-273.541	10070.	0.00
6.4600	0.05658	221528.	3132.	-0.00230	0.00	5.02E+09	-273.924	11038.	0.00
6.6500	0.05146	228690.	2508.	-0.00219	0.00	5.02E+09	-273.133	12101.	0.00
6.8400	0.04658	234397.	1888.	-0.00209	0.00	5.02E+09	-271.144	13272.	0.00
7.0300	0.04194	238661.	1273.	-0.00198	0.00	5.02E+09	-267.941	14567.	0.00
7.2200	0.03754	241496.	667.2965	-0.00187	0.00	5.02E+09	-263.509	16003.	0.00
7.4100	0.03340	242925.	72.9567	-0.00176	0.00	5.02E+09	-257.842	17601.	0.00
7.6000	0.02951	242979.	-507.047	-0.00165	0.00	5.02E+09	-250.934	19389.	0.00
7.7900	0.02587	241691.	-1070.	-0.00154	0.00	5.02E+09	-242.785	21399.	0.00
7.9800	0.02248	239106.	-1613.	-0.00143	0.00	5.02E+09	-233.395	23673.	0.00
8.1700	0.01934	235272.	-2133.	-0.00132	0.00	5.02E+09	-222.763	26266.	0.00
8.3600	0.01644	230245.	-2622.	-0.00122	0.00	5.02E+09	-206.139	28591.	0.00
8.5500	0.01378	224112.	-3058.	-0.00112	0.00	5.02E+09	-176.715	29241.	0.00
8.7400	0.01135	217028.	-3429.	-0.00102	0.00	5.02E+09	-148.820	29891.	0.00
8.9300	0.00915	209137.	-3739.	-9.18E-04	0.00	5.02E+09	-122.553	30541.	0.00
9.1200	0.00716	200579.	-3990.	-8.25E-04	0.00	5.02E+09	-97.996	31190.	0.00
9.3100	0.00539	191481.	-4188.	-7.36E-04	0.00	5.02E+09	-75.209	31840.	0.00
9.5000	0.00381	181964.	-4335.	-6.51E-04	0.00	5.02E+09	-54.236	32490.	0.00
9.6900	0.00242	172138.	-4437.	-5.71E-04	0.00	5.02E+09	-35.102	33140.	0.00
9.8800	0.00120	162104.	-4497.	-4.95E-04	0.00	5.02E+09	-17.820	33790.	0.00
10.0700	1.58E-04	151954.	-4520.	-4.24E-04	0.00	5.02E+09	-2.383	34439.	0.00
10.2600	-7.29E-04	141768.	-4510.	-3.57E-04	0.00	5.02E+09	11.2265	35089.	0.00
10.4500	-0.00147	131620.	-4471.	-2.95E-04	0.00	5.02E+09	23.0391	35739.	0.00
10.6400	-0.00207	121572.	-4407.	-2.37E-04	0.00	5.02E+09	33.0972	36389.	0.00
10.8300	-0.00255	111678.	-4322.	-1.84E-04	0.00	5.02E+09	41.4533	37039.	0.00
11.0200	-0.00291	101983.	-4220.	-1.36E-04	0.00	5.02E+09	48.1691	37688.	0.00
11.2100	-0.00317	92524.	-4104.	-9.15E-05	0.00	5.02E+09	53.3148	38338.	0.00
11.4000	-0.00333	83328.	-3979.	-5.16E-05	0.00	5.02E+09	56.9675	38988.	0.00
11.5900	-0.00341	74415.	-3846.	-1.57E-05	0.00	5.02E+09	59.2110	39638.	0.00
11.7800	-0.00340	65800.	-3710.	1.61E-05	0.00	5.02E+09	60.1345	40288.	0.00
11.9700	-0.00333	57487.	-3573.	4.41E-05	0.00	5.02E+09	59.8325	40937.	0.00
12.1600	-0.00320	49476.	-3439.	6.84E-05	0.00	5.02E+09	58.4038	41587.	0.00
12.3500	-0.00302	41762.	-3308.	8.92E-05	0.00	5.02E+09	55.9511	42237.	0.00
12.5400	-0.00280	34333.	-3184.	1.06E-04	0.00	5.02E+09	52.5811	42887.	0.00
12.7300	-0.00253	27172.	-3069.	1.20E-04	0.00	5.02E+09	48.4036	43537.	0.00
12.9200	-0.00225	20258.	-2965.	1.31E-04	0.00	5.02E+09	43.5322	44186.	0.00
13.1100	-0.00194	13568.	-2871.	1.39E-04	0.00	5.02E+09	38.0834	44836.	0.00
13.3000	-0.00161	7074.	-2791.	1.44E-04	0.00	5.02E+09	32.1778	45486.	0.00
13.4900	-0.00128	745.9399	-2725.	1.45E-04	0.00	5.02E+09	25.9395	46136.	0.00
13.6800	-9.50E-04	-5447.	-2673.	1.44E-04	0.00	5.02E+09	19.4966	46786.	0.00
13.8700	-6.24E-04	-11539.	-2636.	1.40E-04	0.00	5.02E+09	12.9820	47435.	0.00
14.0600	-3.10E-04	-17560.	-855.668	1.14E-04	0.00	8.39E+08	1549.	1.14E+07	0.00
14.2500	-1.04E-04	-15515.	1505.	6.90E-05	0.00	8.39E+08	522.0310	1.14E+07	0.00

14.4400	4.86E-06	-10741.	2073.	3.33E-05	0.00	8.39E+08	-24.322	1.14E+07	0.00
14.6300	4.76E-05	-6085.	1774.	1.05E-05	0.00	8.40E+08	-238.067	1.14E+07	0.00
14.8200	5.27E-05	-2661.	1202.	-1.38E-06	0.00	8.41E+08	-263.492	1.14E+07	0.00
15.0100	4.13E-05	-604.270	665.7541	-5.80E-06	0.00	8.44E+08	-206.683	1.14E+07	0.00
15.2000	2.63E-05	378.5983	280.4895	-6.10E-06	0.00	8.44E+08	-131.269	1.14E+07	0.00
15.3900	1.35E-05	678.7456	53.8805	-4.68E-06	0.00	8.44E+08	-67.511	1.14E+07	0.00
15.5800	4.93E-06	627.3449	-51.184	-2.91E-06	0.00	8.44E+08	-24.651	1.14E+07	0.00
15.7700	2.21E-07	447.2455	-80.547	-1.46E-06	0.00	8.44E+08	-1.106	1.14E+07	0.00
15.9600	-1.73E-06	261.0031	-71.925	-5.05E-07	0.00	8.44E+08	8.6693	1.14E+07	0.00
16.1500	-2.08E-06	119.5974	-50.176	8.93E-09	0.00	8.44E+08	10.4087	1.14E+07	0.00
16.3400	-1.69E-06	32.1947	-28.659	2.14E-07	0.00	8.44E+08	8.4658	1.14E+07	0.00
16.5300	-1.11E-06	-11.228	-12.702	2.42E-07	0.00	8.44E+08	5.5317	1.14E+07	0.00
16.7200	-5.89E-07	-25.884	-3.040	1.92E-07	0.00	8.44E+08	2.9433	1.14E+07	0.00
16.9100	-2.30E-07	-25.218	1.6280	1.23E-07	0.00	8.44E+08	1.1518	1.14E+07	0.00
17.1000	-2.74E-08	-18.541	3.0971	6.40E-08	0.00	8.44E+08	0.1368	1.14E+07	0.00
17.2900	6.15E-08	-11.137	2.9025	2.39E-08	0.00	8.44E+08	-0.307	1.14E+07	0.00
17.4800	8.18E-08	-5.321	2.0860	1.70E-09	0.00	8.44E+08	-0.409	1.14E+07	0.00
17.6700	6.93E-08	-1.626	1.2252	-7.68E-09	0.00	8.44E+08	-0.346	1.14E+07	0.00
17.8600	4.68E-08	0.2710	0.5639	-9.50E-09	0.00	8.44E+08	-0.234	1.14E+07	0.00
18.0500	2.59E-08	0.9521	0.1497	-7.85E-09	0.00	8.44E+08	-0.130	1.14E+07	0.00
18.2400	1.09E-08	0.9586	-0.06047	-5.27E-09	0.00	8.44E+08	-0.05473	1.14E+07	0.00
18.4300	1.87E-09	0.6798	-0.134	-3.06E-09	0.00	8.44E+08	-0.00937	1.14E+07	0.00
18.6200	-3.01E-09	0.3516	-0.127	-1.67E-09	0.00	8.44E+08	0.01505	1.14E+07	0.00
18.8100	-5.73E-09	0.1014	-0.07726	-1.06E-09	0.00	8.44E+08	0.02865	1.14E+07	0.00
19.0000	-7.83E-09	0.00	0.00	-9.19E-10	0.00	8.44E+08	0.03913	5700000.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     0.24000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =       -667437. inch-lbs
Maximum shear force              =         15503. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              5
```

Summary of Pile-head Responses for Conventional Analyses

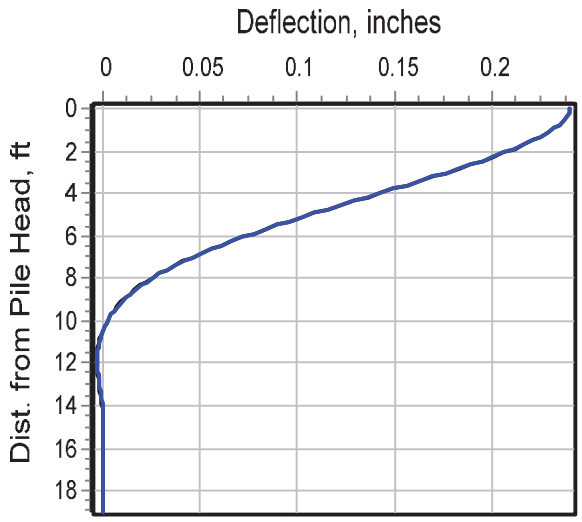
Definitions of Pile-head Loading Conditions:

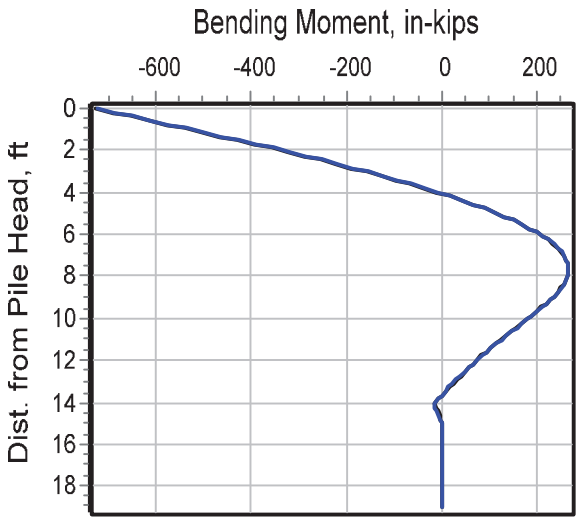
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

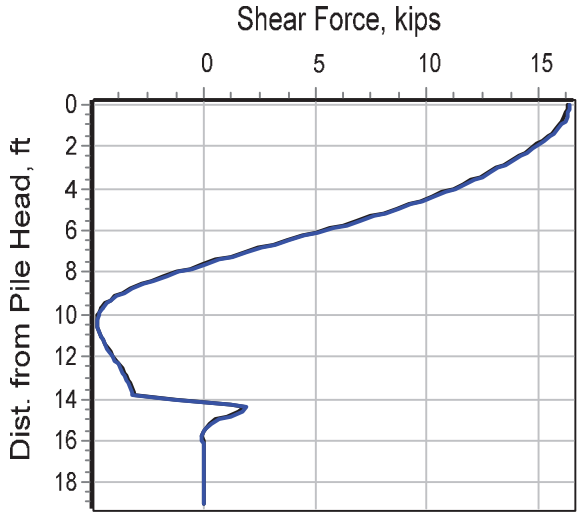
Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.2400	S, rad	0.00	201200.	0.2400	0.00	15388.	-669605.
2	y, in	0.2400	S, rad	0.00	143100.	0.2400	0.00	15503.	-667437.

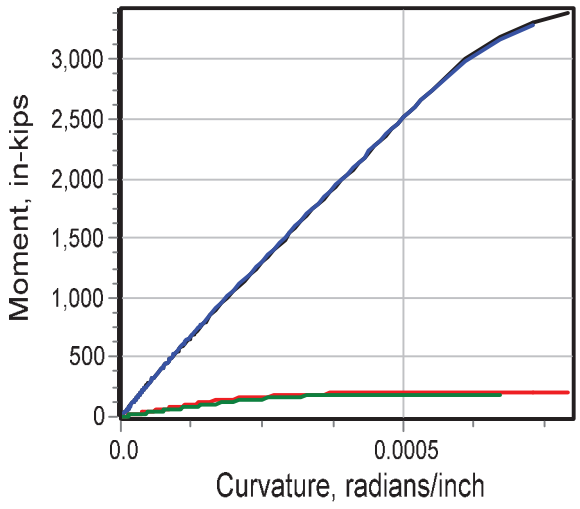
Maximum pile-head deflection = 0.2400000000 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

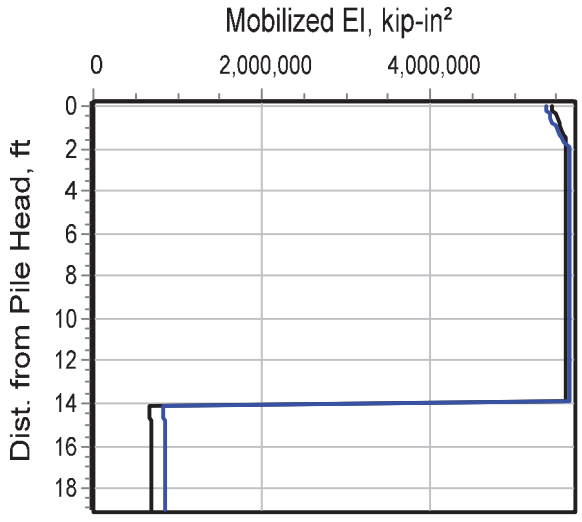
The analysis ended normally.

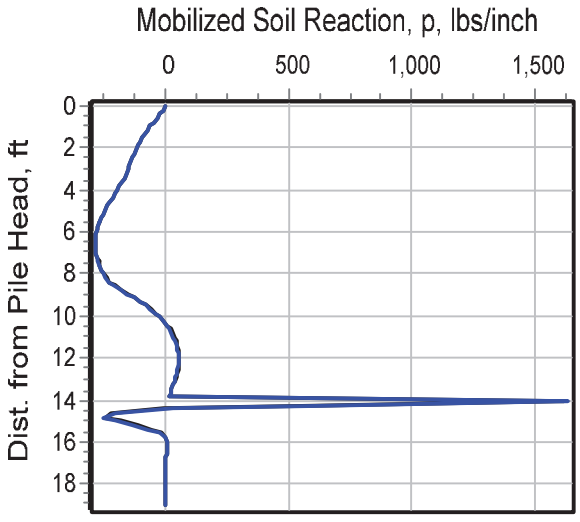

Deflection, inches
0
0.05
0.1
0.15
0.2
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


Bending Moment, in-kips
-600
-400
-200
0
200
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


Shear Force, kips
0
5
10
15
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


Moment, in-kips
3,000
2,500
2,000
1,500
1,000
500
0
0.0
0.0005
Curvature, radians/inch


Mobilized EI, kip-in²
0
2,000,000
4,000,000
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18


Mobilized Soil Reaction, p, lbs/inch
0
500
1,000
1,500
Dist. from Pile Head, ft
0
2
4
6
8
10
12
14
16
18

```
================================================================================

                     LPile for Windows, Version 2022-12.005

                  Analysis of Individual Piles and Drilled Shafts
                 Subjected to Lateral Loading Using the p-y Method
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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Users\rclopper\Desktop\Micropile Integral Abutment\

Name of input data file:
9.625-inch, 80 KSI, No Corrosion - NO Overburden.lp12d

Name of output report file:
9.625-inch, 80 KSI, No Corrosion - NO Overburden.lp12o

Name of plot output file:
9.625-inch, 80 KSI, No Corrosion - NO Overburden.lp12p

Name of runtime message file:
9.625-inch, 80 KSI, No Corrosion - NO Overburden.lp12r



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                           Date and Time of Analysis
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               Date:  September 28, 2022          Time:  10:07:11
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Problem Title

Project Name: East Oxbow Road in Charlemont, MA

Job Number: 100169.00

Client: CHA

Engineer: Rob Clopper

Description: Micropile for Integral Abutment Bridge-9.625 w/80KSI, NC

Program Options and Settings

Computational Options:
 - Conventional Analysis
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed = 500
 - Deflection tolerance for convergence = 1.0000E-05 in
 - Maximum allowable deflection = 100.0000 in
 - Number of pile increments = 100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1

- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 19.000 ft
Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	9.6250
2	14.000	9.6250
3	14.000	8.6250
4	19.000	8.6250

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a drilled shaft with permanent casing
Length of section = 14.000000 ft
Casing outside diameter = 9.625000 in

Pile Section No. 2:

Section 2 is a round drilled shaft, bored pile, or CIDH pile
Length of section = 5.000000 ft
Shaft Diameter = 8.625000 in

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

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   Distance from top of pile to top of layer           =       0.0000 ft
   Distance from top of pile to bottom of layer        =    14.000000 ft
   Effective unit weight at top of layer               =    67.600000 pcf
   Effective unit weight at bottom of layer            =    67.600000 pcf
   Friction angle at top of layer                      =    38.000000 deg.
   Friction angle at bottom of layer                   =    38.000000 deg.
   Subgrade k at top of layer                          =   125.000000 pci
   Subgrade k at bottom of layer                       =   125.000000 pci


Layer 2 is strong rock (vuggy limestone)

   Distance from top of pile to top of layer           =    14.000000 ft
   Distance from top of pile to bottom of layer        =    39.800000 ft
   Effective unit weight at top of layer               =   100.000000 pcf
   Effective unit weight at bottom of layer            =   100.000000 pcf
   Uniaxial compressive strength at top of layer       =        5000. psi
   Uniaxial compressive strength at bottom of layer    =        5000. psi


 (Depth of the lowest soil layer extends 20.800 ft below the pile tip)



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                        Summary of Input Soil Properties
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Layer         Soil Type          Layer      Effective    Angle of     Uniaxial
 Num.           Name            Depth       Unit Wt.    Friction        qu          kpy
         (p-y Curve Type)         ft           pcf         deg.         psi         pci
-----   ------------------   ----------   ----------   ----------   ----------   ----------
  1           Sand                0.00      67.6000      38.0000       --         125.0000
         (Reese, et al.)        14.0000      67.6000      38.0000       --         125.0000
  2         Strong Rock          14.0000     100.0000       --           5000.       --
         (Vuggy Limestone)       39.8000     100.0000       --           5000.       --


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                      Modification Factors for p-y Curves
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Distribution of p-y modifiers with depth defined using 2 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1           0.000         1.0000         1.0000
  2          14.000         1.0000         1.0000
```

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	5	y = 0.240000 in	S = 0.0000 in/in	201200.	N.A.	Yes
2	5	y = 0.240000 in	S = 0.0000 in/in	143100.	N.A.	Yes

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Permanent Casing:

Length of Section	=	14.000000 ft
Outer Diameter of Casing	=	9.625000 in
Concrete Cover Thickness Inside Casing	=	3.000000 in
Casing Wall Thickness	=	0.545000 in
Moment of Inertia of Steel Casing	=	160.796181 in^4
Yield Stress of Casing	=	80000. psi
Elastic Modulus of Casing	=	29000000. psi

Number of Reinforcing Bars = 1 bar
Area of Single Reinforcing Bar = 2.250000 sq. in.
Edge-to-Edge Bar Spacing = -1.69300 in
Maximum Concrete Aggregate Size = 0.250000 in
Ratio of Bar Spacing to Aggregate Size = -6.77
Offset of Center of Rebar Cage from Center of Pile = 0.0000 in
Yield Stress of Reinforcing Bars = 60000. psi
Modulus of Elasticity of Reinforcing Bars = 29000000. psi
Gross Area of Pile = 72.759777 sq. in.
Area of Concrete = 54.963291 sq. in.
Cross-sectional Area of Steel Casing = 15.546485 sq. in.
Area of All Steel (Casing and Bars) = 17.796485 sq. in.
Area Ratio of All Steel to Gross Area of Pile = 24.46 percent

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 1565.594 kips
Tensile Load for Cracking of Concrete = -82.402 kips
Nominal Axial Tensile Capacity = -1378.719 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.693000	2.250000	0.00000	0.00000

NOTE: The positions of the above rebars were computed by LPile

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34165 psi
Compression Strain at Peak Stress = 0.001886
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.250000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	143.100
2	201.200

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 143.100 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.00000125	7.0832477	5666598.	160.1006068	0.0002001	0.0001881	0.8035143	5.6588509	5.8019025	
0.00000250	14.1641521	5665661.	82.4573011	0.0002061	0.0001821	0.8260607	5.6885621	5.9746653	
0.00000375	21.2450511	5665347.	56.5765352	0.0002122	0.0001761	0.8485320	5.7183099	6.1474646	
0.00000500	28.3259419	5665188.	43.6364043	0.0002182	0.0001701	0.8709283	5.7480943	6.3203005	
0.00000625	35.4068216	5665091.	35.8725274	0.0002242	0.0001640	0.8932493	5.7779151	6.4931730	
0.00000750	42.4876875	5665025.	30.6967775	0.0002302	0.0001580	0.9154952	5.8077726	6.6660819	
0.00000875	49.5685370	5664976.	26.9999572	0.0002362	0.0001520	0.9376658	5.8376665	6.8390275	
0.00001000	56.6493671	5664937.	24.2274681	0.0002423	0.0001460	0.9597611	5.8675970	7.0120095	
0.00001125	63.7301751	5664904.	22.0711997	0.0002483	0.0001400	0.9817810	5.8975641	7.1850281	
0.00001250	70.8109584	5664877.	20.3462857	0.0002543	0.0001340	1.0037255	5.9275677	7.3580833	
0.00001375	77.8917140	5664852.	18.9350841	0.0002604	0.0001280	1.0255946	5.9576078	7.5311750	
0.00001500	84.9724393	5664829.	17.7591668	0.0002664	0.0001220	1.0473882	5.9876845	7.7043032	
0.00001625	92.0531314	5664808.	16.7642375	0.0002724	0.0001160	1.0691062	6.0177977	7.8774680	
0.00001750	99.1337877	5664788.	15.9115128	0.0002785	0.0001100	1.0907486	6.0479475	8.0506694	
0.00001875	106.2144053	5664768.	15.1725521	0.0002845	0.0001040	1.1123153	6.0781338	8.2239073	
0.00002000	113.2949816	5664749.	14.5260244	0.0002905	0.00009802	1.1338063	6.1083567	8.3971817	
0.00002125	120.3755136	5664730.	13.9556181	0.0002966	0.00009203	1.1552216	6.1386161	8.5704927	
0.00002250	127.4559987	5664711.	13.4486463	0.0003026	0.00008603	1.1765610	6.1689121	8.7438402	
0.00002375	134.5364341	5664692.	12.9950930	0.0003086	0.00008004	1.1978246	6.1992446	8.9172243	
0.00002500	141.6168170	5664673.	12.5869454	0.0003147	0.00007405	1.2190123	6.2296136	9.0906449	
0.00002625	148.6971447	5664653.	12.2177171	0.0003207	0.00006806	1.2401240	6.2600192	9.2641021	
0.00002750	155.7774144	5664633.	11.8821008	0.0003268	0.00006207	1.2611596	6.2904614	9.4375958	
0.00002875	162.8576233	5664613.	11.5757124	0.0003328	0.00005608	1.2821192	6.3209401	9.6111260	
0.00003000	169.9377687	5664592.	11.2948983	0.0003388	0.00005010	1.3030027	6.3514554	9.7846929	
0.00003125	177.0178478	5664571.	11.0365897	0.0003449	0.00004411	1.3238101	6.3820072	9.9582962	
0.00003250	184.0978579	5664549.	10.7981898	0.0003509	0.00003813	1.3445412	6.4125955	10.1319361	
0.00003375	191.1777961	5664527.	10.5774864	0.0003570	0.00003215	1.3651960	6.4432204	10.3056126	
0.00003500	198.2576598	5664505.	10.3725837	0.0003630	0.00002617	1.3857745	6.4738819	10.4793256	
0.00003625	205.3374461	5664481.	10.1818469	0.0003691	0.00002019	1.4062767	6.5045799	10.6530752	
0.00003750	212.4171522	5664457.	10.0038595	0.0003751	0.00001421	1.4267024	6.5353145	10.8268613	

0.00003875	219.4967755	5664433.	9.8373877	0.0003812	0.00000823	1.4470516	6.5660856	11.0006840
0.00004000	226.5763132	5664408.	9.6813519	0.0003873	0.00000225	1.4673243	6.5968933	11.1745433
0.00004125	233.6557624	5664382.	9.5348033	0.0003933	-0.00000372	1.4875205	6.6277375	11.3484391
0.00004250	240.7351205	5664356.	9.3969049	0.0003994	-0.00000969	1.5076400	6.6586183	11.5223714
0.00004375	247.8143846	5664329.	9.2669153	0.0004054	-0.00001567	1.5276828	6.6895356	11.6963403
0.00004500	254.8935520	5664301.	9.1441753	0.0004115	-0.00002164	1.5476489	6.7204895	11.8703458
0.00004625	261.9726179	5664273.	9.0280972	0.0004175	-0.00002761	1.5675383	6.7514800	12.0443878
0.00004750	269.0515485	5664243.	8.9181547	0.0004236	-0.00003358	1.5873507	6.7825067	12.2184660
0.00004875	276.1302459	5664210.	8.8138753	0.0004297	-0.00003954	1.6070862	6.8135687	12.3925796
0.00005125	290.2864233	5664125.	8.6206447	0.0004418	-0.00005147	1.6463252	6.8757935	12.7409076
0.00005375	304.4400756	5664001.	8.4454695	0.0004539	-0.00006340	1.6852538	6.9381437	13.0893609
0.00005625	318.5901744	5663825.	8.2859354	0.0004661	-0.00007532	1.7238704	7.0006081	13.4379284
0.00005875	332.7357860	5663588.	8.1400397	0.0004782	-0.00008724	1.7621735	7.0631763	13.7865998
0.00006125	346.8761100	5663283.	8.0061070	0.0004904	-0.00009916	1.8001618	7.1258391	14.1353657
0.00006375	361.0104386	5662909.	7.8827252	0.0005025	-0.000111	1.8378342	7.1885877	14.4842174
0.00006625	372.0350663	5615624.	7.7510010	0.0005135	-0.000124	1.8715642	7.2174178	14.7991506 C
0.00006875	385.4007518	5605829.	7.6415083	0.0005254	-0.000136	1.9076980	7.2714722	15.1393081 C
0.00007125	398.7032561	5595835.	7.5393346	0.0005372	-0.000149	1.9434434	7.3247729	15.4787120 C
0.00007375	411.9492564	5585753.	7.4437668	0.0005490	-0.000161	1.9788094	7.3773869	15.8174291 C
0.00007625	425.1440786	5575660.	7.3541796	0.0005608	-0.000173	2.0138035	7.4293682	16.1555135 C
0.00007875	438.2912468	5565603.	7.2700170	0.0005725	-0.000185	2.0484305	7.4807477	16.4929962 C
0.00008125	451.3896758	5555565.	7.1907590	0.0005842	-0.000198	2.0826875	7.5314800	16.8298316 C
0.00008375	464.4497822	5545669.	7.1160277	0.0005960	-0.000210	2.1165912	7.5817142	17.1661689 C
0.00008625	477.4767821	5535963.	7.0454594	0.0006077	-0.000222	2.1501503	7.6315252	17.5020830 C
0.00008875	490.4753061	5526482.	6.9787310	0.0006194	-0.000235	2.1833733	7.6809865	17.8376474 C
0.00009125	503.4304896	5517046.	6.9154151	0.0006310	-0.000247	2.2162322	7.7298026	18.1725667 C
0.00009375	516.3647066	5507890.	6.8553863	0.0006427	-0.000260	2.2487677	7.7783747	18.5072418 C
0.00009625	529.2743055	5498954.	6.7983627	0.0006543	-0.000272	2.2809734	7.8266308	18.8416012 C
0.00009875	542.1530428	5490157.	6.7440651	0.0006660	-0.000284	2.3128363	7.8744253	19.1754987 C
0.0001013	555.0197439	5481676.	6.6924217	0.0006776	-0.000297	2.3443937	7.9221398	19.5093164 C
0.0001038	567.8518596	5473271.	6.6430781	0.0006892	-0.000309	2.3756001	7.9692857	19.8425654 C
0.0001063	580.6780011	5465205.	6.5960697	0.0007008	-0.000322	2.4065134	8.0164720	20.1758548 C
0.0001088	593.4719057	5457213.	6.5510481	0.0007124	-0.000334	2.4370794	8.0631083	20.5085942 C
0.0001113	606.2598339	5449527.	6.5080617	0.0007240	-0.000347	2.4673527	8.1097819	20.8413710 C
0.0001138	619.0233923	5441964.	6.4668438	0.0007356	-0.000359	2.4972943	8.1560567	21.1737489 C
0.0001163	631.7754451	5434627.	6.4273702	0.0007472	-0.000372	2.5269320	8.2022355	21.5060308 C
0.0001188	644.5158869	5427502.	6.3895272	0.0007588	-0.000384	2.5562649	8.2483057	21.8382042 C
0.0001213	657.2343783	5420490.	6.3531404	0.0007703	-0.000397	2.5852710	8.2940092	22.1700108 C
0.0001238	669.9487699	5413727.	6.3182455	0.0007819	-0.000409	2.6139894	8.3397908	22.5018955 C
0.0001263	682.6454199	5407092.	6.2846555	0.0007934	-0.000422	2.6423893	8.3852900	22.8334978 C
0.0001288	695.3285069	5400610.	6.2523238	0.0008050	-0.000434	2.6704807	8.4306167	23.1649276 C
0.0001313	708.0074700	5394343.	6.2212440	0.0008165	-0.000447	2.6982848	8.4760204	23.4964344 C
0.0001338	720.6705190	5388191.	6.1912604	0.0008281	-0.000459	2.7257741	8.5211697	23.8276869 C
0.0001363	733.3203923	5382168.	6.1623321	0.0008396	-0.000472	2.7529555	8.5661410	24.1587613 C
0.0001388	745.9661230	5376332.	6.1344652	0.0008512	-0.000484	2.7798500	8.6111883	24.4899117 C
0.0001413	758.6046971	5370653.	6.1075812	0.0008627	-0.000497	2.8064502	8.6562213	24.8210479 C
0.0001438	771.2234954	5365033.	6.0815379	0.0008742	-0.000509	2.8327261	8.7008608	25.1517905 C
0.0001463	783.8381372	5359577.	6.0564027	0.0008857	-0.000522	2.8587155	8.7455754	25.4826083 C
0.0001488	796.4486172	5354276.	6.0321298	0.0008973	-0.000534	2.8844180	8.7903653	25.8135012 C
0.0001588	846.7943441	5334138.	5.9424645	0.0009434	-0.000585	2.9842268	8.9685177	27.1360661 C
0.0001688	897.0199162	5315674.	5.8632973	0.0009894	-0.000635	3.0793148	9.1460392	28.4580001 C
0.0001788	947.1400070	5298685.	5.7929465	0.0010355	-0.000685	3.1697165	9.3233458	29.7797192 C
0.0001888	997.1648630	5282993.	5.7300731	0.0010816	-0.000735	3.2554556	9.5007783	31.1015642 C

0.0001988	1047.	5268336.	5.6734417	0.0011276	-0.000785	3.3364941	9.6777212	32.4229196 C
0.0002088	1097.	5254721.	5.6223720	0.0011737	-0.000836	3.4129109	9.8554875	33.7450984 C
0.0002188	1147.	5241911.	5.5759532	0.0012197	-0.000886	3.4846475	10.0331332	35.0671566 C
0.0002288	1196.	5229921.	5.5337685	0.0012658	-0.000936	3.5517687	10.2119520	36.3903880 C
0.0002388	1246.	5218542.	5.4950989	0.0013120	-0.000986	3.6142025	10.3906352	37.7134836 C
0.0002488	1295.	5207803.	5.4597036	0.0013581	-0.001036	3.6720061	10.5705125	39.0377734 C
0.0002588	1345.	5197601.	5.4271500	0.0014043	-0.001086	3.7251514	10.7511847	40.3628582 C
0.0002688	1394.	5187854.	5.3970755	0.0014505	-0.001136	3.7736178	10.9322964	41.6883824 C
0.0002788	1444.	5178557.	5.3693079	0.0014967	-0.001186	3.8174243	11.1146133	43.0151118 C
0.0002888	1493.	5169664.	5.3436082	0.0015430	-0.001236	3.8565584	11.2981414	44.3430523 C
0.0002988	1542.	5161087.	5.3196622	0.0015892	-0.001286	3.8909849	11.4819567	45.6712802 C
0.0003088	1591.	5152835.	5.2973959	0.0016356	-0.001336	3.9207184	11.6669239	47.0006599 C
0.0003188	1640.	5144881.	5.2766597	0.0016819	-0.001386	3.9457481	11.8531194	48.3312678 C
0.0003288	1689.	5137197.	5.2573144	0.0017283	-0.001436	3.9660609	12.0405493	49.6631102 C
0.0003388	1738.	5129745.	5.2392068	0.0017748	-0.001486	3.9816406	12.2289171	50.9958905 C
0.0003488	1786.	5122498.	5.2222079	0.0018212	-0.001535	3.9924758	12.4179960	52.3293820 C
0.0003588	1835.	5115457.	5.2062773	0.0018678	-0.001585	3.9985605	12.6083292	53.6641276 C
0.0003688	1884.	5108603.	5.1913286	0.0019143	-0.001635	3.9992857	12.7999231	55.0001340 C
0.0003788	1932.	5101920.	5.1772846	0.0019609	-0.001685	3.9996935	12.9927843	56.3374078 C
0.0003888	1981.	5095396.	5.1640762	0.0020075	-0.001734	3.9998943	13.1869197	57.6759556 C
0.0003988	2029.	5089016.	5.1516410	0.0020542	-0.001784	3.9999745	13.3823358	59.0157843 C
0.0004088	2078.	5082757.	5.1398770	0.0021009	-0.001833	3.9999966	13.5784954	60.3563563 C
0.0004188	2126.	5076616.	5.1287722	0.0021477	-0.001883	3.9999996	13.7758369	61.6981104 C
0.0004288	2174.	5070575.	5.1182967	0.0021945	-0.001932	3.9999981	13.9745621	63.0412480 C
0.0004388	2222.	5064625.	5.1084087	0.0022413	-0.001982	3.9999828	14.1746873	64.3857857 C
0.0004488	2270.	5058764.	5.0990680	0.0022882	-0.002031	3.9999209	14.3761995	65.7317104 C
0.0004588	2318.	5052990.	5.0902366	0.0023351	-0.002080	3.9997554	14.5790704	67.0789938 C
0.0004688	2366.	5047306.	5.0818793	0.0023821	-0.002130	3.9994059	14.7832623	68.4275983 C
0.0004788	2414.	5041714.	5.0739629	0.0024292	-0.002179	3.9987678	14.9887303	69.7774787 C
0.0004888	2461.	5036217.	5.0664570	0.0024762	-0.002228	3.9993941	15.1954235	71.1285845 C
0.0004988	2509.	5030805.	5.0593387	0.0025233	-0.002277	3.9998642	15.4033703	72.4809437 C
0.0005088	2557.	5025487.	5.0525761	0.0025705	-0.002326	3.9992519	15.6124366	73.8344225 C
0.0005188	2604.	5020262.	5.0461174	0.0026177	-0.002375	3.9979686	15.8221511	75.1885495 C
0.0005288	2652.	5015129.	5.0399755	0.0026649	-0.002424	3.9998827	16.0329780	76.5437890 C
0.0005388	2699.	5010089.	5.0341297	0.0027121	-0.002473	3.9990059	16.2448686	77.9000921 C
0.0005488	2747.	5005151.	5.0285560	0.0027594	-0.002522	3.9994778	16.4576994	79.2573353 C
0.0006088	3008.	4941725.	5.0136135	0.0030520	-0.002807	3.9985933	17.9933835	80.0000000 CY
0.0006688	3192.	4773755.	5.0230542	0.0033592	-0.003078	3.9982253	19.9499500	80.0000000 CY
0.0007288	3310.	4542364.	5.0247949	0.0036618	-0.003352	3.9998077	21.7766347	80.0000000 CY
0.0007888	3393.	4301334.	5.0225163	0.0039615	-0.003630	3.9998248	23.5174474	80.0000000 CY

Axial Thrust Force = 201.200 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.00000125	7.0252563	5620205.	224.6352045	0.0002808	0.0002688	1.1020391	7.9982301	8.1412816	
0.00000250	14.0471847	5618874.	114.7246103	0.0002868	0.0002627	1.1235050	8.0279421	8.3140452	
0.00000375	21.0691075	5618429.	78.0880863	0.0002928	0.0002567	1.1448957	8.0576911	8.4868458	
0.00000500	28.0910219	5618204.	59.7700798	0.0002989	0.0002507	1.1662112	8.0874772	8.6596835	
0.00000625	35.1129252	5618068.	48.7794804	0.0003049	0.0002447	1.1874513	8.1173004	8.8325582	

0.00000750	42.1348145	5617975.	41.4525844	0.0003109	0.0002387	1.2086161	8.1471606	9.0054699	
0.00000875	49.1566870	5617907.	36.2192333	0.0003169	0.0002327	1.2297054	8.1770578	9.1784188	
0.00001000	56.1785400	5617854.	32.2943478	0.0003229	0.0002267	1.2507192	8.2069921	9.3514046	
0.00001125	63.2003706	5617811.	29.2417726	0.0003290	0.0002207	1.2716576	8.2369635	9.5244276	
0.00001250	70.2221760	5617774.	26.7998147	0.0003350	0.0002147	1.2925203	8.2669719	9.6974876	
0.00001375	77.2439535	5617742.	24.8019421	0.0003410	0.0002087	1.3133074	8.2970174	9.8705846	
0.00001500	84.2657001	5617713.	23.1371334	0.0003471	0.0002027	1.3340188	8.3270999	10.0437187	
0.00001625	91.2874132	5617687.	21.7285277	0.0003531	0.0001967	1.3546545	8.3572195	10.2168898	
0.00001750	98.3090899	5617662.	20.5212245	0.0003591	0.0001907	1.3752145	8.3873762	10.3900980	
0.00001875	105.3307275	5617639.	19.4749631	0.0003652	0.0001847	1.3956985	8.4175699	10.5633433	
0.00002000	112.3523230	5617616.	18.5595484	0.0003712	0.0001787	1.4161067	8.4478006	10.7366256	
0.00002125	119.3738737	5617594.	17.7518896	0.0003772	0.0001727	1.4364390	8.4780684	10.9099450	
0.00002250	126.3953769	5617572.	17.0340274	0.0003833	0.0001667	1.4566952	8.5083733	11.0833014	
0.00002375	133.4168296	5617551.	16.3917835	0.0003893	0.0001607	1.4768754	8.5387152	11.2566949	
0.00002500	140.4382292	5617529.	15.8138151	0.0003953	0.0001547	1.4969796	8.5690941	11.4301254	
0.00002625	147.4595727	5617508.	15.2909400	0.0004014	0.0001487	1.5170075	8.5995102	11.6035930	
0.00002750	154.4808575	5617486.	14.8156455	0.0004074	0.0001427	1.5369593	8.6299633	11.7770977	
0.00002875	161.5020806	5617464.	14.3817254	0.0004135	0.0001368	1.5568349	8.6604534	11.9506394	
0.00003000	168.5232393	5617441.	13.9840079	0.0004195	0.0001308	1.5766341	8.6909807	12.1242182	
0.00003125	175.5443308	5617419.	13.6181486	0.0004256	0.0001248	1.5963570	8.7215449	12.2978340	
0.00003250	182.5653523	5617395.	13.2804718	0.0004316	0.0001188	1.6160035	8.7521463	12.4714869	
0.00003375	189.5863010	5617372.	12.9678458	0.0004377	0.0001128	1.6355735	8.7827847	12.6451768	
0.00003500	196.6071740	5617348.	12.6775869	0.0004437	0.0001068	1.6550670	8.8134601	12.8189039	
0.00003625	203.6279686	5617323.	12.4073810	0.0004498	0.0001009	1.6744840	8.8441726	12.9926680	
0.00003750	210.6486820	5617298.	12.1552229	0.0004558	0.00009488	1.6938243	8.8749222	13.1664691	
0.00003875	217.6693113	5617273.	11.9193661	0.0004619	0.00008891	1.7130880	8.9057089	13.3403073	
0.00004000	224.6898538	5617246.	11.6982823	0.0004679	0.00008293	1.7322750	8.9365326	13.5141826	
0.00004125	231.7103067	5617220.	11.4906285	0.0004740	0.00007696	1.7513852	8.9673934	13.6880949	
0.00004250	238.7306671	5617192.	11.2952197	0.0004800	0.00007098	1.7704186	8.9982912	13.8620443	
0.00004375	245.7509323	5617164.	11.1110063	0.0004861	0.00006501	1.7893752	9.0292261	14.0360308	
0.00004500	252.7710994	5617136.	10.9370554	0.0004922	0.00005904	1.8082548	9.0601981	14.2100543	
0.00004625	259.7911656	5617106.	10.7725349	0.0004982	0.00005307	1.8270574	9.0912071	14.3841150	
0.00004750	266.8111282	5617076.	10.6167003	0.0005043	0.00004711	1.8457831	9.1222533	14.5582126	
0.00004875	273.8309843	5617046.	10.4688835	0.0005104	0.00004114	1.8644316	9.1533365	14.7323474	
0.00005125	287.8703658	5616983.	10.1949563	0.0005225	0.00002921	1.9014973	9.2156141	15.0807281	
0.00005375	301.9092879	5616917.	9.9466058	0.0005346	0.00001729	1.9382541	9.2780399	15.4292571	
0.00005625	315.9477280	5616848.	9.7204219	0.0005468	0.00000537	1.9747015	9.3406141	15.7779344	
0.00005875	329.9856636	5616777.	9.5135747	0.0005589	-0.00000655	2.0108392	9.4033366	16.1267601	
0.00006125	344.0230724	5616703.	9.3236965	0.0005711	-0.00001845	2.0466667	9.4662075	16.4757340	
0.00006375	358.0599319	5616626.	9.1487909	0.0005832	-0.00003036	2.0821837	9.5292266	16.8248563	
0.00006625	372.0962075	5616547.	8.9871629	0.0005954	-0.00004226	2.1173897	9.5923940	17.1741268	
0.00006875	386.1316214	5616460.	8.8373628	0.0006076	-0.00005415	2.1522840	9.6557071	17.5235430	
0.00007125	400.1655409	5616358.	8.6981425	0.0006197	-0.00006604	2.1868656	9.7191598	17.8730988	
0.00007375	414.1972040	5616233.	8.5684225	0.0006319	-0.00007792	2.2211335	9.7827443	18.2227865	
0.00007625	428.2258647	5616077.	8.4472649	0.0006441	-0.00008980	2.2550863	9.8464529	18.5725983	
0.00007875	442.2508174	5615883.	8.3338507	0.0006563	-0.000102	2.2887232	9.9102779	18.9225264	
0.00008125	456.2714043	5615648.	8.2274622	0.0006685	-0.000114	2.3220430	9.9742119	19.2725635	
0.00008375	468.4562746	5593508.	8.1194015	0.0006800	-0.000126	2.3532070	10.0186572	19.6031119	C
0.00008625	481.9400808	5587711.	8.0231078	0.0006920	-0.000138	2.3853581	10.0768681	19.9474259	C
0.00008875	495.3643194	5581570.	7.9320013	0.0007040	-0.000150	2.4171360	10.1344659	20.2911269	C
0.00009125	508.7324833	5575151.	7.8456651	0.0007159	-0.000162	2.4485445	10.1914767	20.6342408	C
0.00009375	522.0408856	5568436.	7.7636905	0.0007278	-0.000174	2.4795787	10.2478269	20.9766940	C
0.00009625	535.3001649	5561560.	7.6857821	0.0007398	-0.000187	2.5102515	10.3036404	21.3186107	C

0.00009875	548.5153832	5554586.	7.6116506	0.0007517	-0.000199	2.5405692	10.3589733	21.6600468 C
0.0001013	561.6916458	5547572.	7.5410376	0.0007635	-0.000211	2.5705388	10.4138884	22.0010650 C
0.0001038	574.8229900	5540463.	7.4736545	0.0007754	-0.000223	2.6001523	10.4682824	22.3415621 C
0.0001063	587.9113654	5533283.	7.4092755	0.0007872	-0.000235	2.6294119	10.5221626	22.6815454 C
0.0001088	600.9728946	5526188.	7.3477711	0.0007991	-0.000248	2.6583397	10.5757732	23.0212592 C
0.0001113	613.9946710	5519053.	7.2888802	0.0008109	-0.000260	2.6869182	10.6288978	23.3604868 C
0.0001138	626.9844291	5511951.	7.2324631	0.0008227	-0.000272	2.7151576	10.6816435	23.6993356 C
0.0001163	639.9526395	5504969.	7.1784124	0.0008345	-0.000284	2.7430734	10.7341863	24.0379816 C
0.0001188	652.8797293	5497935.	7.1264751	0.0008463	-0.000297	2.7706373	10.7861702	24.3760686 C
0.0001213	665.7964917	5491105.	7.0766743	0.0008580	-0.000309	2.7978941	10.8381352	24.7141367 C
0.0001238	678.6699067	5484201.	7.0287106	0.0008698	-0.000321	2.8247955	10.8894721	25.0515768 C
0.0001263	691.5374297	5477524.	6.9826619	0.0008816	-0.000334	2.8513970	10.9408657	25.3890735 C
0.0001288	704.3659254	5470803.	6.9382467	0.0008933	-0.000346	2.8776491	10.9916813	25.7259923 C
0.0001313	717.1864869	5464278.	6.8955276	0.0009050	-0.000358	2.9035990	11.0425124	26.0629264 C
0.0001338	729.9784633	5457783.	6.8543021	0.0009168	-0.000371	2.9292150	11.0929428	26.3994600 C
0.0001363	742.7543904	5451408.	6.8145514	0.0009285	-0.000383	2.9545170	11.1432224	26.7358427 C
0.0001388	755.5177841	5445173.	6.7762111	0.0009402	-0.000395	2.9795099	11.1934133	27.0721368 C
0.0001413	768.2514347	5438948.	6.7391182	0.0009519	-0.000408	3.0041676	11.2431548	27.4079814 C
0.0001438	780.9809613	5432911.	6.7033364	0.0009636	-0.000420	3.0285300	11.2929831	27.7439127 C
0.0001463	793.6873634	5426922.	6.6686997	0.0009753	-0.000432	3.0525672	11.3424802	28.0795131 C
0.0001488	806.3769416	5421021.	6.6351826	0.0009870	-0.000445	3.0762897	11.3917843	28.4149202 C
0.0001588	857.0146428	5398517.	6.5114584	0.0010337	-0.000494	3.1681068	11.5880232	29.7555717 C
0.0001688	907.4529470	5377499.	6.4020217	0.0010803	-0.000544	3.2550024	11.7824214	31.0943824 C
0.0001788	957.7129460	5357835.	6.3045362	0.0011269	-0.000594	3.3370153	11.9752984	32.4316719 C
0.0001888	1008.	5339415.	6.2171656	0.0011735	-0.000643	3.4141814	12.1670006	33.7677865 C
0.0001988	1058.	5322144.	6.1384477	0.0012200	-0.000693	3.4865325	12.3578998	35.1030982 C
0.0002088	1108.	5305936.	6.0672044	0.0012665	-0.000743	3.5540967	12.5483916	36.4380025 C
0.0002188	1157.	5290715.	6.0024764	0.0013130	-0.000792	3.6168972	12.7388938	37.7729173 C
0.0002288	1207.	5276304.	5.9433456	0.0013595	-0.000842	3.6749163	12.9289842	39.1074201 C
0.0002388	1256.	5262676.	5.8891862	0.0014060	-0.000892	3.7281789	13.1191998	40.4420483 C
0.0002488	1306.	5249767.	5.8394352	0.0014526	-0.000942	3.7766927	13.3098038	41.7770648 C
0.0002588	1355.	5237465.	5.7935345	0.0014991	-0.000991	3.8204427	13.5004440	43.1121174 C
0.0002688	1404.	5225754.	5.7511271	0.0015456	-0.001041	3.8594440	13.6916877	44.4477736 C
0.0002788	1454.	5214574.	5.7118341	0.0015922	-0.001091	3.8936894	13.8835031	45.7840016 C
0.0002888	1503.	5203838.	5.6752868	0.0016387	-0.001140	3.9231655	14.0755292	47.1204402 C
0.0002988	1552.	5193580.	5.6413314	0.0016853	-0.001190	3.9478874	14.2688143	48.4581377 C
0.0003088	1600.	5183688.	5.6096035	0.0017320	-0.001240	3.9678286	14.4623488	49.7960847 C
0.0003188	1649.	5174158.	5.5799490	0.0017786	-0.001289	3.9829911	14.6566475	51.1347959 C
0.0003288	1698.	5164987.	5.5522320	0.0018253	-0.001339	3.9933698	14.8522179	52.4747788 C
0.0003388	1747.	5156121.	5.5262399	0.0018720	-0.001388	3.9989501	15.0486566	53.8156300 C
0.0003488	1795.	5147510.	5.5017785	0.0019187	-0.001438	3.9996407	15.2455020	55.1568880 C
0.0003588	1844.	5139174.	5.4788047	0.0019655	-0.001487	3.9999437	15.4436350	56.4994335 C
0.0003688	1892.	5131091.	5.4571979	0.0020123	-0.001537	3.9994206	15.6430622	57.8432731 C
0.0003788	1940.	5123236.	5.4368440	0.0020592	-0.001586	3.9991457	15.8437201	59.1883435 C
0.0003888	1989.	5115553.	5.4175625	0.0021061	-0.001636	3.9993841	16.0446605	60.5336964 C
0.0003988	2037.	5108059.	5.3993655	0.0021530	-0.001685	3.9994985	16.2469599	61.8804083 C
0.0004088	2085.	5100730.	5.3821780	0.0022000	-0.001734	3.9995176	16.4506707	63.2285317 C
0.0004188	2133.	5093556.	5.3659276	0.0022470	-0.001783	3.9994468	16.6557932	64.5780666 C
0.0004288	2181.	5086532.	5.3505470	0.0022940	-0.001833	3.9992673	16.8623048	65.9289907 C
0.0004388	2229.	5079642.	5.3359442	0.0023411	-0.001882	3.9989358	17.0697926	67.2808910 C
0.0004488	2276.	5072884.	5.3220514	0.0023883	-0.001931	3.9983849	17.2780503	68.6335612 C
0.0004588	2324.	5066268.	5.3088605	0.0024354	-0.001980	3.9999914	17.4875875	69.9875109 C
0.0004688	2372.	5059789.	5.2963254	0.0024827	-0.002029	3.9998187	17.6983890	71.3427249 C

0.0004788	2419.	5053452.	5.2843987	0.0025299	-0.002078	3.9993241	17.9103672	72.6991157 C
0.0004888	2467.	5047258.	5.2730389	0.0025772	-0.002127	3.9983572	18.1234642	74.0566252 C
0.0004988	2514.	5041199.	5.2622111	0.0026245	-0.002176	3.9999620	18.3376663	75.4152398 C
0.0005088	2562.	5035270.	5.2518835	0.0026719	-0.002225	3.9994392	18.5529672	76.7749532 C
0.0005188	2609.	5029475.	5.2420003	0.0027193	-0.002274	3.9981329	18.7689638	78.1353622 C
0.0005288	2656.	5023800.	5.2325255	0.0027667	-0.002323	3.9998834	18.9854913	79.4963022 C
0.0005388	2703.	5017324.	5.2238112	0.0028143	-0.002371	3.9989018	19.2084046	80.0000000 CY
0.0005488	2749.	5009133.	5.2161832	0.0028624	-0.002419	3.9999989	19.4435510	80.0000000 CY
0.0006088	2987.	4906211.	5.2000313	0.0031655	-0.002694	3.9982834	21.2843569	80.0000000 CY
0.0006688	3166.	4734491.	5.2170434	0.0034889	-0.002948	3.9983131	23.7121175	80.0000000 CY
0.0007288	3291.	4515698.	5.2289899	0.0038106	-0.003204	3.9999767	26.0920442	80.0000000 CY

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
1	143.100	2961.736	0.00300000	-0.00275652
2	201.200	2856.762	0.00300000	-0.00254389

Note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318,
or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	143.100000	2962.	93.015000	1925.	5102914.
2	0.65	201.200000	2857.	130.780000	1857.	5136967.
1	0.75	143.100000	2962.	107.325000	2221.	5064725.
2	0.75	201.200000	2857.	150.900000	2143.	5092143.
1	0.90	143.100000	2962.	128.790000	2666.	5013661.
2	0.90	201.200000	2857.	181.080000	2571.	5034121.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	5.000000 ft
Shaft Diameter	=	8.625000 in
Concrete Cover Thickness (to edge of long. rebar)	=	3.000000 in
Number of Reinforcing Bars	=	1 bar
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	58.426260 sq. in.
Total Area of Reinforcing Steel	=	2.250000 sq. in.
Area Ratio of Steel Reinforcement	=	3.85 percent
Edge-to-Edge Bar Spacing	=	-1.69300 in
Maximum Concrete Aggregate Size	=	0.250000 in
Ratio of Bar Spacing to Aggregate Size	=	-6.77
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	325.999 kips
Tensile Load for Cracking of Concrete	=	-30.892 kips
Nominal Axial Tensile Capacity	=	-135.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.693000	2.250000	0.00000	0.00000

NOTE: The positions of the above rebars were computed by LPile

Concrete Properties:

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.34165 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.250000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	143.100
2	201.200

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 143.100 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
0.00000125	1.0552685	844215.	428.2579786	0.0005353	0.0005245	1.9480628	15.3977259	
0.00000250	2.1040410	841616.	216.2876300	0.0005407	0.0005192	1.9642600	15.4276016	
0.00000375	3.1527952	840745.	145.6319215	0.0005461	0.0005138	1.9804051	15.4575941	
0.00000500	4.2015220	840304.	110.3048729	0.0005515	0.0005084	1.9964980	15.4877035	
0.00000625	5.2502121	840034.	89.1092884	0.0005569	0.0005030	2.0125387	15.5179296	
0.00000750	6.2988562	839847.	74.9794359	0.0005623	0.0004977	2.0285268	15.5482727	
0.00000875	7.3474452	839708.	64.8871446	0.0005678	0.0004923	2.0444623	15.5787325	
0.00001000	8.3959698	839597.	57.3183291	0.0005732	0.0004869	2.0603450	15.6093092	
0.00001125	9.4444209	839504.	51.4318307	0.0005786	0.0004816	2.0761749	15.6400028	
0.00001250	10.4927891	839423.	46.7229544	0.0005840	0.0004762	2.0919516	15.6708132	
0.00001375	11.5410654	839350.	42.8705305	0.0005895	0.0004709	2.1076752	15.7017405	
0.00001500	12.5892404	839283.	39.6604459	0.0005949	0.0004655	2.1233454	15.7327846	
0.00001625	13.6373050	839219.	36.9444686	0.0006003	0.0004602	2.1389622	15.7639457	
0.00001750	14.6852499	839157.	34.6167183	0.0006058	0.0004549	2.1545253	15.7952236	
0.00001875	15.7330659	839097.	32.5995497	0.0006112	0.0004495	2.1700346	15.8266185	
0.00002000	16.7807437	839037.	30.8347288	0.0006167	0.0004442	2.1854900	15.8581302	
0.00002125	17.8282743	838978.	29.2777236	0.0006222	0.0004389	2.2008913	15.8897589	
0.00002250	18.8756482	838918.	27.8938982	0.0006276	0.0004336	2.2162384	15.9215046	
0.00002375	19.9228563	838857.	26.6559084	0.0006331	0.0004282	2.2315311	15.9533671	
0.00002500	20.9698894	838796.	25.5418789	0.0006385	0.0004229	2.2467693	15.9853467	
0.00002625	22.0167383	838733.	24.5341012	0.0006440	0.0004176	2.2619529	16.0174432	
0.00002750	23.0633936	838669.	23.6180863	0.0006495	0.0004123	2.2770816	16.0496567	
0.00002875	24.1098462	838603.	22.7818652	0.0006550	0.0004070	2.2921554	16.0819872	

0.00003000	25.1560867	838536.	22.0154638	0.0006605	0.0004017	2.3071741	16.1144348
0.00003125	26.2021061	838467.	21.3105036	0.0006660	0.0003964	2.3221376	16.1469994
0.00003250	27.2478950	838397.	20.6598953	0.0006714	0.0003911	2.3370457	16.1796811
0.00003375	28.2934441	838324.	20.0575999	0.0006769	0.0003859	2.3518982	16.2124798
0.00003500	29.3387443	838250.	19.4984409	0.0006824	0.0003806	2.3666950	16.2453957
0.00003625	30.3837863	838173.	18.9779560	0.0006880	0.0003753	2.3814361	16.2784287
0.00003750	31.4285607	838095.	18.4922779	0.0006935	0.0003700	2.3961211	16.3115788
0.00003875	32.4730585	838014.	18.0380381	0.0006990	0.0003648	2.4107501	16.3448462
0.00004000	33.5172703	837932.	17.6122893	0.0007045	0.0003595	2.4253227	16.3782307
0.00004125	34.5611867	837847.	17.2124414	0.0007100	0.0003542	2.4398390	16.4117324
0.00004250	35.6047987	837760.	16.8362092	0.0007155	0.0003490	2.4542987	16.4453513
0.00004375	36.6480969	837671.	16.4815683	0.0007211	0.0003437	2.4687017	16.4790876
0.00004500	37.6910720	837579.	16.1467196	0.0007266	0.0003385	2.4830478	16.5129411
0.00004625	38.7337147	837486.	15.8300583	0.0007321	0.0003332	2.4973369	16.5469119
0.00004750	39.7760159	837390.	15.5301486	0.0007377	0.0003280	2.5115689	16.5810001
0.00004875	40.8179661	837292.	15.2457019	0.0007432	0.0003228	2.5257436	16.6152057
0.00005125	42.9007766	837088.	14.7186718	0.0007543	0.0003123	2.5539205	16.6839691
0.00005375	44.9820719	836876.	14.2409692	0.0007655	0.0003019	2.5818664	16.7532023
0.00005625	47.0617777	836654.	13.8060173	0.0007766	0.0002914	2.6095802	16.8229057
0.00005875	49.1398193	836422.	13.4083586	0.0007877	0.0002810	2.6370607	16.8930794
0.00006125	51.2161223	836182.	13.0434268	0.0007989	0.0002706	2.6643066	16.9637238
0.00006375	53.2906121	835931.	12.7073719	0.0008101	0.0002603	2.6913169	17.0348392
0.00006625	55.3632138	835671.	12.3969250	0.0008213	0.0002499	2.7180903	17.1064258
0.00006875	57.4338527	835401.	12.1092925	0.0008325	0.0002395	2.7446256	17.1784841
0.00007125	59.5024540	835122.	11.8420731	0.0008437	0.0002292	2.7709217	17.2510142
0.00007375	61.5689426	834833.	11.5931911	0.0008550	0.0002189	2.7969773	17.3240166
0.00007625	63.6332434	834534.	11.3608430	0.0008663	0.0002086	2.8227913	17.3974917
0.00007875	65.6952814	834226.	11.1434543	0.0008775	0.0001983	2.8483624	17.4714397
0.00008125	67.7549812	833907.	10.9396442	0.0008888	0.0001881	2.8736895	17.5458610
0.00008375	69.8122674	833579.	10.7481969	0.0009002	0.0001778	2.8987713	17.6207562
0.00008625	71.8670647	833241.	10.5680376	0.0009115	0.0001676	2.9236066	17.6961255
0.00008875	73.9192974	832893.	10.3982126	0.0009228	0.0001574	2.9481943	17.7719694
0.00009125	75.9688898	832536.	10.2378725	0.0009342	0.0001472	2.9725332	17.8482883
0.00009375	78.0157662	832168.	10.0862588	0.0009456	0.0001370	2.9966219	17.9250827
0.00009625	80.0598505	831791.	9.9426916	0.0009570	0.0001268	3.0204594	18.0023530
0.00009875	82.1010667	831403.	9.8065600	0.0009684	0.0001167	3.0440443	18.0800997
0.0001013	84.1393387	831006.	9.6773133	0.0009798	0.0001065	3.0673756	18.1583233
0.0001038	86.1745901	830598.	9.5544541	0.0009913	0.00009643	3.0904518	18.2370243
0.0001063	88.2067445	830181.	9.4375316	0.0010027	0.00008633	3.1132720	18.3162032
0.0001088	90.2357252	829754.	9.3261366	0.0010142	0.00007625	3.1358347	18.3958605
0.0001113	92.2614556	829316.	9.2198965	0.0010257	0.00006618	3.1581387	18.4759968
0.0001138	94.2838588	828869.	9.1184716	0.0010372	0.00005613	3.1801829	18.5566126
0.0001163	96.3028577	828412.	9.0215516	0.0010488	0.00004610	3.2019661	18.6377085
0.0001188	98.3183752	827944.	8.9288519	0.0010603	0.00003608	3.2234868	18.7192850
0.0001213	100.3303339	827467.	8.8401118	0.0010719	0.00002608	3.2447441	18.8013428
0.0001238	102.3386563	826979.	8.7550915	0.0010834	0.00001610	3.2657365	18.8838825
0.0001263	104.3432648	826481.	8.6735700	0.0010950	0.00000613	3.2864628	18.9669047
0.0001288	106.3440815	825973.	8.5953438	0.0011067	-0.00000382	3.3069218	19.0504100
0.0001313	108.3409712	825455.	8.5202243	0.0011183	-0.00001375	3.3271121	19.1343973
0.0001338	110.3336852	824925.	8.4480361	0.0011299	-0.00002367	3.3470322	19.2188617
0.0001363	112.3219047	824381.	8.3786159	0.0011416	-0.00003357	3.3666803	19.3037962
0.0001388	114.3052801	823822.	8.3118120	0.0011533	-0.00004345	3.3860548	19.3891922
0.0001413	116.2834496	823246.	8.2474833	0.0011650	-0.00005332	3.4051537	19.4750407

0.0001438	118.2560839	822651.	8.1854987	0.0011767	-0.00006318	3.4239756	19.5613334	
0.0001463	120.2228343	822036.	8.1257359	0.0011884	-0.00007302	3.4425186	19.6480614	
0.0001488	122.1833401	821401.	8.0680805	0.0012001	-0.00008284	3.4607811	19.7352147	
0.0001588	127.9830077	806192.	7.8414955	0.0012448	-0.000124	3.5275275	20.0188111	C
0.0001688	134.0959281	794643.	7.6453036	0.0012901	-0.000165	3.5906761	20.3197245	C
0.0001788	139.7086070	781587.	7.4688718	0.0013351	-0.000207	3.6488044	20.6092780	C
0.0001888	144.8651147	767497.	7.3091610	0.0013796	-0.000248	3.7020523	20.8880276	C
0.0001988	149.6182580	752796.	7.1638625	0.0014238	-0.000290	3.7505759	21.1572134	C
0.0002088	154.0231375	737835.	7.0311968	0.0014678	-0.000333	3.7945310	21.4186015	C
0.0002188	158.0726811	722618.	6.9092064	0.0015114	-0.000375	3.8339542	21.6707660	C
0.0002288	161.8379693	707488.	6.7969594	0.0015548	-0.000418	3.8690203	21.9168121	C
0.0002388	165.3376840	692514.	6.6932919	0.0015980	-0.000461	3.8998001	22.1571537	C
0.0002488	168.5869764	677737.	6.5972072	0.0016411	-0.000504	3.9263559	22.3920734	C
0.0002588	171.6005180	663190.	6.5078666	0.0016839	-0.000548	3.9487463	22.6218677	C
0.0002688	174.4080844	648960.	6.4247132	0.0017266	-0.000591	3.9670424	22.8480661	C
0.0002788	177.0132274	635025.	6.3470491	0.0017692	-0.000635	3.9812767	23.0704095	C
0.0002888	179.4340474	621417.	6.2744123	0.0018117	-0.000679	3.9914934	23.2898052	C
0.0002988	181.6876956	608160.	6.2064151	0.0018542	-0.000723	3.9977247	23.5072677	C
0.0003088	183.7892422	595269.	6.1427220	0.0018966	-0.000766	3.9999897	23.7238298	C
0.0003188	185.7419644	582720.	6.0830436	0.0019390	-0.000810	3.9997111	23.9405610	C
0.0003288	187.5135279	570383.	6.0266944	0.0019813	-0.000854	3.9999798	24.1544177	C
0.0003388	189.1580885	558400.	5.9739022	0.0020237	-0.000898	3.9993894	24.3705364	C
0.0003488	190.6647699	546709.	5.9241837	0.0020661	-0.000942	3.9997218	24.5871209	C
0.0003588	192.0393371	535301.	5.8772221	0.0021085	-0.000986	3.9998902	24.8035510	C
0.0003688	193.3128539	524238.	5.8330580	0.0021509	-0.001030	3.9999639	25.0226596	C
0.0003788	194.4630385	513434.	5.7911269	0.0021934	-0.001073	3.9999883	25.2406796	C
0.0003888	195.5292964	502969.	5.7516222	0.0022359	-0.001117	3.9999936	25.4617338	C
0.0003988	196.4972363	492783.	5.7141073	0.0022785	-0.001161	3.9999879	25.6828848	C
0.0004088	197.3815272	482891.	5.6785327	0.0023211	-0.001204	3.9999615	25.9052777	C
0.0004188	198.2056783	473327.	5.6449625	0.0023638	-0.001248	3.9998870	26.1313774	C
0.0004288	198.9317587	463981.	5.6127201	0.0024065	-0.001292	3.9997114	26.3545164	C
0.0004388	199.6131738	454959.	5.5822959	0.0024492	-0.001335	3.9993742	26.5820803	C
0.0004488	200.2361802	446209.	5.5533314	0.0024921	-0.001378	3.9987875	26.8110117	C
0.0004588	200.7866129	437682.	5.5255196	0.0025348	-0.001422	3.9999792	27.0384708	C
0.0004688	201.2985579	429437.	5.4991965	0.0025777	-0.001465	3.9997107	27.2700362	C
0.0004788	201.7730006	421458.	5.4741750	0.0026208	-0.001508	3.9990273	27.5044043	C
0.0004888	202.1788968	413665.	5.4499108	0.0026636	-0.001552	3.9999930	27.7349935	C
0.0004988	202.5513478	406118.	5.4268841	0.0027067	-0.001595	3.9996174	27.9694092	C
0.0005088	202.8984884	398818.	5.4049755	0.0027498	-0.001638	3.9985411	28.2069655	C
0.0005188	203.2064719	391723.	5.3839708	0.0027929	-0.001681	3.9998749	28.4454133	C
0.0005288	203.4652748	384804.	5.3636167	0.0028360	-0.001724	3.9989363	28.6816537	C
0.0005388	203.7026762	378102.	5.3442005	0.0028792	-0.001768	3.9999578	28.9207426	C
0.0005488	203.9154305	371600.	5.3256926	0.0029225	-0.001810	3.9990730	29.1630236	C
0.0006088	204.6671216	336209.	5.2284973	0.0031828	-0.002068	3.9979891	30.6358303	C
0.0006688	204.7273460	306134.	5.1506465	0.0034445	-0.002323	3.9991207	32.1455602	C
0.0007288	204.7273460	280929.	5.0873163	0.0037074	-0.002578	3.9987681	33.6912433	C
0.0007888	204.7273460	259559.	5.0577672	0.0039893	-0.002814	3.9982109	35.7892378	C

Axial Thrust Force = 201.200 kips

Bending Curvature	Bending Moment	Bending Stiffness	Depth to N Axis	Max Comp Strain	Max Tens Strain	Max Conc Stress	Max Steel Stress	Run Msg

rad/in.	in-kip	kip-in2	in	in/in	in/in	ksi	ksi
0.00000125	0.8571550	685724.	639.6456584	0.0007996	0.0007888	2.6722224	23.0605293
0.00000250	1.7044643	681786.	321.9818619	0.0008050	0.0007834	2.6852478	23.0904334
0.00000375	2.5517522	680467.	216.0951805	0.0008104	0.0007780	2.6982203	23.1204735
0.00000500	3.3990082	679802.	163.1527779	0.0008158	0.0007726	2.7111398	23.1506497
0.00000625	4.2462214	679395.	131.3880868	0.0008212	0.0007673	2.7240061	23.1809619
0.00000750	5.0933812	679117.	110.2122516	0.0008266	0.0007619	2.7368190	23.2114101
0.00000875	5.9404768	678912.	95.0871911	0.0008320	0.0007565	2.7495784	23.2419943
0.00001000	6.7874974	678750.	83.7438649	0.0008374	0.0007512	2.7622840	23.2727146
0.00001125	7.6344324	678616.	74.9216948	0.0008429	0.0007458	2.7749359	23.3035709
0.00001250	8.4812710	678502.	67.8643342	0.0008483	0.0007405	2.7875336	23.3345634
0.00001375	9.3280024	678400.	62.0904713	0.0008537	0.0007352	2.8000772	23.3656919
0.00001500	10.1746160	678308.	57.2792317	0.0008592	0.0007298	2.8125664	23.3969565
0.00001625	11.0211010	678222.	53.2084716	0.0008646	0.0007245	2.8250011	23.4283571
0.00001750	11.8674467	678140.	49.7195169	0.0008701	0.0007192	2.8373810	23.4598940
0.00001875	12.7136423	678061.	46.6960066	0.0008756	0.0007138	2.8497060	23.4915669
0.00002000	13.5596770	677984.	44.0506698	0.0008810	0.0007085	2.8619760	23.5233760
0.00002125	14.4055402	677908.	41.7167700	0.0008865	0.0007032	2.8741908	23.5553213
0.00002250	15.2512210	677832.	39.6424012	0.0008920	0.0006979	2.8863501	23.5874028
0.00002375	16.0967087	677756.	37.7865847	0.0008974	0.0006926	2.8984539	23.6196204
0.00002500	16.9419927	677680.	36.1165378	0.0009029	0.0006873	2.9105020	23.6519744
0.00002625	17.7870620	677602.	34.6057220	0.0009084	0.0006820	2.9224941	23.6844645
0.00002750	18.6319064	677524.	33.2324240	0.0009139	0.0006767	2.9344301	23.7170903
0.00002875	19.4765142	677444.	31.9787066	0.0009194	0.0006714	2.9463099	23.7498531
0.00003000	20.3208752	677363.	30.8296224	0.0009249	0.0006661	2.9581333	23.7827522
0.00003125	21.1649785	677279.	29.7726155	0.0009304	0.0006609	2.9699002	23.8157877
0.00003250	22.0088134	677194.	28.7970614	0.0009359	0.0006556	2.9816102	23.8489595
0.00003375	22.8523691	677107.	27.8939100	0.0009414	0.0006503	2.9932633	23.8822678
0.00003500	23.6956348	677018.	27.0554039	0.0009469	0.0006451	3.0048593	23.9157126
0.00003625	24.5385997	676927.	26.2748556	0.0009525	0.0006398	3.0163981	23.9492938
0.00003750	25.3812530	676833.	25.5464694	0.0009580	0.0006346	3.0278794	23.9830116
0.00003875	26.2235839	676738.	24.8651974	0.0009635	0.0006293	3.0393031	24.0168659
0.00004000	27.0655817	676640.	24.2266226	0.0009691	0.0006241	3.0506690	24.0508568
0.00004125	27.9072355	676539.	23.6268635	0.0009746	0.0006188	3.0619769	24.0849843
0.00004250	28.7485345	676436.	23.0624953	0.0009802	0.0006136	3.0732267	24.1192485
0.00004375	29.5894679	676331.	22.5304844	0.0009857	0.0006084	3.0844182	24.1536494
0.00004500	30.4300249	676223.	22.0281345	0.0009913	0.0006031	3.0955513	24.1881871
0.00004625	31.2701946	676112.	21.5530407	0.0009968	0.0005979	3.1066257	24.2228615
0.00004750	32.1099662	675999.	21.1030511	0.0010024	0.0005927	3.1176412	24.2576728
0.00004875	32.9493289	675884.	20.6762347	0.0010080	0.0005875	3.1285978	24.2926210
0.00005125	34.6267842	675645.	19.8853393	0.0010191	0.0005771	3.1503333	24.3629282
0.00005375	36.3024735	675395.	19.1683672	0.0010303	0.0005667	3.1718308	24.4337834
0.00005625	37.9763099	675134.	18.5154621	0.0010415	0.0005563	3.1930888	24.5051872
0.00005875	39.6482064	674863.	17.9184457	0.0010527	0.0005460	3.2141060	24.5771400
0.00006125	41.3180759	674581.	17.3704746	0.0010639	0.0005357	3.2348811	24.6496420
0.00006375	42.9858309	674288.	16.8657790	0.0010752	0.0005253	3.2554125	24.7226940
0.00006625	44.6513842	673983.	16.3994601	0.0010865	0.0005151	3.2756990	24.7962962
0.00006875	46.3146482	673668.	15.9673316	0.0010978	0.0005048	3.2957391	24.8704493
0.00007125	47.9755352	673341.	15.5657947	0.0011091	0.0004945	3.3155313	24.9451538
0.00007375	49.6339574	673003.	15.1917388	0.0011204	0.0004843	3.3350745	25.0204101
0.00007625	51.2898268	672653.	14.8424609	0.0011317	0.0004741	3.3543670	25.0962189
0.00007875	52.9430553	672293.	14.5156015	0.0011431	0.0004639	3.3734075	25.1725807

0.00008125	54.5935546	671921.	14.2090916	0.0011545	0.0004537	3.3921946	25.2494963
0.00008375	56.2412363	671537.	13.9211090	0.0011659	0.0004435	3.4107268	25.3269660
0.00008625	57.8860118	671142.	13.6500428	0.0011773	0.0004334	3.4290028	25.4049908
0.00008875	59.5277923	670736.	13.3944639	0.0011888	0.0004233	3.4470211	25.4835711
0.00009125	61.1664887	670318.	13.1530995	0.0012002	0.0004132	3.4647803	25.5627077
0.00009375	62.8020121	669888.	12.9248128	0.0012117	0.0004031	3.4822790	25.6424014
0.00009625	64.4342729	669447.	12.7085850	0.0012232	0.0003930	3.4995157	25.7226527
0.00009875	66.0631818	668994.	12.5035004	0.0012347	0.0003830	3.5164890	25.8034626
0.0001013	67.6886488	668530.	12.3087339	0.0012463	0.0003730	3.5331974	25.8848317
0.0001038	69.3105841	668054.	12.1235399	0.0012578	0.0003630	3.5496395	25.9667609
0.0001063	70.9288974	667566.	11.9472429	0.0012694	0.0003530	3.5658139	26.0492510
0.0001088	72.5434984	667067.	11.7792297	0.0012810	0.0003430	3.5817190	26.1323028
0.0001113	74.1542965	666555.	11.6189420	0.0012926	0.0003331	3.5973535	26.2159172
0.0001138	75.7612007	666033.	11.4658707	0.0013042	0.0003231	3.6127158	26.3000951
0.0001163	77.3641200	665498.	11.3195505	0.0013159	0.0003132	3.6278045	26.3848373
0.0001188	78.9629630	664951.	11.1795554	0.0013276	0.0003034	3.6426182	26.4701449
0.0001213	80.5576380	664393.	11.0454943	0.0013393	0.0002935	3.6571552	26.5560188
0.0001238	82.1480533	663823.	10.9170079	0.0013510	0.0002836	3.6714142	26.6424599
0.0001263	83.7341167	663241.	10.7937652	0.0013627	0.0002738	3.6853937	26.7294693
0.0001288	85.3157357	662646.	10.6754612	0.0013745	0.0002640	3.6990921	26.8170479
0.0001313	86.8928178	662041.	10.5618138	0.0013862	0.0002542	3.7125080	26.9051969
0.0001338	88.4652698	661423.	10.4525622	0.0013980	0.0002444	3.7256399	26.9939173
0.0001363	90.0329985	660793.	10.3474647	0.0014098	0.0002347	3.7384862	27.0832102
0.0001388	91.5959103	660151.	10.2462971	0.0014217	0.0002250	3.7510454	27.1730766
0.0001413	93.1539114	659497.	10.1488510	0.0014335	0.0002152	3.7633160	27.2635179
0.0001438	94.7069076	658831.	10.0549324	0.0014454	0.0002056	3.7752965	27.3545351
0.0001463	96.2548042	658153.	9.9643608	0.0014573	0.0001959	3.7869853	27.4461294
0.0001488	97.7975065	657462.	9.8769677	0.0014692	0.0001862	3.7983810	27.5383021
0.0001588	103.9144634	654579.	9.5561825	0.0015170	0.0001478	3.8410004	27.9128014
0.0001688	109.9406315	651500.	9.2753285	0.0015652	0.0001097	3.8788034	28.2966587
0.0001788	115.8697650	648222.	9.0277214	0.0016137	0.00007199	3.9116883	28.6899646
0.0001888	121.6955135	644744.	8.8080949	0.0016625	0.00003456	3.9395510	29.0928170
0.0001988	127.4114128	641064.	8.6122438	0.0017117	-0.00000254	3.9622857	29.5053214
0.0002088	133.0099221	637173.	8.4367634	0.0017612	-0.00003929	3.9797837	29.9275514
0.0002188	138.4788609	633046.	8.2788420	0.0018110	-0.00007572	3.9919333	30.3593926
0.0002288	143.8040278	628651.	8.1361444	0.0018611	-0.000112	3.9986234	30.8006303
0.0002388	147.3907160	617343.	7.9962674	0.0019091	-0.000150	3.9999271	31.1786331 C
0.0002488	151.4589833	608880.	7.8727241	0.0019583	-0.000187	3.9999897	31.5933336 C
0.0002588	155.1527583	599624.	7.7585425	0.0020075	-0.000224	3.9999975	32.0066273 C
0.0002688	158.5099197	589804.	7.6527857	0.0020567	-0.000261	3.9999868	32.4193563 C
0.0002788	161.5530007	579562.	7.5545050	0.0021058	-0.000298	3.9999119	32.8311813 C
0.0002888	164.3079861	569032.	7.4628860	0.0021549	-0.000336	3.9996451	33.2417833 C
0.0002988	166.7999534	558326.	7.3772429	0.0022040	-0.000373	3.9999781	33.6510273 C
0.0003088	169.0530679	547540.	7.2969981	0.0022529	-0.000410	3.9995746	34.0589265 C
0.0003188	171.0933333	536763.	7.2216485	0.0023019	-0.000447	3.9998761	34.4655391 C
0.0003288	172.9459668	526071.	7.1507657	0.0023508	-0.000485	3.9999877	34.8710326 C
0.0003388	174.6315717	515518.	7.0840054	0.0023997	-0.000522	3.9993306	35.2759127 C
0.0003488	176.1715705	505151.	7.0210687	0.0024486	-0.000559	3.9993401	35.6807420 C
0.0003588	177.5537793	494923.	6.9613823	0.0024974	-0.000597	3.9993954	36.0828833 C
0.0003688	178.8089821	484906.	6.9048230	0.0025462	-0.000634	3.9993569	36.4838467 C
0.0003788	179.9706427	475170.	6.8513498	0.0025949	-0.000672	3.9992204	36.8859027 C
0.0003888	180.9985029	465591.	6.8002674	0.0026436	-0.000709	3.9990860	37.2838976 C
0.0003988	181.9487510	456298.	6.7518234	0.0026923	-0.000747	3.9999946	37.6827750 C

0.0004088	182.8039074	447227.	6.7056182	0.0027409	-0.000785	3.9999071	38.0800927 C
0.0004188	183.5808448	438402.	6.6615348	0.0027895	-0.000822	3.9996461	38.4763770 C
0.0004288	184.2870612	429824.	6.6194330	0.0028381	-0.000860	3.9991091	38.8717337 C
0.0004388	184.9279370	421488.	6.5791720	0.0028866	-0.000898	3.9999931	39.2660921 C
0.0004488	185.4980279	413366.	6.5405927	0.0029351	-0.000935	3.9997278	39.6589776 C
0.0004588	186.0309739	405517.	6.5037736	0.0029836	-0.000973	3.9989659	40.0529179 C
0.0004688	186.4845075	397834.	6.4681841	0.0030320	-0.001011	3.9999517	40.4422111 C
0.0004788	186.9174088	390428.	6.4343194	0.0030804	-0.001049	3.9993546	40.8348084 C
0.0004888	187.2852348	383192.	6.4015019	0.0031287	-0.001087	3.9999986	41.2226079 C
0.0004988	187.6143348	376169.	6.3700427	0.0031771	-0.001125	3.9994930	41.6110198 C
0.0005088	187.9334403	369402.	6.3399706	0.0032255	-0.001163	3.9997308	42.0016499 C
0.0005188	188.1720630	362741.	6.3106085	0.0032736	-0.001201	3.9994548	42.3855187 C
0.0005288	188.4018983	356316.	6.2824676	0.0033219	-0.001239	3.9999990	42.7710839 C
0.0005388	188.6154926	350098.	6.2555569	0.0033702	-0.001277	3.9992240	43.1595470 C
0.0005488	188.7697876	344000.	6.2291708	0.0034183	-0.001315	3.9999564	43.5407510 C
0.0006088	189.2931003	310954.	6.0892254	0.0037068	-0.001544	3.9978853	45.8309101 C
0.0006688	189.2931003	283055.	6.0103134	0.0040194	-0.001749	3.9989975	48.8177235 C

Summary of Results for Nominal Moment Capacity for Section 2

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
1	143.100	204.139	0.00300000	-0.00188705
2	201.200	186.185	0.00300000	-0.00098596

Note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318,
or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	143.100000	204.139246	93.015000	132.690510	797298.
2	0.65	201.200000	186.184735	130.780000	121.020078	645148.

1	0.75	143.100000	204.139246	107.325000	153.104435	740956.
2	0.75	201.200000	186.184735	150.900000	139.638552	632089.
1	0.90	143.100000	204.139246	128.790000	183.725322	595661.
2	0.90	201.200000	186.184735	181.080000	167.566262	554658.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	230237.
2	14.0000	14.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.240000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 201200.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2400	-724716.	16315.	0.00	0.00	5.46E+09	0.00	0.00	0.00
0.1900	0.2397	-687476.	16292.	-2.95E-04	0.00	5.46E+09	-9.466	90.0592	0.00
0.3800	0.2387	-650154.	16257.	-5.73E-04	0.00	5.50E+09	-20.918	199.8418	0.00
0.5700	0.2370	-612817.	16195.	-8.34E-04	0.00	5.52E+09	-33.615	323.3313	0.00
0.7600	0.2349	-575538.	16104.	-0.00108	0.00	5.54E+09	-46.792	454.2718	0.00
0.9500	0.2321	-538394.	15982.	-0.00131	0.00	5.56E+09	-59.957	588.9319	0.00
1.1400	0.2289	-501461.	15831.	-0.00152	0.00	5.58E+09	-72.370	720.9021	0.00
1.3300	0.2252	-464809.	15652.	-0.00172	0.00	5.60E+09	-84.398	854.5406	0.00
1.5200	0.2210	-428510.	15447.	-0.00190	0.00	5.62E+09	-95.462	984.6331	0.00

1.7100	0.2165	-392627.	15218.	-0.00207	0.00	5.62E+09	-105.321	1109.	0.00
1.9000	0.2116	-357218.	14969.	-0.00222	0.00	5.62E+09	-113.698	1225.	0.00
2.0900	0.2064	-322334.	14701.	-0.00236	0.00	5.62E+09	-121.035	1337.	0.00
2.2800	0.2009	-288019.	14417.	-0.00248	0.00	5.62E+09	-127.847	1451.	0.00
2.4700	0.1951	-254316.	14119.	-0.00259	0.00	5.62E+09	-134.110	1567.	0.00
2.6600	0.1891	-221261.	13804.	-0.00269	0.00	5.62E+09	-142.155	1714.	0.00
2.8500	0.1828	-188905.	13472.	-0.00277	0.00	5.62E+09	-148.487	1852.	0.00
3.0400	0.1764	-157285.	13129.	-0.00284	0.00	5.62E+09	-152.813	1975.	0.00
3.2300	0.1699	-126431.	12777.	-0.00290	0.00	5.62E+09	-155.992	2094.	0.00
3.4200	0.1632	-96364.	12409.	-0.00294	0.00	5.62E+09	-166.782	2330.	0.00
3.6100	0.1565	-67146.	12017.	-0.00298	0.00	5.62E+09	-177.045	2580.	0.00
3.8000	0.1496	-38835.	11602.	-0.00300	0.00	5.62E+09	-186.606	2843.	0.00
3.9900	0.1428	-11488.	11167.	-0.00301	0.00	5.62E+09	-195.331	3119.	0.00
4.1800	0.1359	14846.	10709.	-0.00301	0.00	5.62E+09	-206.089	3457.	0.00
4.3700	0.1291	40106.	10227.	-0.00300	0.00	5.62E+09	-216.718	3828.	0.00
4.5600	0.1223	64232.	9722.	-0.00298	0.00	5.62E+09	-226.814	4230.	0.00
4.7500	0.1155	87167.	9194.	-0.00294	0.00	5.62E+09	-236.299	4664.	0.00
4.9400	0.1088	108857.	8645.	-0.00290	0.00	5.62E+09	-245.100	5135.	0.00
5.1300	0.1023	129253.	8077.	-0.00286	0.00	5.62E+09	-253.149	5644.	0.00
5.3200	0.09581	148309.	7492.	-0.00280	0.00	5.62E+09	-260.380	6196.	0.00
5.5100	0.08949	165984.	6891.	-0.00274	0.00	5.62E+09	-266.731	6795.	0.00
5.7000	0.08333	182241.	6276.	-0.00267	0.00	5.62E+09	-272.144	7446.	0.00
5.8900	0.07734	197050.	5651.	-0.00259	0.00	5.62E+09	-276.568	8153.	0.00
6.0800	0.07153	210384.	5016.	-0.00251	0.00	5.62E+09	-279.955	8924.	0.00
6.2700	0.06591	222224.	4375.	-0.00242	0.00	5.62E+09	-282.263	9764.	0.00
6.4600	0.06050	232555.	3731.	-0.00233	0.00	5.62E+09	-283.455	10682.	0.00
6.6500	0.05530	241369.	3084.	-0.00223	0.00	5.62E+09	-283.499	11688.	0.00
6.8400	0.05033	248665.	2439.	-0.00213	0.00	5.62E+09	-282.368	12791.	0.00
7.0300	0.04559	254446.	1798.	-0.00203	0.00	5.62E+09	-280.043	14005.	0.00
7.2200	0.04108	258724.	1164.	-0.00192	0.00	5.62E+09	-276.509	15345.	0.00
7.4100	0.03682	261517.	538.4900	-0.00182	0.00	5.62E+09	-271.753	16830.	0.00
7.6000	0.03279	262848.	-74.289	-0.00171	0.00	5.62E+09	-265.772	18479.	0.00
7.7900	0.02901	262749.	-672.031	-0.00161	0.00	5.62E+09	-258.563	20322.	0.00
7.9800	0.02547	261257.	-1252.	-0.00150	0.00	5.62E+09	-250.126	22390.	0.00
8.1700	0.02217	258416.	-1811.	-0.00139	0.00	5.62E+09	-240.466	24726.	0.00
8.3600	0.01912	254276.	-2347.	-0.00129	0.00	5.62E+09	-229.582	27383.	0.00
8.5500	0.01629	248896.	-2847.	-0.00119	0.00	5.62E+09	-208.962	29241.	0.00
8.7400	0.01370	242383.	-3290.	-0.00109	0.00	5.62E+09	-179.623	29891.	0.00
8.9300	0.01133	234892.	-3668.	-9.91E-04	0.00	5.62E+09	-151.811	30541.	0.00
9.1200	0.00918	226567.	-3984.	-8.97E-04	0.00	5.62E+09	-125.623	31190.	0.00
9.3100	0.00724	217547.	-4243.	-8.07E-04	0.00	5.62E+09	-101.138	31840.	0.00
9.5000	0.00550	207961.	-4447.	-7.21E-04	0.00	5.62E+09	-78.415	32490.	0.00
9.6900	0.00396	197929.	-4602.	-6.38E-04	0.00	5.62E+09	-57.498	33140.	0.00
9.8800	0.00259	187561.	-4712.	-5.60E-04	0.00	5.62E+09	-38.414	33790.	0.00
10.0700	0.00140	176958.	-4780.	-4.86E-04	0.00	5.62E+09	-21.175	34439.	0.00
10.2600	3.75E-04	166212.	-4810.	-4.16E-04	0.00	5.62E+09	-5.777	35089.	0.00
10.4500	-4.97E-04	155405.	-4808.	-3.51E-04	0.00	5.62E+09	7.7951	35739.	0.00
10.6400	-0.00123	144610.	-4777.	-2.90E-04	0.00	5.62E+09	19.5693	36389.	0.00
10.8300	-0.00182	133890.	-4721.	-2.34E-04	0.00	5.62E+09	29.5849	37039.	0.00
11.0200	-0.00229	123298.	-4644.	-1.82E-04	0.00	5.62E+09	37.8917	37688.	0.00
11.2100	-0.00265	112881.	-4550.	-1.34E-04	0.00	5.62E+09	44.5484	38338.	0.00
11.4000	-0.00290	102674.	-4442.	-8.99E-05	0.00	5.62E+09	49.6224	38988.	0.00
11.5900	-0.00306	92706.	-4325.	-5.03E-05	0.00	5.62E+09	53.1887	39638.	0.00

11.7800	-0.00313	82997.	-4202.	-1.46E-05	0.00	5.62E+09	55.3289	40288.	0.00
11.9700	-0.00313	73560.	-4074.	1.71E-05	0.00	5.62E+09	56.1310	40937.	0.00
12.1600	-0.00305	64401.	-3947.	4.51E-05	0.00	5.62E+09	55.6887	41587.	0.00
12.3500	-0.00292	55520.	-3822.	6.95E-05	0.00	5.62E+09	54.1007	42237.	0.00
12.5400	-0.00274	46910.	-3701.	9.02E-05	0.00	5.62E+09	51.4708	42887.	0.00
12.7300	-0.00251	38559.	-3588.	1.08E-04	0.00	5.62E+09	47.9071	43537.	0.00
12.9200	-0.00225	30449.	-3484.	1.22E-04	0.00	5.62E+09	43.5223	44186.	0.00
13.1100	-0.00195	22560.	-3391.	1.32E-04	0.00	5.62E+09	38.4334	44836.	0.00
13.3000	-0.00164	14867.	-3309.	1.40E-04	0.00	5.62E+09	32.7621	45486.	0.00
13.4900	-0.00132	7341.	-3242.	1.44E-04	0.00	5.62E+09	26.6344	46136.	0.00
13.6800	-9.84E-04	-47.522	-3188.	1.46E-04	0.00	5.62E+09	20.1817	46786.	0.00
13.8700	-6.51E-04	-7331.	-3150.	1.44E-04	0.00	5.62E+09	13.5401	47435.	0.00
14.0600	-3.25E-04	-14543.	-1283.	1.18E-04	0.00	6.78E+08	1624.	1.14E+07	0.00
14.2500	-1.10E-04	-13288.	1199.	7.17E-05	0.00	6.78E+08	552.4990	1.14E+07	0.00
14.4400	2.01E-06	-9141.	1818.	3.40E-05	0.00	6.78E+08	-10.051	1.14E+07	0.00
14.6300	4.45E-05	-5031.	1553.	1.02E-05	0.00	6.79E+08	-222.400	1.14E+07	0.00
14.8200	4.84E-05	-2070.	1023.	-1.73E-06	0.00	6.81E+08	-242.195	1.14E+07	0.00
15.0100	3.66E-05	-364.765	538.2687	-5.80E-06	0.00	6.86E+08	-182.993	1.14E+07	0.00
15.2000	2.20E-05	389.7916	204.2986	-5.76E-06	0.00	6.86E+08	-109.964	1.14E+07	0.00
15.3900	1.03E-05	572.1191	19.9911	-4.16E-06	0.00	6.86E+08	-51.710	1.14E+07	0.00
15.5800	3.03E-06	484.7666	-56.219	-2.40E-06	0.00	6.86E+08	-15.141	1.14E+07	0.00
15.7700	-6.10E-07	317.9634	-70.001	-1.07E-06	0.00	6.86E+08	3.0519	1.14E+07	0.00
15.9600	-1.84E-06	166.5405	-56.042	-2.62E-07	0.00	6.86E+08	9.1931	1.14E+07	0.00
16.1500	-1.80E-06	62.6529	-35.277	1.19E-07	0.00	6.86E+08	9.0216	1.14E+07	0.00
16.3400	-1.30E-06	5.5675	-17.611	2.33E-07	0.00	6.86E+08	6.4753	1.14E+07	0.00
16.5300	-7.44E-07	-17.865	-5.990	2.12E-07	0.00	6.86E+08	3.7179	1.14E+07	0.00
16.7200	-3.28E-07	-21.944	0.1151	1.46E-07	0.00	6.86E+08	1.6378	1.14E+07	0.00
16.9100	-7.79E-08	-17.475	2.4260	8.05E-08	0.00	6.86E+08	0.3893	1.14E+07	0.00
17.1000	3.93E-08	-10.955	2.6456	3.32E-08	0.00	6.86E+08	-0.197	1.14E+07	0.00
17.2900	7.35E-08	-5.441	2.0024	5.94E-09	0.00	6.86E+08	-0.368	1.14E+07	0.00
17.4800	6.64E-08	-1.830	1.2049	-6.15E-09	0.00	6.86E+08	-0.332	1.14E+07	0.00
17.6700	4.55E-08	0.05850	0.5672	-9.10E-09	0.00	6.86E+08	-0.227	1.14E+07	0.00
17.8600	2.49E-08	0.7652	0.1660	-7.73E-09	0.00	6.86E+08	-0.125	1.14E+07	0.00
18.0500	1.02E-08	0.8226	-0.03438	-5.09E-09	0.00	6.86E+08	-0.05110	1.14E+07	0.00
18.2400	1.74E-09	0.6131	-0.103	-2.70E-09	0.00	6.86E+08	-0.00871	1.14E+07	0.00
18.4300	-2.09E-09	0.3574	-0.101	-1.09E-09	0.00	6.86E+08	0.01045	1.14E+07	0.00
18.6200	-3.21E-09	0.1554	-0.07036	-2.34E-10	0.00	6.86E+08	0.01606	1.14E+07	0.00
18.8100	-3.16E-09	0.03673	-0.03407	8.57E-11	0.00	6.86E+08	0.01578	1.14E+07	0.00
19.0000	-2.82E-09	0.00	0.00	1.47E-10	0.00	6.86E+08	0.01411	5700000.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.24000000 inches
Computed slope at pile head = 0.000000 radians
Maximum bending moment = -724716. inch-lbs

Maximum shear force = 16315. lbs
Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 7
Number of zero deflection points = 5

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.240000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 143100.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2400	-722221.	16422.	0.00	0.00	5.39E+09	0.00	0.00	0.00
0.1900	0.2397	-684756.	16399.	-2.98E-04	0.00	5.39E+09	-9.466	90.0600	0.00
0.3800	0.2386	-647245.	16365.	-5.79E-04	0.00	5.43E+09	-20.918	199.8488	0.00
0.5700	0.2370	-609754.	16303.	-8.42E-04	0.00	5.45E+09	-33.614	323.3555	0.00
0.7600	0.2348	-572355.	16211.	-0.00109	0.00	5.47E+09	-46.788	454.3299	0.00
0.9500	0.2320	-535122.	16089.	-0.00132	0.00	5.49E+09	-59.950	589.0450	0.00
1.1400	0.2288	-498127.	15938.	-0.00153	0.00	5.52E+09	-72.358	721.0933	0.00
1.3300	0.2251	-461441.	15760.	-0.00173	0.00	5.55E+09	-84.379	854.8350	0.00
1.5200	0.2209	-425133.	15555.	-0.00191	0.00	5.58E+09	-95.435	985.0545	0.00
1.7100	0.2163	-389263.	15326.	-0.00208	0.00	5.60E+09	-105.285	1110.	0.00
1.9000	0.2114	-353890.	15076.	-0.00223	0.00	5.66E+09	-113.652	1226.	0.00
2.0900	0.2062	-319060.	14809.	-0.00236	0.00	5.66E+09	-120.978	1338.	0.00
2.2800	0.2006	-284818.	14525.	-0.00249	0.00	5.66E+09	-127.779	1452.	0.00
2.4700	0.1948	-251202.	14227.	-0.00259	0.00	5.66E+09	-134.029	1568.	0.00
2.6600	0.1888	-218250.	13912.	-0.00269	0.00	5.66E+09	-142.060	1716.	0.00
2.8500	0.1826	-186008.	13581.	-0.00277	0.00	5.66E+09	-148.378	1853.	0.00
3.0400	0.1762	-154513.	13238.	-0.00284	0.00	5.66E+09	-152.690	1976.	0.00
3.2300	0.1696	-123792.	12886.	-0.00289	0.00	5.66E+09	-155.857	2095.	0.00
3.4200	0.1630	-93864.	12518.	-0.00294	0.00	5.66E+09	-166.637	2331.	0.00
3.6100	0.1562	-64790.	12127.	-0.00297	0.00	5.66E+09	-176.891	2582.	0.00
3.8000	0.1494	-36627.	11713.	-0.00299	0.00	5.67E+09	-186.445	2845.	0.00
3.9900	0.1426	-9429.	11278.	-0.00300	0.00	5.67E+09	-195.166	3121.	0.00
4.1800	0.1357	16756.	10820.	-0.00300	0.00	5.67E+09	-205.924	3459.	0.00
4.3700	0.1289	41868.	10339.	-0.00299	0.00	5.67E+09	-216.558	3830.	0.00
4.5600	0.1221	65850.	9833.	-0.00296	0.00	5.66E+09	-226.662	4232.	0.00
4.7500	0.1154	88644.	9306.	-0.00293	0.00	5.66E+09	-236.162	4666.	0.00
4.9400	0.1087	110199.	8757.	-0.00289	0.00	5.66E+09	-244.984	5136.	0.00
5.1300	0.1022	130465.	8190.	-0.00285	0.00	5.66E+09	-253.059	5645.	0.00
5.3200	0.09577	149400.	7604.	-0.00279	0.00	5.66E+09	-260.322	6197.	0.00
5.5100	0.08948	166961.	7003.	-0.00273	0.00	5.66E+09	-266.713	6796.	0.00
5.7000	0.08335	183114.	6389.	-0.00265	0.00	5.66E+09	-272.174	7445.	0.00

5.8900	0.07738	197828.	5763.	-0.00258	0.00	5.66E+09	-276.654	8152.	0.00
6.0800	0.07159	211078.	5129.	-0.00250	0.00	5.66E+09	-280.105	8921.	0.00
6.2700	0.06600	222844.	4487.	-0.00241	0.00	5.66E+09	-282.485	9759.	0.00
6.4600	0.06061	233112.	3842.	-0.00232	0.00	5.66E+09	-283.758	10675.	0.00
6.6500	0.05543	241875.	3195.	-0.00222	0.00	5.66E+09	-283.892	11677.	0.00
6.8400	0.05048	249130.	2549.	-0.00212	0.00	5.66E+09	-282.862	12777.	0.00
7.0300	0.04575	254882.	1906.	-0.00202	0.00	5.66E+09	-280.648	13986.	0.00
7.2200	0.04126	259142.	1270.	-0.00192	0.00	5.66E+09	-277.234	15319.	0.00
7.4100	0.03701	261926.	643.4867	-0.00181	0.00	5.66E+09	-272.611	16795.	0.00
7.6000	0.03299	263259.	28.5877	-0.00171	0.00	5.66E+09	-266.774	18435.	0.00
7.7900	0.02922	263170.	-571.617	-0.00160	0.00	5.66E+09	-259.722	20263.	0.00
7.9800	0.02569	261697.	-1154.	-0.00150	0.00	5.66E+09	-251.456	22314.	0.00
8.1700	0.02240	258882.	-1717.	-0.00139	0.00	5.66E+09	-241.982	24626.	0.00
8.3600	0.01935	254776.	-2256.	-0.00129	0.00	5.66E+09	-231.304	27251.	0.00
8.5500	0.01653	249433.	-2762.	-0.00119	0.00	5.66E+09	-212.048	29241.	0.00
8.7400	0.01394	242955.	-3212.	-0.00109	0.00	5.66E+09	-182.815	29891.	0.00
8.9300	0.01158	235495.	-3597.	-9.90E-04	0.00	5.66E+09	-155.093	30541.	0.00
9.1200	0.00943	227198.	-3921.	-8.97E-04	0.00	5.66E+09	-128.979	31190.	0.00
9.3100	0.00749	218201.	-4187.	-8.08E-04	0.00	5.66E+09	-104.551	31840.	0.00
9.5000	0.00575	208632.	-4400.	-7.22E-04	0.00	5.66E+09	-81.870	32490.	0.00
9.6900	0.00420	198609.	-4563.	-6.40E-04	0.00	5.66E+09	-60.979	33140.	0.00
9.8800	0.00283	188243.	-4680.	-5.62E-04	0.00	5.66E+09	-41.906	33790.	0.00
10.0700	0.00163	177635.	-4756.	-4.88E-04	0.00	5.66E+09	-24.663	34439.	0.00
10.2600	6.01E-04	166875.	-4794.	-4.19E-04	0.00	5.66E+09	-9.248	35089.	0.00
10.4500	-2.78E-04	156046.	-4800.	-3.54E-04	0.00	5.66E+09	4.3556	35739.	0.00
10.6400	-0.00101	145218.	-4777.	-2.93E-04	0.00	5.66E+09	16.1741	36389.	0.00
10.8300	-0.00162	134456.	-4728.	-2.37E-04	0.00	5.66E+09	26.2470	37039.	0.00
11.0200	-0.00209	123812.	-4659.	-1.85E-04	0.00	5.66E+09	34.6236	37688.	0.00
11.2100	-0.00246	113332.	-4572.	-1.37E-04	0.00	5.66E+09	41.3626	38338.	0.00
11.4000	-0.00272	103052.	-4472.	-9.39E-05	0.00	5.66E+09	46.5315	38988.	0.00
11.5900	-0.00289	93001.	-4362.	-5.44E-05	0.00	5.66E+09	50.2051	39638.	0.00
11.7800	-0.00297	83198.	-4245.	-1.89E-05	0.00	5.66E+09	52.4658	40288.	0.00
11.9700	-0.00297	73657.	-4124.	1.26E-05	0.00	5.66E+09	53.4021	40937.	0.00
12.1600	-0.00291	64384.	-4003.	4.04E-05	0.00	5.66E+09	53.1083	41587.	0.00
12.3500	-0.00279	55378.	-3883.	6.45E-05	0.00	5.66E+09	51.6844	42237.	0.00
12.5400	-0.00262	46634.	-3768.	8.50E-05	0.00	5.66E+09	49.2352	42887.	0.00
12.7300	-0.00240	38140.	-3660.	1.02E-04	0.00	5.67E+09	45.8706	43537.	0.00
12.9200	-0.00215	29880.	-3560.	1.16E-04	0.00	5.67E+09	41.7050	44186.	0.00
13.1100	-0.00187	21832.	-3470.	1.26E-04	0.00	5.67E+09	36.8576	44836.	0.00
13.3000	-0.00158	13973.	-3392.	1.33E-04	0.00	5.67E+09	31.4523	45486.	0.00
13.4900	-0.00127	6275.	-3327.	1.37E-04	0.00	5.67E+09	25.6178	46136.	0.00
13.6800	-9.50E-04	-1290.	-3276.	1.38E-04	0.00	5.67E+09	19.4882	46786.	0.00
13.8700	-6.35E-04	-8754.	-3239.	1.36E-04	0.00	5.67E+09	13.2030	47435.	0.00
14.0600	-3.28E-04	-16147.	-1357.	1.13E-04	0.00	8.39E+08	1638.	1.14E+07	0.00
14.2500	-1.20E-04	-15014.	1197.	7.04E-05	0.00	8.39E+08	602.4039	1.14E+07	0.00
14.4400	-6.45E-06	-10736.	1920.	3.54E-05	0.00	8.39E+08	32.2428	1.14E+07	0.00
14.6300	4.11E-05	-6280.	1723.	1.23E-05	0.00	8.40E+08	-205.492	1.14E+07	0.00
14.8200	4.98E-05	-2887.	1205.	-1.10E-07	0.00	8.41E+08	-248.867	1.14E+07	0.00
15.0100	4.06E-05	-785.785	689.7733	-5.09E-06	0.00	8.44E+08	-202.993	1.14E+07	0.00
15.2000	2.66E-05	261.2851	306.8263	-5.79E-06	0.00	8.44E+08	-132.926	1.14E+07	0.00
15.3900	1.42E-05	617.1234	74.4611	-4.61E-06	0.00	8.44E+08	-70.903	1.14E+07	0.00
15.5800	5.58E-06	603.8341	-38.153	-2.96E-06	0.00	8.44E+08	-27.881	1.14E+07	0.00
15.7700	6.90E-07	445.0753	-73.871	-1.54E-06	0.00	8.44E+08	-3.450	1.14E+07	0.00

15.9600	-1.46E-06	267.9895	-69.507	-5.79E-07	0.00	8.44E+08	7.2779	1.14E+07	0.00
16.1500	-1.95E-06	128.5012	-50.090	-4.38E-08	0.00	8.44E+08	9.7549	1.14E+07	0.00
16.3400	-1.66E-06	39.6097	-29.535	1.83E-07	0.00	8.44E+08	8.2756	1.14E+07	0.00
16.5300	-1.12E-06	-6.297	-13.743	2.28E-07	0.00	8.44E+08	5.5767	1.14E+07	0.00
16.7200	-6.14E-07	-23.208	-3.884	1.88E-07	0.00	8.44E+08	3.0718	1.14E+07	0.00
16.9100	-2.56E-07	-24.130	1.0787	1.24E-07	0.00	8.44E+08	1.2813	1.14E+07	0.00
17.1000	-4.68E-08	-18.370	2.8059	6.71E-08	0.00	8.44E+08	0.2338	1.14E+07	0.00
17.2900	4.96E-08	-11.379	2.7894	2.69E-08	0.00	8.44E+08	-0.248	1.14E+07	0.00
17.4800	7.60E-08	-5.668	2.0734	3.89E-09	0.00	8.44E+08	-0.380	1.14E+07	0.00
17.6700	6.74E-08	-1.927	1.2563	-6.36E-09	0.00	8.44E+08	-0.337	1.14E+07	0.00
17.8600	4.70E-08	0.06481	0.6045	-8.88E-09	0.00	8.44E+08	-0.235	1.14E+07	0.00
18.0500	2.69E-08	0.8359	0.1835	-7.66E-09	0.00	8.44E+08	-0.135	1.14E+07	0.00
18.2400	1.20E-08	0.9068	-0.03833	-5.31E-09	0.00	8.44E+08	-0.06008	1.14E+07	0.00
18.4300	2.70E-09	0.6646	-0.122	-3.19E-09	0.00	8.44E+08	-0.01352	1.14E+07	0.00
18.6200	-2.51E-09	0.3515	-0.123	-1.81E-09	0.00	8.44E+08	0.01257	1.14E+07	0.00
18.8100	-5.57E-09	0.1034	-0.07725	-1.20E-09	0.00	8.44E+08	0.02784	1.14E+07	0.00
19.0000	-7.98E-09	0.00	0.00	-1.06E-09	0.00	8.44E+08	0.03992	5700000.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     0.24000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =       -722221. inch-lbs
Maximum shear force              =         16422. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              5
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

```
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians
```

Load Case	Load Type	Pile-head	Load Type	Pile-head	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max Shear in Pile	Max Moment in Pile

No.	1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1	y, in	0.2400	S, rad	0.00	201200.	0.2400	0.00	16315.	-724716.
2	y, in	0.2400	S, rad	0.00	143100.	0.2400	0.00	16422.	-722221.

Maximum pile-head deflection = 0.2400000000 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

nobis

MassDOT East Oxbow Road over Oxbow Brook (Bridge No. C-05-042) Charlemont, Massachusetts

Calculated by: JDV Date: 12/02/2019
Checked by: RAC Date: 11/19/2021

Seismic Site Classification Evaluation - Bridge replacement over Oxbow Brook.

Objective: Evaluate seismic site classification for proposed bridge reconstruction.

References:

1) AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2nd Edition, 2011.
2) Boring Logs observed by Nobis, December 2018, April 2019 and November 2019.
3) MassDOT LRFD Bridge Manual, 2013.

Solution: AASHTO Section 3.4 was used to evaluate the seismic site classification for the proposed reconstruction of East Oxbow Road bridge over Oxbow Brook, as follows:

Step 1: Check for the four categories of Site Class F as described in attached AASHTO Site Classification, as follows:

1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils (per Article 6.8), quick and highly sensitive clays, collapsible weakly cemented soils.
2. Peats and/or highly organic clays (H>10 ft [3m] of peat and/or highly organic clay, where H = thickness of soil).
3. Very high plasticity clays (H>25 ft [7.6m] with PI >75).
4. Very thick soft/medium stiff clays (H > 120 ft [37m]).

Soil conditions for Site Class F were not shown on the Nobis boring logs.

Step 2: Check for Site Class E described as a soil profile with N-Bar less than 15 blows/ft or any profile with more than 10-ft of soft clay defined as soil with PI >20, ω>=40%, and Su <0.5 ksf (25 kPa). See attached AASHTO Table 3.4.2.1-1 Site Class Definitions.

Soil conditions for Site Class E were not shown on the Nobis boring logs.

Step 3: Categorize the site using one of three methods as described in AASHTO Section 3.4.2.1.

Method 2 (N-bar Method) was used to determine the "average" Standard Penetration Test (SPT) blow count (blows/ft) for the upper 100 ft of the soil profile using the Nobis borings. See attached Table 3.4.2.1-1. The Nobis borings were performed in general accordance with ASTM D1586. Samples were obtained using a 1-3/8" diameter sampler driven with a 140-lb automatic hammer dropping a distance of 30 inches. The N-bar value was calculated using equation 3.4.2.2-2 from Reference 1.

Table 1: Summary of Seismic Site Classification

Boring No.	N_{bar} (bpf)	Site Class	Comments
BB-1	**49**	Site Class D - Stiff Soil	Boring terminated at 37.0 ft bgs in Bedrock.
BB-2	**74**	Site Class C - Very Dense Soil & Soft Rock	Boring terminated at 35.0 ft bgs in Bedrock.
BB-3	**62**	Site Class C - Very Dense Soil & Soft Rock	Boring terminated at 34.0 ft bgs in Bedrock.
BB-4	**42**	Site Class D - Stiff Soil	Boring terminated at 43.0 ft bgs in Bedrock.
BB-5	**70**	Site Class C - Very Dense Soil & Soft Rock	Boring terminated at 30.7 ft bgs in Bedrock.
BB-6	**70**	Site Class C - Very Dense Soil & Soft Rock	Boring terminated at 29.5 ft bgs in Bedrock.
BB-7	**85**	Site Class C - Very Dense Soil & Soft Rock	Boring terminated at 31.0 ft bgs in Bedrock.

Conclusion:

Based on the Nobis boring logs, SPT blow counts for the site ranges from 6 bpf to 58 bpf with an average N-bar value of 65 bpf. The recommended seismic site classification for the proposed bridge over Oxbow Brook site is **Site Class C**. The calculated average N-bar values for the borings are summarized in the following table. See attached tables presenting the value of SPT-N vs. depth for the respective borings. This site is a **SEISMIC DESIGN CATEGORY A**.

Sample Calculation: Consider Boring BB-2

Determine the Average SPT, N-bar: Use the average N value of each layer, N_{60},for each layer provided in the table toward the end of this report.

$$\overline{N} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{N_i}}$$

$$\overline{N} = \frac{3' + 22.7' + 74.3'}{\frac{3'}{58} + \frac{22.7'}{41} + \frac{74.3'}{100}} = 74\ bpf$$ (3.4.2.2-2, Reference 1)

Determine the site class for this boring using the Site Definitions, Table 3.4.2.1-1 in Reference 1

Boring BB-2 is classified as **Site Class C** as its standard penetration resistance of 74 bpf, above 50 bpf.

nobis

MassDOT East Oxbow Road
over Oxbow Brook
(Bridge No. C-05-042)
Charlemont, Massachusetts
Page: 3 of 6

Calculated by: JDV Date: 12/02/2019
Checked by: RAC Date: 11/19/2021

Data from Boring BB-1

Layer	Depth Range Start [ft]	Depth Range End [ft]	Thickness (d_i) [ft]	N_{60} blows/ft	d_i/N_i	Comments
1	0	4.3	4.3	16	0.277	Fill
2	4.3	26	21.7	22	1.009	Glacial Till
3	26	100	74	100	0.740	Bedrock
SUM			**100**		**2.027**	

N bar	49	Site Class D - Stiff Soil

Data from Boring BB-2

Layer	Depth Range Start [ft]	Depth Range End [ft]	Thickness (d_i) [ft]	N_{60} blows/ft	d_i/N_i	Comments
1	0	3	3	58	0.052	Fill
2	3	25.7	22.7	41	0.556	Glacial Till
3	25.7	100	74.3	100	0.743	Bedrock
SUM			**100**		**1.351**	

N bar	74	Site Class C - Very Dense Soil & Soft Rock

Data from Boring BB-3

Layer	Depth Range Start [ft]	Depth Range End [ft]	Thickness (d_i) [ft]	N_{60} blows/ft	d_i/N_i	Comments
1	0	4	4	16	0.250	Fill
2	4	24	20	33	0.601	Glacial Till
3	24	100	76	100	0.760	Bedrock
SUM			**100**		**1.611**	

N bar	62	Site Class C - Very Dense Soil & Soft Rock

Data from Boring BB-4

Layer	Depth Range Start [ft]	Depth Range End [ft]	Thickness (d_i) [ft]	N_{60} blows/ft	d_i/N_i	Comments
1	0	4.5	4.5	7	0.643	Fill
2	4.5	33	28.5	26	1.084	Glacial Till
3	33	100	67	100	0.670	Bedrock
SUM			**100**		**2.397**	

N bar	42	Site Class D - Stiff Soil

nobis

MassDOT East Oxbow Road
over Oxbow Brook
(Bridge No. C-05-042)
Charlemont, Massachusetts
Page: 4 of 6

Calculated by: JDV Date: 12/02/2019
Checked by: RAC Date: 11/19/2021

Data from Boring BB-5

Layer	Depth Range Start [ft]	End [ft]	Thickness (d_i) [ft]	N_{60} blows/ft	d_i/N_i	Comments
1	0	0.5	0.5	9	0.056	Topsoil
2	0.5	21	20.5	35	0.591	Glacial Till
3	21	100	79	100	0.790	Bedrock
SUM			**100**		**1.436**	

N bar	70	Site Class C - Very Dense Soil & Soft Rock

Data from Boring BB-6

Layer	Depth Range Start [ft]	End [ft]	Thickness (d_i) [ft]	N_{60} blows/ft	d_i/N_i	Comments
1	0	4	4	13	0.308	Topsoil
2	4	26.3	22.3	59	0.381	Glacial Till
3	26.3	100	73.7	100	0.737	Bedrock
SUM			**100**		**1.425**	

N bar	70	Site Class C - Very Dense Soil & Soft Rock

Data from Boring BB-7

Layer	Depth Range Start [ft]	End [ft]	Thickness (d_i) [ft]	N_{60} blows/ft	d_i/N_i	Comments
1	0	7.5	7.5	46	0.165	Topsoil
2	7.5	28	20.5	71	0.288	Glacial Till
3	28	100	72	100	0.720	Bedrock
SUM			**100**		**1.173**	

N bar	85	Site Class C - Very Dense Soil & Soft Rock

Step 4: According to Reference 3, special consideration must be given to structures which are considered Critical Bridges. These include:

1. Bridges on or over the following National Highway System (NHS) routes:
   A. Eisenhower Interstate System.
   B. Other NHS Routes.
   C. All STRAHNET Routes and Connectors.
2. On designated emergency evacuation routes.

East Oxbow Road does not fall within the "National Highway System" and therefore will not be considered a critical/essential bridge per Section 3.1.2.

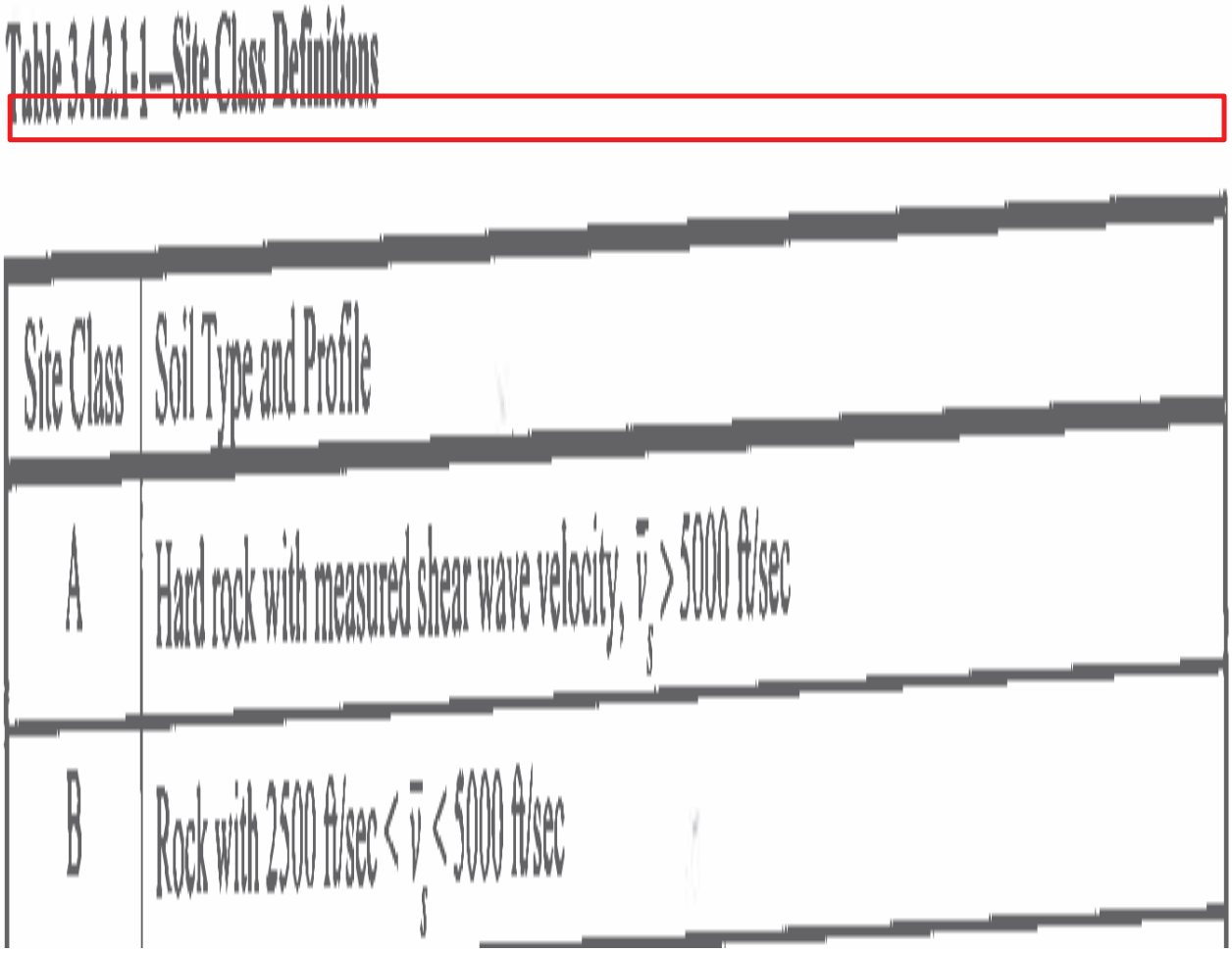

Table 3.4.2.1.—Site Class Definitions

Site Class	Soil Type and Profile
A	Hard rock with measured shear wave velocity, $\bar{v}_s > 5000$ ft/sec
B	Rock with 2500 ft/sec $< \bar{v}_s <$ 5000 ft/sec

Determination of Seismic Design Parameters using Reference 1 and Reference 3.

***Site Class**	C	Section 3.4, based on above calculation
***PGA**	0.058	Based on USGS 1000 year map contours (Reference 1)
***0.2 Sec (S_S)**	0.132	Based on USGS 1000 year map contours (Reference 1)
***1.0 Sec (S_1)**	0.04	Based on USGS 1000 year map contours (Reference 1)
*F_{PGA}	1.2	Table 3.4.2.3-1
*F_a	1.2	Table 3.4.2.3-1
*F_v	1.7	Table 3.4.2.3-2
A_s	0.070	EQ 3.4.1-1
S_{DS}	0.158	EQ 3.4.1-2
S_{D1}	0.068	EQ 3.4.1-3
***SDC**	A	Table 3.5-1

*Input required

Table 3.4.2.3-1—Values of F_{pga} and F_a as a Function of Site Class and Mapped Peak Ground Acceleration or Short-Period Spectral Acceleration Coefficient

Site Class	Mapped Peak Ground Acceleration or Spectral Response Acceleration Coefficient at Short Periods				
	$PGA \le 0.10$ $S_s \le 0.25$	$PGA = 0.20$ $S_s = 0.50$	$PGA = 0.30$ $S_s = 0.75$	$PGA = 0.40$ $S_s = 1.00$	$PGA \ge 0.50$ $S_s \ge 1.25$
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	[a]	[a]	[a]	[a]	[a]

Note: Use straight line interpolation for intermediate values of PGA and S_s, where PGA is the peak ground acceleration and S_s is the spectral acceleration coefficient at 0.2 sec obtained from the ground motion maps.

[a] Site-specific response geotechnical investigation and dynamic site response analyses should be considered (Article 3.4.3).

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				
	$S_1 \le 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \ge 0.5$
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	[a]	[a]	[a]	[a]	[a]

Note: Use straight line interpolation for intermediate values of S_1, where S_1 is the spectral acceleration coefficient at 1.0 sec obtained from the ground motion maps.

[a] Site-specific response geotechnical investigation and dynamic site response analyses should be considered (Article 3.4.3).

$$A_s = F_{pga} PGA \qquad (3.4.1\text{-}1)$$

$$S_{DS} = F_a S_s \qquad (3.4.1\text{-}2)$$

$$S_{D1} = F_v S_1 \qquad (3.4.1\text{-}3)$$

Table 3.5-1—Partitions for Seismic Design Categories A, B, C, and D

Value of $S_{D1} = F_v S_1$	SDC
$S_{D1} < 0.15$	A
$0.15 \le S_{D1} < 0.30$	B
$0.30 \le S_{D1} < 0.50$	C
$0.50 \le S_{D1}$	D

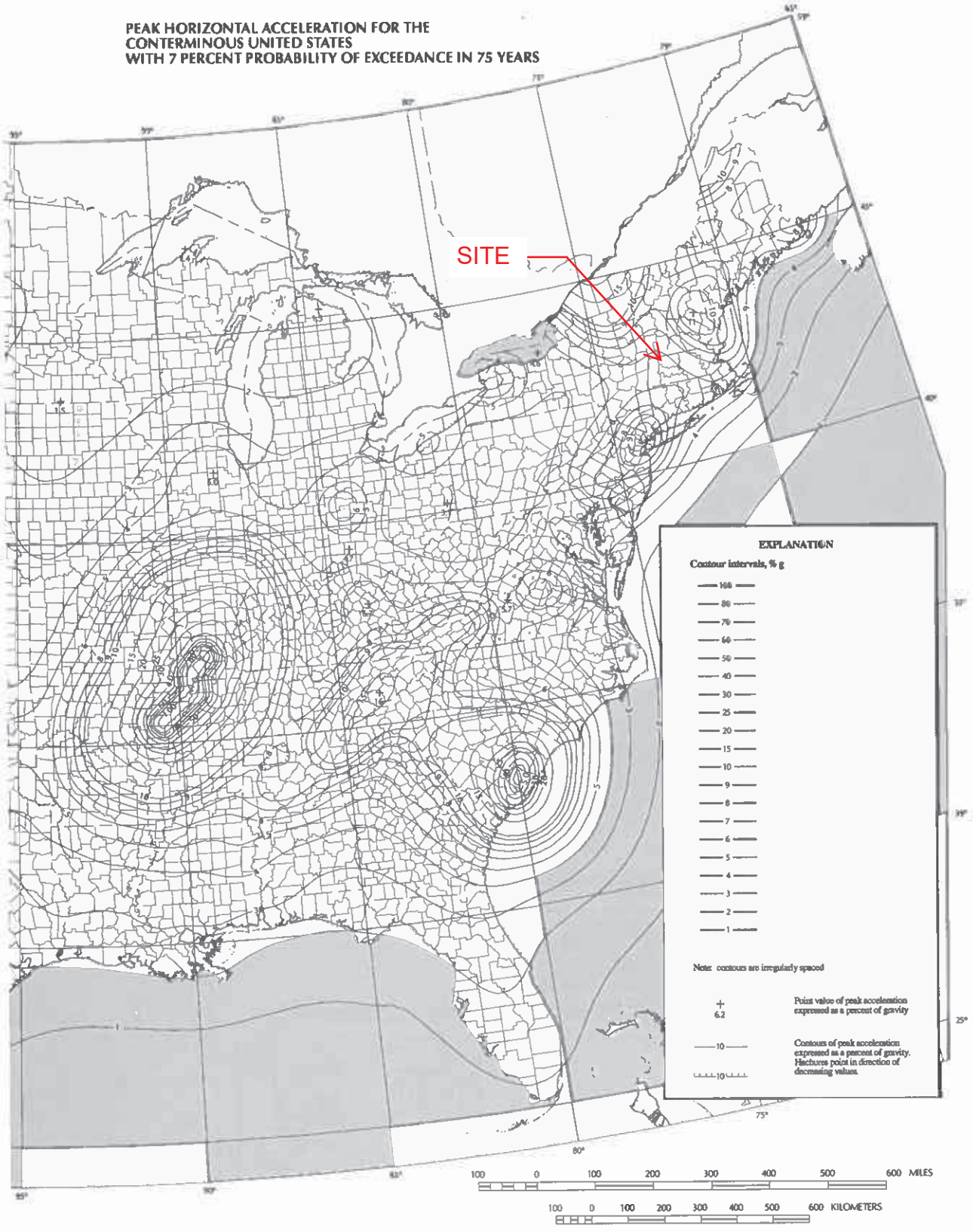

Figure 3.4.1-2b—Horizontal Peak Ground Acceleration Coefficient for the Conterminous United States (*PGA*) with Seven Percent Probability of Exceedance in 75 yr (Approx. 1000-yr Return Period)

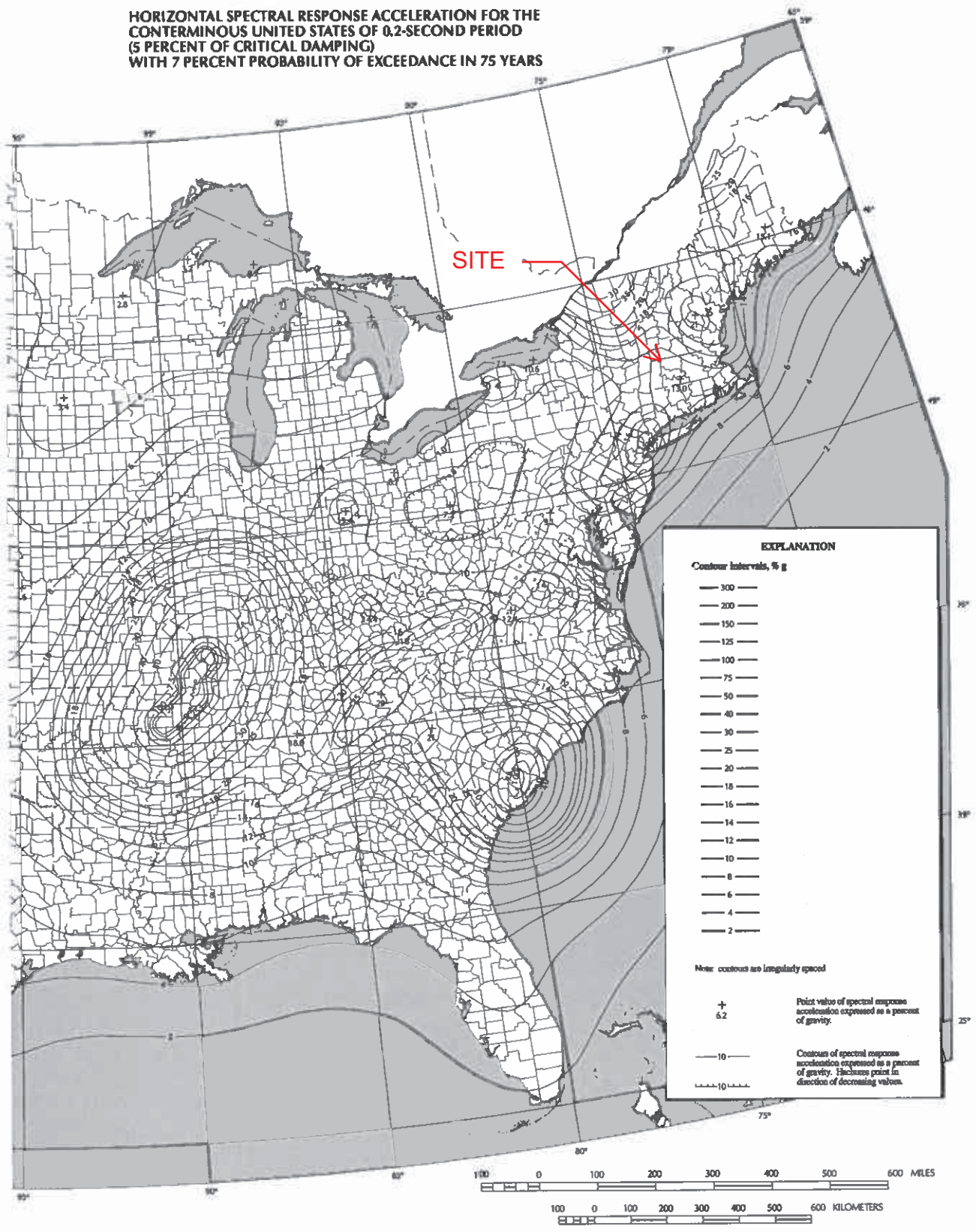

Figure 3.4.1-3b—Horizontal Response Spectral Acceleration Coefficient for the Conterminous United States at Period of 0.2-sec (S_s) with Seven Percent Probability of Exceedance in 75 yr (Approx. 1000-yr Return Period) and Five Percent Critical Damping

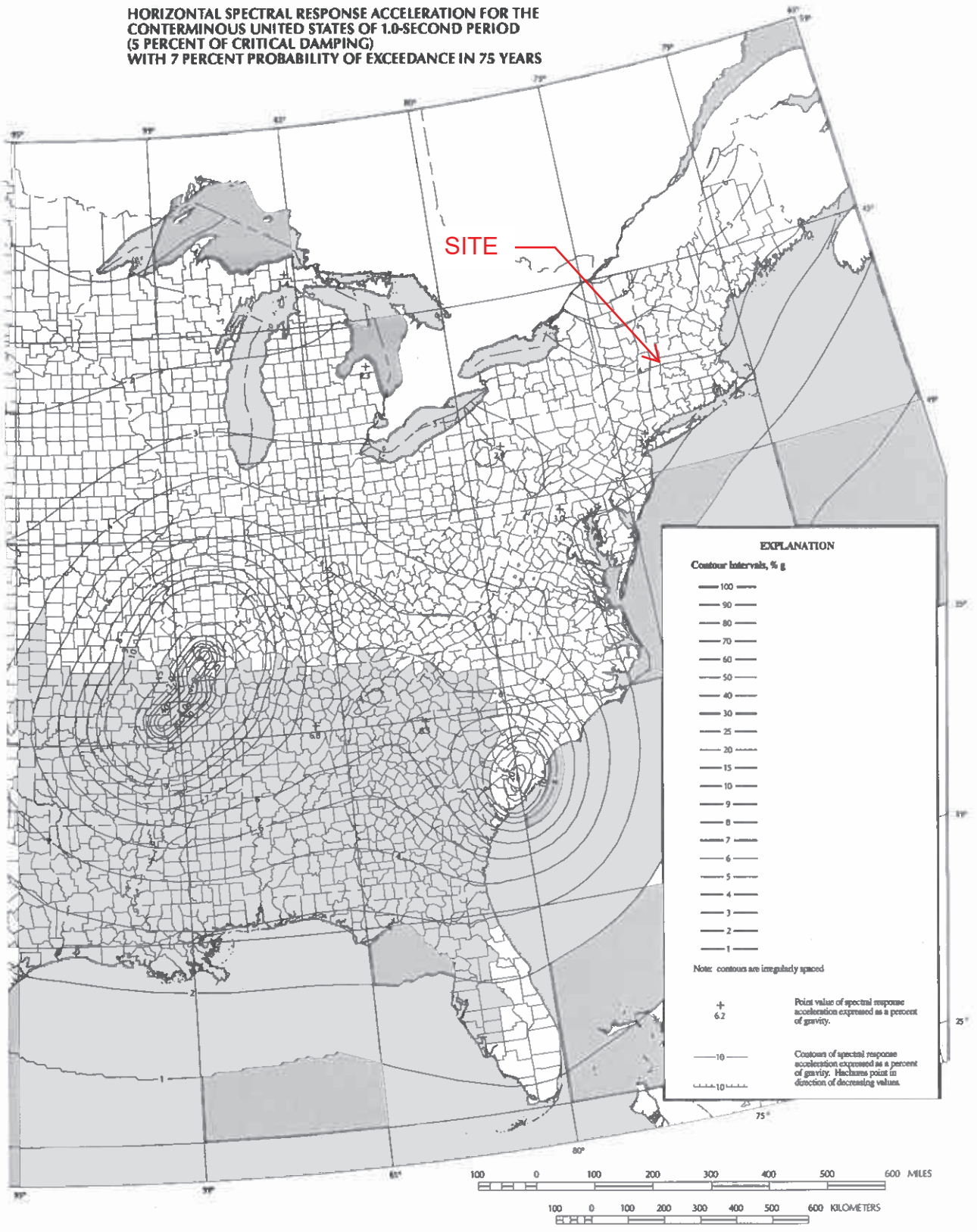

Figure 3.4.1-4b—Horizontal Response Spectral Acceleration Coefficient for the Conterminous United States at Period of 1.0-sec (S_1) with Seven Percent Probability of Exceedance in 75 yr (Approx. 1000-yr Return Period) and Five Percent Critical Damping

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APPENDIX B

HAZARDOUS MATERIALS REPORT

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HAZARDOUS MATERIALS SURVEY
MASSDOT BRIDGE REPLACEMENT C-05-042
EAST OXBOW ROAD BRIDGE OVER OXBOW BROOK
CHARLEMONT, MA

August 2018

Project No: 18149

GREEN
ENVIRONMENTAL

HAZARDOUS MATERIALS SURVEY
MASSDOT BRIDGE REPLACEMENT C-05-042
EAST OXBOW ROAD BRIDGE OVER OXBOW BROOK
CHARLEMONT, MA

August 3, 2018

GREEN Project No: 18149

Prepared for:

Patrick Engineering, Inc.
4970 Varsity Drive
Lisle, Illinois 60532

Prepared by:

Green Environmental Inc.
296 C Weymouth Street
Rockland, MA 02370
617-479-0550
www.greenenvironmental.com

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TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

The East Oxbow Road Bridge is situated over the Oxbow Brook in Charlemont, Massachusetts. The bridge is scheduled to be replaced by the Massachusetts Department of Transportation (MassDOT), as part of the 2022 Transportation Improvement Program. Patrick Engineering, Inc. (Patrick) is the prime contractor for the Oxbow Road Bridge Replacement project. The project is currently in the preliminary design phase and Green Environmental, Inc. (GREEN) was retained by Patrick to complete a Hazardous Materials Survey to support bridge replacement. The survey was conducted in order to determine the extent of hazardous materials that may require special handling and/or disposal prior to demolition activities.

The subject beam bridge was constructed circa 1940. It is approximately 14 feet wide and is constructed of four steel stringers with concrete abutments. Copies of the 1940 Commonwealth of Massachusetts Proposed Bridge Plans were provided to GREEN and are included in **Appendix A**.

GREEN made site visits on July 11 and July 18, 2018 to assess the bridge for the presence of hazardous materials. This included an asbestos bulk sampling survey, testing of painted surfaces, a visual inspection for the presence of caulking materials and a soil sampling and assessment program.

Site photographs are included in **Appendix B**.

2.0 ASBESTOS SURVEY

2.1 Regulatory Background

Regulations for asbestos exposure and/or asbestos release have been promulgated by the United States Environmental Protection Agency (EPA), U.S. Occupational Safety and Health Administration (OSHA), and Massachusetts Department of Environmental Protection (MassDEP).

OSHA regulates asbestos in the workplace through the Asbestos for General Industry Standard (29 Code of Federal Regulations [CFR] 1910.1001) and the removal of regulated asbestos-containing material (RACM) though the Asbestos Standard for Construction (29 CFR 1926.1101). OSHA regulations are created for the protection of the health of workers who may be occupationally exposed to asbestos. These occupations include asbestos abatement, construction activities, building maintenance, and others. OSHA requires that asbestos ACM be removed or appropriately abated prior to any work which will disturb the material, including demolition and renovation.

EPA and MassDEP regulate ACM associated with building demolition, renovation, and abatement projects. The regulations are promulgated via the National Emission Standards for Hazardous Air Pollutants (NESHAP 40 CFR part 61) and the Code of Massachusetts Regulations (310 CMR part 7.00, 7.09, and 7.15). The regulations are developed to protect public health and the environment and require that buildings be inspected for asbestos prior to any demolition or renovation. Further, the regulations require that all affected friable and non-friable ACM which is damaged or will be damaged as a result of the demolition or renovation activities be properly removed or abated prior to disturbance by the work.

NESHAP defines three types of ACM:

- Friable ACM: ACM that can be reduced to power by hand pressure requiring removal prior to renovation or demolition (e.g., thermal system insulation (TSI), plaster, joint compound, ceiling tiles).
- Category I non-friable ACM: ACM that is not friable and does not require removal prior to demolition, unless these materials have become friable, will become friable if disturbed, or are in poor condition; must be removed prior to renovation (e.g., resilient floor covering, packings, gaskets, asphalt roofing).

- Category II non-friable ACM: ACM that is not friable and does not require removal prior to demolition, unless these materials have become friable, will become friable if disturbed, or are in poor condition; must be removed prior to renovation (all other non-friable ACM).

RACM is friable ACM and non-friable ACM that may become friable during demolition or renovation activities. Practically speaking, both Category I non-friable ACM and Category II non- friable ACM will become friable in a typical commercial demolition or renovation scenario and must be abated prior to the work.

Additionally, the Massachusetts Department of Labor Standards (DLS) as defined by 453 CMR 6.00, include licensing requirements for asbestos abatement contractors, workers, and consultants, as well as requirements for asbestos abatement. All applicable federal, state, and local regulations must be followed during asbestos abatement.

2.2 Bulk Sample Collection and Analysis

During the initial site visit on July 11, 2018, GREEN identified suspect black tar paper located along the bridge decking. This material is also noted in the 1940 bridge drawings (see **Appendix A**). On July 18, 2018, an Asbestos Survey was conducted Mr. Jody Freitas, Massachusetts Licensed Asbestos Inspector #AI000208. Three bulk samples of the tar paper were collected, field logged and placed in individual air tight plastic bags. No other suspect ACM was identified on the bridge structure.

The samples were transferred under chain of custody to Asbestos Identification Laboratory of Woburn, MA for analysis via EPA 600/R-93/116 and/or EPA Interim Method 600/M4-82-020 methods using Polarized Light Microscopy (PLM). Asbestos Identification Laboratory is licensed by the Commonwealth of Massachusetts (#AA 000208) for bulk asbestos analysis. The laboratory certificates of analysis are included in **Appendix C**. In accordance with NESHAP and DEP regulations, materials are considered asbestos-containing if they contain at least 1% asbestos as determined by PLM.

No asbestos was detected in the tar paper samples. The laboratory analytical data certificates and chain of custody documentation is presented in **Appendix C.**

3.0 PAINTED SURFACES SURVEY

3.1 Lead-Based Paint

Lead-Based Paint can be defined as any paint, varnish, shellac, or other coating that contains lead equal to or greater than 1.0 mg/cm2 as measured by XRF or laboratory analysis, 0.5 percent by dry weight or 5,000 milligrams per kilogram (mg/kg) as measured by laboratory analysis.

The Occupational Safety and Health Administration (OSHA) worker protection rule has established a permissible exposure limit (PEL) of 0.050 milligrams per cubic meter for airborne lead. OSHA worker protection rules are applicable for any amount of lead. The Resource Conservation and Recovery Act (RCRA) regulates wastes containing lead as hazardous wastes if the leachable lead in the waste exceeds 5 parts per million (ppm) by Toxicity Characteristic Leachate Procedure (TCLP).

3.2 Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) were widely used in construction materials and various building products produced from the 1950's through the 1970's. This included PCB-containing paints, mastics and adhesives. PCBs were typically used as plasticizers, but were also used in corrosion resistant paints. PCBs are regulated by the Toxic Substance Control Act (TSCA) Title 40, Part 761 (enacted in 1976). TSCA requirements include: the manufacturing, processing, distribution in commerce, use, storage and disposal of PCBs and PCB Items. The following definitions apply:

PCB Bulk Product Waste

Non-liquid "source material" containing ≥50 ppm PCBs at the time of disposal (e.g. building sealants such as caulk, adhesives and glazing compounds).

PCB Remediation Waste

Waste containing PCBs as a result of a spill or the leaching of PCB Source Material
PCB remediation waste includes items such as soil, concrete, wood

Bulk PCB Remediation Waste

Includes non liquid waste such as soil, vegetation, sediments, sludge
Rags, and other debris generated as a result of any PCB spill cleanup

3.3 Sample Collection and Analysis

Field observations indicated that the structural steel portions of the bridge was historically coated with green paint. The paint was found to be in poor condition at the time of the survey. GREEN collected paint chip samples from six locations. The samples were submitted under chain of custody to ESS Laboratory in Cranston, RI for Total Lead analysis via EPA test method 6010C and PCBs analysis via test method 8082A.

The test results are summarized in the following table. The laboratory analytical data is included in **Appendix D**.

Paint Chip Test Data
East Oxbow Bridge
July 11, 2018

Sample ID	Test Location	Lead Result (mg/kg)	PCBs (mg/kg
PC1-WES	West elevation, south end	138,000	ND
PC2-WECP	West elevation, center post	82,800	ND
PC3-EES	East elevation, south end	104,000	ND
PC4-EENEP	East elevation, adjacent to northeast abutment	69,500	ND
PC5-CEB	Central east beam, beneath decking	59,400	ND
PC6-CWB	Central west beam, beneath decking	62,800	ND

Based upon the above laboratory results being greater than 5,000 mg/kg, the paint is considered to be lead-based paint. No PCBs were detected above the laboratory reporting limits in the paint samples.

4.0 SURFICIAL SOIL

Shallow soil located adjacent to bridges and other historic structures can be impacted by metals or PCBs that leach from paint or caulking over time. Based upon this information, GREEN collected five (5) surficial soil samples, from the upper foot, proximate to the bridge in an effort to determine if leaching of paint or caulking had occurred. Each sample was analyzed for lead and PCBs laboratory analysis. Lead concentrations ranged from 7.14 to 55.6 milligrams per kilogram (mg/kg), and were below both the Massachusetts Contingency Plan (MCP) RCS-1 Reportable Concentration of 200 mg/kg and the MassDEP Published Background in "Natural Soil" concentration of 100 mg/kg. No PCBs were detected above the laboratory reporting limits. The soil data is summarized in the table below and the laboratory analytical data is included in **Appendix E**.

Surficial Soil Data
East Oxbow Bridge
July 11, 2018

Sample ID	Test Location	Lead (mg/kg)	PCBs (mg/kg
SS1-NW	Adjacent to northwest abutment footing	33.2	ND
SS2-NE	Adjacent to northeast abutment footing	14.5	ND
SS3-SE	Adjacent to southeast abutment footing	40.3	ND
SS4-SW	Adjacent to southwest abutment footing	55.6	ND
SS5-BB	Beneath bridge, south central portion	7.14	ND

5.0 BUILDING MATERIALS

PCB-containing caulk was historically used around windows, door frames, building joints, masonry columns and other masonry building materials. The bridge abutments and bridge seat are of concrete construction, however no caulked or grouted joints were observed and no samples were collected.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Green Environmental, Inc. was retained by Patrick Engineering, Inc. to complete a Hazardous Materials Survey to support replacement. The survey was conducted in order to determine the extent of hazardous materials that may require special handling and/or disposal prior to demolition activities. The survey included an asbestos bulk sampling program, testing of painted surfaces, and a visual inspection for the presence of caulking materials and surficial soil sampling and laboratory analysis.

No asbestos or PCB containing materials were identified on the bridge components. No elevated concentrations of lead or PCBs were identified in surficial soil located adjacent to the bridge.

The bridge is coated with lead-based paint and depending on the method of dismantling will require some form of removal, prior to demolition. At a minimum loose and flaking paint on the structural steel should be removed and properly disposed, and areas that will be cut will require full lead abatement. Remediation must be in accordance with applicable state and federal regulations for the protection of workers, the public and the environment.

7.0 LIMITATIONS

This report documents the findings of a Hazardous Materials Survey of the East Oxbow Road Bridge located in Charlemont, Massachusetts. The bridge is scheduled to be replaced and Green Environmental, Inc. was retained by Patrick to complete a Hazardous Materials Survey to support the work. The survey was conducted in order to determine the extent of hazardous materials that may require special handling and/or disposal prior to demolition activities.

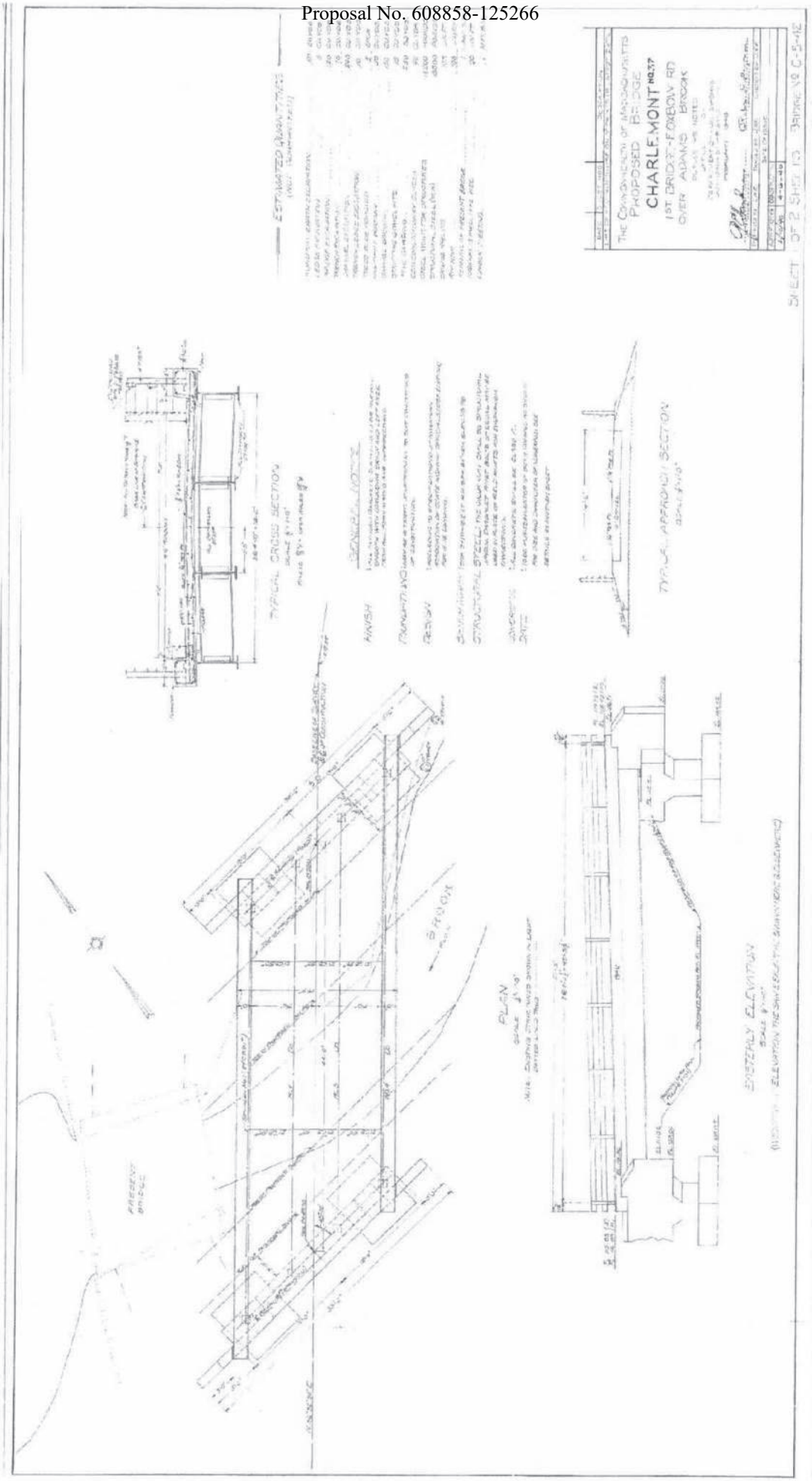
The opinions expressed by GREEN are based solely on the observations, sampling and analysis, and information cited in this report. Observations were made at the subject site under the conditions stated. The purpose of this study was to determine the nature and approximate quantities of hazardous materials that can be anticipated during bridge replacement. This report does not constitute a complete determination of whether past or current owners, operators or occupants of the site have been in compliance with all applicable state, federal or local environmental regulations. GREEN makes no representative regarding material located in inaccessible areas or outside the scope of work.

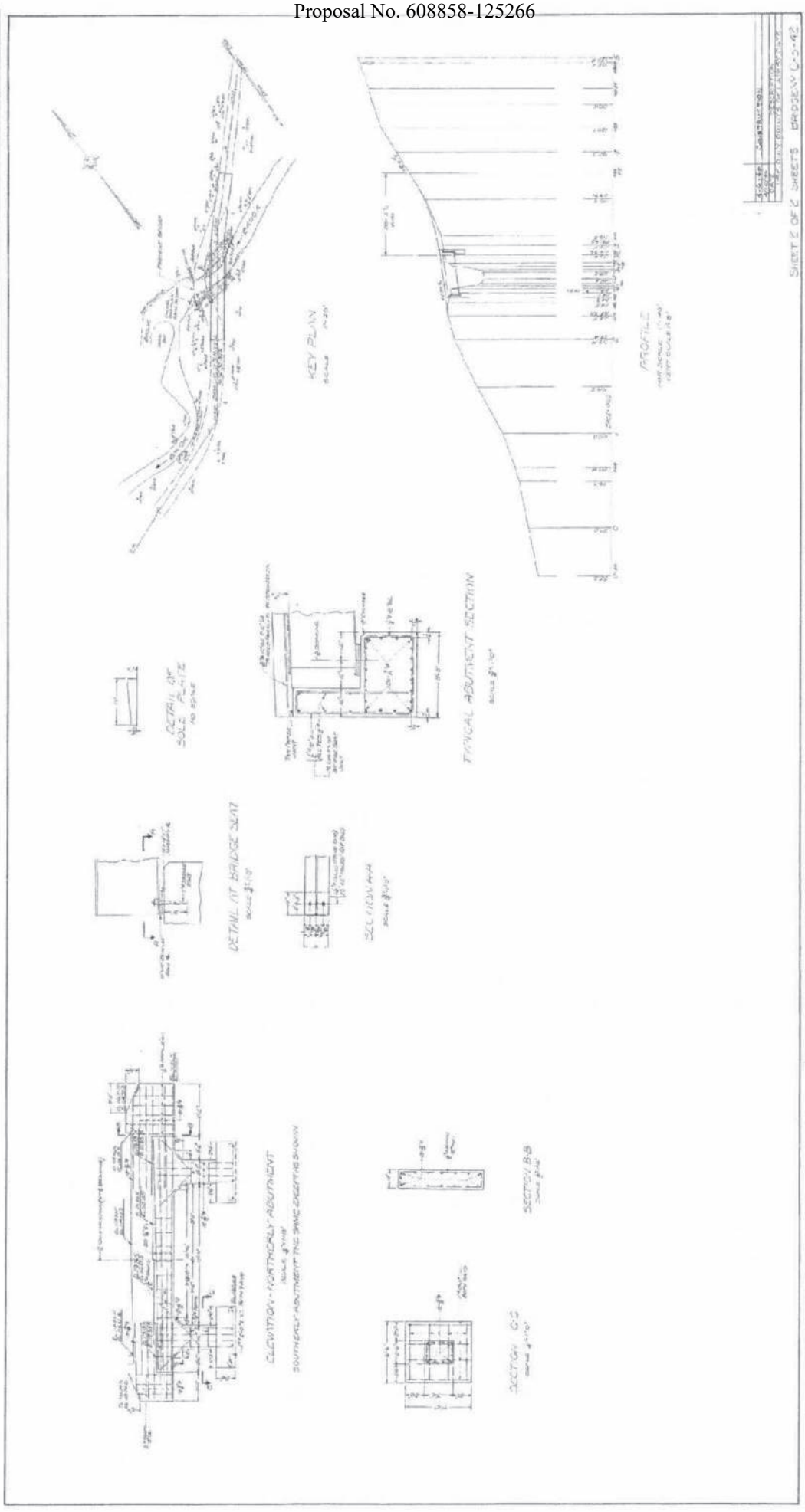
Our conclusions are based solely on the information described herein and are believed to be representative of conditions at the time of the survey. If additional information concerning the environmental conditions of the subject site becomes available, GREEN should be notified and presented with that information. Based on the new information, we will reevaluate the conclusions stated in this report to determine whether modifications are warranted.

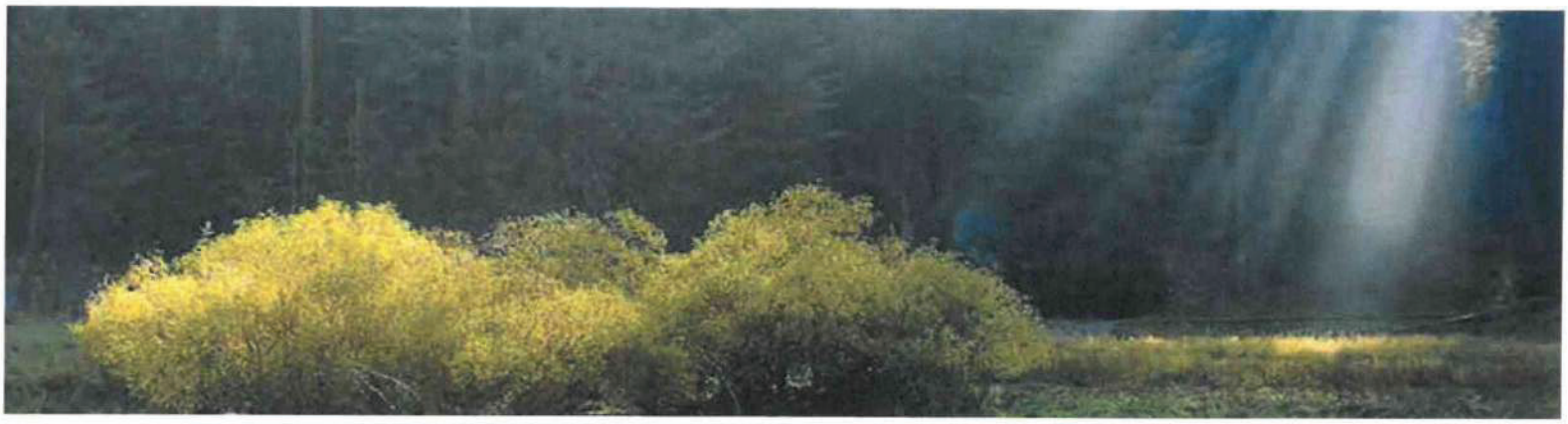
Additional field measurements and/or bulk sampling may be required following the exposure/removal of bridge structures. Should additional material be identified during demolition activities that are not listed in this report the work should be stopped and samples be collected to determine if hazardous classification is warranted. This report is not a project specification and should not be used as a bidding document.

Appendix A

GREEN ENVIRONMENTAL


THE CONSTRUCTION OF MASONRY UNITS
PROPOSED
BRIDGE
CHARLEMONT NO. 7/7
1ST BRIDGE-FOXBOW RD
OVER ADAMS BROOK
TYPICAL CROSS SECTION
TYPICAL APPROACH SECTION
PLAN
ELEVATION
SHEET 1 OF 2 SHEETS
BRIDGE NO. C-5-12


KEY PLAN
PROFILE
TYPICAL ABUTMENT SECTION
DETAIL OF SOLE PLATE
DETAIL AT BRIDGE SEAT
SECTION A-A
SECTION B-B
SECTION C-C
SHEET 2 OF 2 SHEETS BRIDGE NO. 0-3-42



Appendix B

GREEN ENVIRONMENTAL

Site Photographs East Oxbow Bridge July 11, 2018

View of bridge facing south

View of bridge facing north

Project 18149

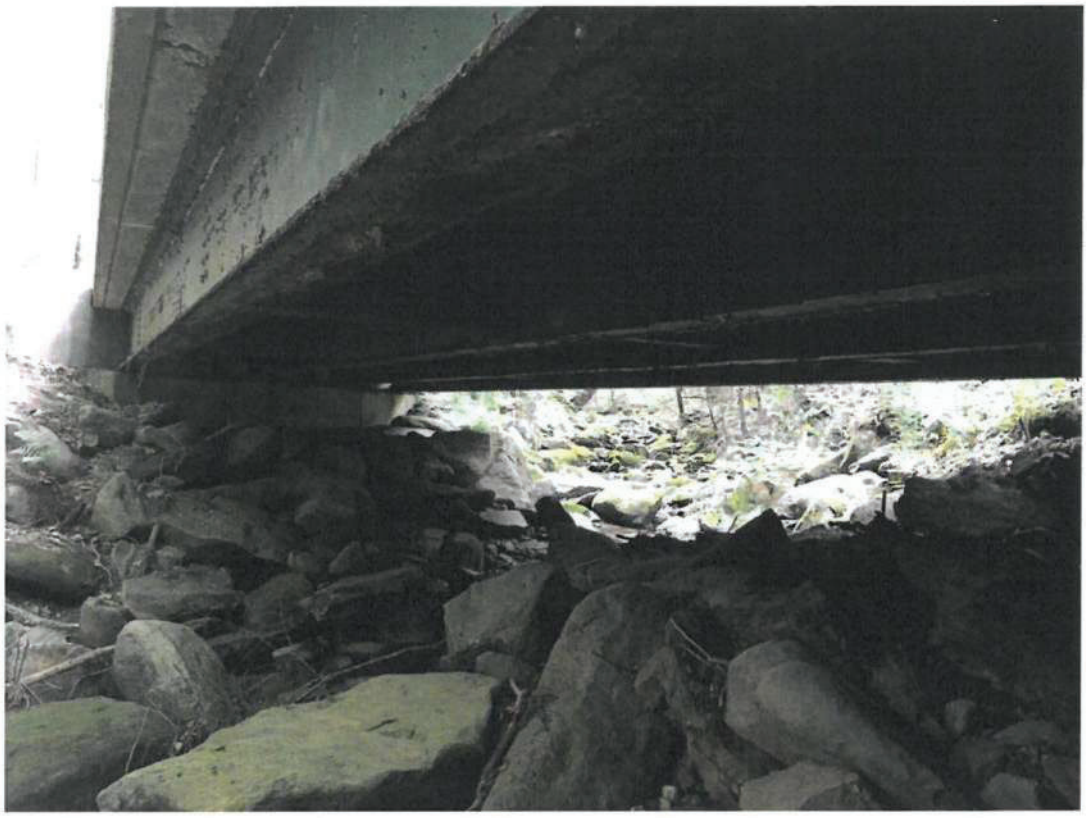
Site Photographs East Oxbow Bridge July 11, 2018

View of westerly elevation of bridge, facing southeast

View of easterly elevation of bridge, facing southwest

Project 18149

Site Photographs East Oxbow Bridge July 11, 2018



View of riprap beneath bridge

View of wetlands flagging along brook

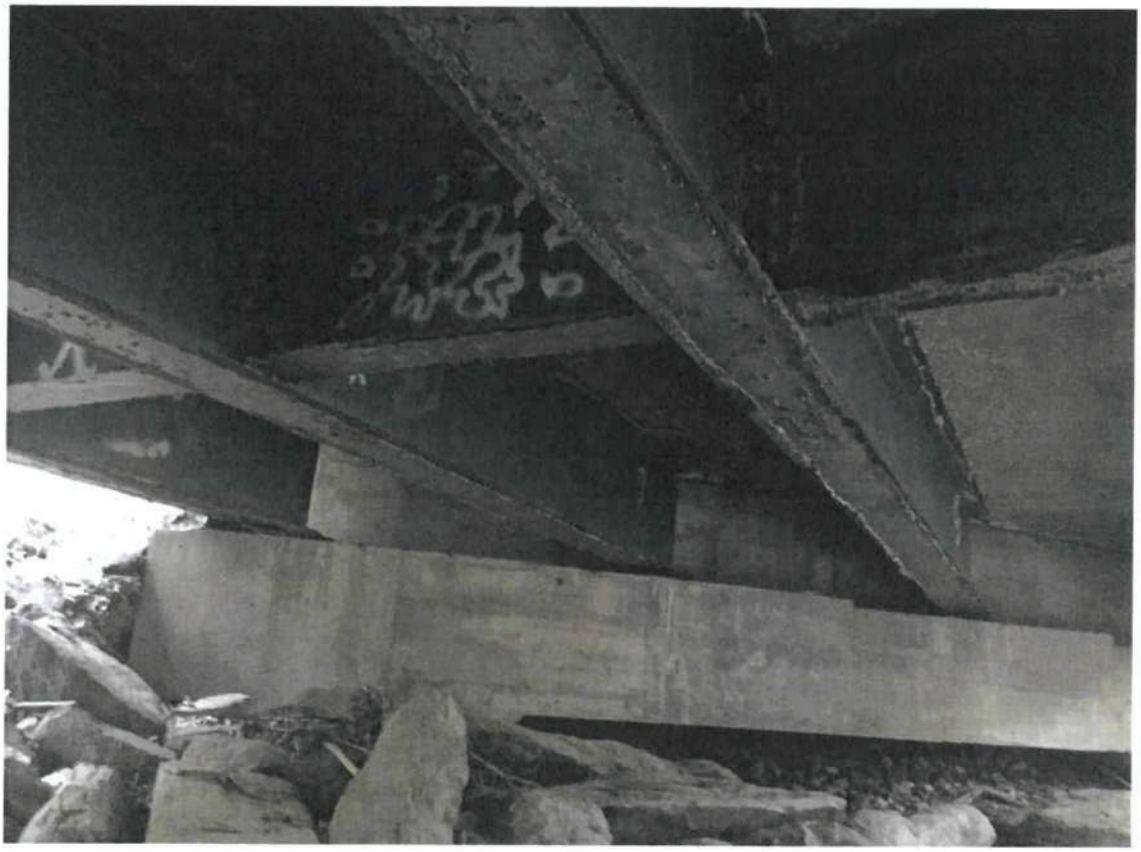
Project 18149

Site Photographs East Oxbow Bridge July 11, 2018

Soil samples collected adjacent to bridge abutment footings

Project 18149

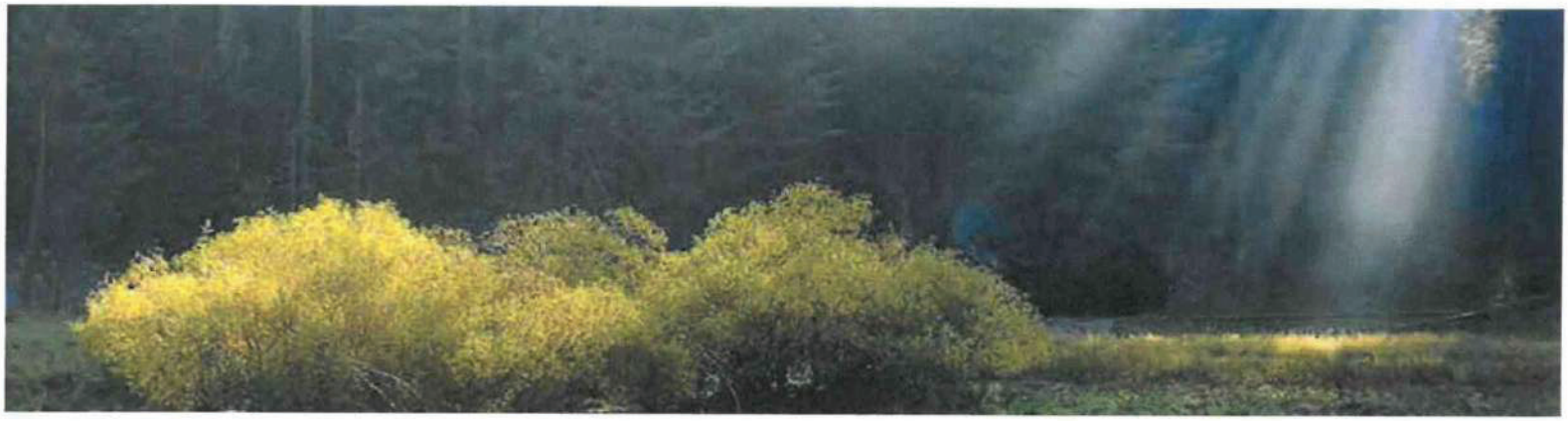
Views of structural steel coated with green paint



No visible caulking at joints

No visible caulking at joints

Views of black tar paper at joints along bridge deck



Appendix C

GREEN ENVIRONMENTAL

FLI Environmental

69 Bridge Street
Dedham, MA 02026
Phone 781.251.0040
Fax 781.251.0901

Kristen Awed
Green Environmental, Inc.
296 Weymouth Street
Rockland, Massachusetts 02370

July 26, 2018

RE: Bulk Sample Analytical Results
Bridge #18148 E. Oxbow Road
Charlemont, Massachusetts
FLI Project #: 18-1886

Dear Mrs. Awed,

FLI Environmental, Inc. collected samples of specific materials from the address noted above. Samples were transported under chain-of-custody protocol to an accredited laboratory for analysis.

Sampling Summary:

Field Technician:	Jody Freitas
License #:	AI900238
Date of Sampling:	July 18, 2018
Total # of Samples:	3
Samples Analyzed At:	Asbestos Identification Laboratory, Inc.
NIST/NVLAP Certification#:	200919-0
MassDLS Lab Certification#:	AA000208

Bulk samples were collected in a random manner and submitted via chain of custody to the analytical laboratory. The samples were analyzed by Polarized Light Microscopy per EPA Method 600/R-93-116, July 1993. Any homogeneous material having at least one (1) sample analyzed to contain greater than one percent (1%) asbestos is categorized as an asbestos containing material. Any homogeneous material having at least one (1) sample analyzed to contain any amount of asbestos is categorized as an asbestos containing waste material. Homogeneous materials where each sample analyzed was determined not to contain asbestos are categorized as non-asbestos. Laboratory Analytical Data Sheets are attached and provide details about each sample collected.

Remarks and Limitations:

1. Sampling was limited to the specific materials and areas identified by the client. Additional suspect materials may be present and if discovered during building renovation, maintenance or demolition, should be sampled and analyzed for asbestos content prior to disturbing.
2. Each identified asbestos containing material must be removed by a licensed asbestos abatement contractor prior to being disturbed by building maintenance, renovation or demolition activities.

Should you have any questions or need additional information, please contact our office at (781) 251-0040. Thank you for the opportunity to provide you with our services and we look forward to working together in the future.

Sincerely,
FLI Environmental, Inc.

Steve Shea
Manager, Field Services

Asbestos Identification Laboratory
165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600
Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com

Batch: 34168

NVLAP® Lab Code: 200919-0

July 24, 2018

Jody Freitas
FLI Environmental
69 Bridge Street
Dedham, MA 02026

Project Number: 18-1886
Project Name: Bridge #18149 E. Oxbow Road, Charlemont, MA
Date Sampled: 2018-07-18
Work Received: 2018-07-19
Work Analyzed: 2018-07-23

Analysis Method: BULK PLM ANALYSIS EPA/600/R-93/116

Dear Jody Freitas,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Jody Freitas for your business.

Michael Manning
Owner/Director

July 24, 2018

Jody Freitas
FLI Environmental
69 Bridge Street
Dedham, MA 02026

Project Number: 18-1886
Project Name: Bridge #18149 E. Oxbow Road, Charlemont, MA
Date Sampled: 2018-07-18
Work Received: 2018-07-19
Work Analyzed: 2018-07-23

Analysis Method: BULK PLM ANALYSIS EPA/600/R-93/116

FieldID / LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A / 381991	Tar Paper	Southwest Bridge Abutment	black	Cellulose 40 Non-Fibrous 60	None Detected
01B / 381992	Tar Paper	Southwest Bridge Abutment	black	Cellulose 40 Non-Fibrous 60	None Detected
01C / 381993	Tar Paper	Northwest Bridge Abutment	black	Cellulose 40 Non-Fibrous 60	None Detected

Tuesday 24 July 2018 End of Report Page 1 of 1

Analyzed by:

Batch: 34168

FLI Environmental
Needham • MA • 02026 (781) 251-0040 fax (781) 251-0901

ASBESTOS BULK SAMPLE CHAIN OF CUSTODY RECORD

FLI Project #: 18-1886

Client: Green Environemntal, Inc.

Date: 7/18/2018

Site: Bridge # 18149 E. Oxbow Road
Charlemont, Massachusetts

Sampled by: Jody Freitas

License #: AI900238

Sample # (s)	Material	Location	Asbestos Analysis		
			PLM	TEM	Point Count
01 A	Tar Paper	Southwest Bridge Abutment	x		
01 B	Tar Paper	Southwest Bridge Abutment	x		
01 C	Tar Paper	Northwest Bridge Abutment	x		

Relinquished by: [signature] 7/19/18 Date/Time

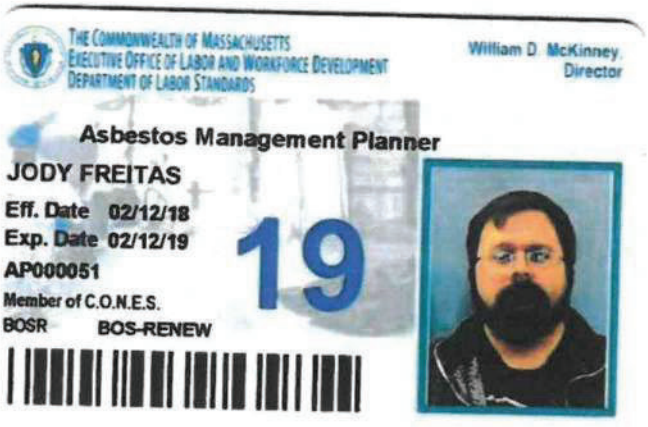
Received by: [signature] 7/19/18 Date/Time

Relinquished by: _____ Date/Time

Received by: _____ Date/Time

Turnaround: Rush 24-Hr 48-Hr
3-Day 4-Day 5-Day

Date Needed


THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
William D. McKinney
Director
Asbestos Management Planner
JODY FREITAS
Eff. Date 02/12/18
Exp. Date 02/12/19
19
AP000051
Member of C.O.N.E.S.
BOSR BOS-RENEW


THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
William D. McKinney
Director
Asbestos Inspector
JODY FREITAS
Eff. Date 02/12/18
Exp. Date 02/12/19
19
AI900238
Member of C.O.N.E.S.
BOSR BOS-RENEW

Certificate No: **A047163**

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
19 STANIFORD STREET, BOSTON, MASSACHUSETTS 02114

CERTIFICATION FOR ASBESTOS ANALYTICAL SERVICES

ASBESTOS IDENTIFICATION LABORATORY
165 NEW BOSTON STREET
SUITE 227
WOBURN MA 01801

LICENSE: **AA000208** EXPIRES: **Sunday, June 23, 2019**

IN ACCORDANCE WITH MGL CH. 149 § 6B AND 453 CMR 6.08 THIS CERTIFICATE IS ISSUED BY THE DEPARTMENT OF LABOR STANDARDS TO THE ABOVE NAMED ENTITIY TO PROVIDE THE ASBESTOS ANALYTICAL SERVICES SPECIFICALLY LISTED BELOW.

CLASS A CERTIFICATE CLASS C CERTIFICATE

William D. McKinney

WILLIAM D. MCKINNEY, DIRECTOR

Mailing Address:

ASBESTOS IDENTIFICATION LABORATORY
165 NEW BOSTON STREET
SUITE 227
WOBURN, MA 01801

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200919-0

Asbestos Identification Laboratory

Woburn, MA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-07-01 through 2019-06-30

Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program

A00824 - 31

Proposal No. 608858-125266

Appendix D

GREEN ENVIRONMENTAL

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Kristen Awed Ladas
Green Environmental, Inc.
296 Weymouth Street Unit C
Rockland, MA 02370

RE: Oxbow Rd Bridge (18149)
ESS Laboratory Work Order Number: 1807266

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 6:59 pm, Jul 19, 2018

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.

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

SAMPLE RECEIPT

The following samples were received on July 12, 2018 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1807266-01	PC-1-WES	Solid	6010C, 8082A
1807266-02	PC2-WECP	Solid	6010C, 8082A
1807266-03	PC3-EES	Solid	6010C, 8082A
1807266-04	PC4-EENEP	Solid	6010C, 8082A
1807266-05	PC5-CEB	Solid	6010C, 8082A
1807266-06	PC6-CWB	Solid	6010C, 8082A

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

PROJECT NARRATIVE

No unusual 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 Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - 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
8260B - VOA
8270D - SVOA
8270D 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 04-1.1 - EPH
MADEP 04-2.1 - 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
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - 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 Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1807266-01 through 1807266-06**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	(X) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) 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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	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 (X) 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 protocols(s)?	Yes (X) 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 (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

All negative responses must be addressed in an attached laboratory narrative.

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.

Signature: _____ Date: July 19, 2018

Printed Name: Laurel Stoddard Position: Laboratory Director

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC-1-WES
Date Sampled: 07/11/18 10:45
Percent Solids: N/A

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-01
Sample Matrix: Solid
Units: mg/kg wet

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**138000** (1960)		6010C		100	KJK	07/16/18 12:25	0.51	100	CG81342

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC-1-WES
Date Sampled: 07/11/18 10:45
Percent Solids: N/A
Initial Volume: 10.7
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-01
Sample Matrix: Solid
Units: mg/kg wet
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1221	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1232	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1242	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1248	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1254	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1260	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1262	ND (0.09)		8082A		1	07/16/18 15:53		CG81307
Aroclor 1268	ND (0.09)		8082A		1	07/16/18 15:53		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*68 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*71 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*85 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*88 %*		*30-150*

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC2-WECP
Date Sampled: 07/11/18 11:05
Percent Solids: N/A

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-02
Sample Matrix: Solid
Units: mg/kg wet

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**82800** (1890)		6010C		100	KJK	07/16/18 12:29	0.53	100	CG81342

ESS Laboratory
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BAL Laboratory
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of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC2-WECP
Date Sampled: 07/11/18 11:05
Percent Solids: N/A
Initial Volume: 10
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-02
Sample Matrix: Solid
Units: mg/kg wet
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1221	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1232	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1242	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1248	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1254	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1260	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1262	ND (0.1)		8082A		1	07/16/18 16:13		CG81307
Aroclor 1268	ND (0.1)		8082A		1	07/16/18 16:13		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*98 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*102 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*95 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*97 %*		*30-150*

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC3-EES
Date Sampled: 07/11/18 11:10
Percent Solids: N/A

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-03
Sample Matrix: Solid
Units: mg/kg wet

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**104000** (1750)		6010C		100	KJK	07/16/18 12:34	0.57	100	CG81342

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC3-EES
Date Sampled: 07/11/18 11:10
Percent Solids: N/A
Initial Volume: 10.1
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-03
Sample Matrix: Solid
Units: mg/kg wet
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1221	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1232	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1242	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1248	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1254	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1260	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1262	ND (0.1)		8082A		1	07/16/18 16:32		CG81307
Aroclor 1268	ND (0.1)		8082A		1	07/16/18 16:32		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*66 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*70 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*80 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*84 %*		*30-150*

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC4-EENEP
Date Sampled: 07/11/18 11:20
Percent Solids: N/A

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-04
Sample Matrix: Solid
Units: mg/kg wet

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**69500** (1720)		6010C		100	KJK	07/16/18 12:38	0.58	100	CG81342

ESS Laboratory
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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC4-EENEP
Date Sampled: 07/11/18 11:20
Percent Solids: N/A
Initial Volume: 10.1
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-04
Sample Matrix: Solid
Units: mg/kg wet
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1221	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1232	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1242	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1248	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1254	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1260	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1262	ND (0.1)		8082A		1	07/16/18 16:51		CG81307
Aroclor 1268	ND (0.1)		8082A		1	07/16/18 16:51		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*84 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*89 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*85 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*99 %*		*30-150*

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC5-CEB
Date Sampled: 07/11/18 11:25
Percent Solids: N/A

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-05
Sample Matrix: Solid
Units: mg/kg wet

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**59400** (1640)		6010C		100	KJK	07/16/18 12:43	0.61	100	CG81342

ESS Laboratory
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BAL Laboratory
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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC5-CEB
Date Sampled: 07/11/18 11:25
Percent Solids: N/A
Initial Volume: 10
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-05
Sample Matrix: Solid
Units: mg/kg wet
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1221	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1232	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1242	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1248	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1254	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1260	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1262	ND (0.1)		8082A		1	07/16/18 17:10		CG81307
Aroclor 1268	ND (0.1)		8082A		1	07/16/18 17:10		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*77 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*80 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*89 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*92 %*		*30-150*

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC6-CWB
Date Sampled: 07/11/18 11:30
Percent Solids: N/A

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-06
Sample Matrix: Solid
Units: mg/kg wet

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**62800** (1720)		6010C		100	KJK	07/16/18 12:47	0.58	100	CG81342

ESS Laboratory
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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: PC6-CWB
Date Sampled: 07/11/18 11:30
Percent Solids: N/A
Initial Volume: 10.2
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807266
ESS Laboratory Sample ID: 1807266-06
Sample Matrix: Solid
Units: mg/kg wet
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1221	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1232	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1242	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1248	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1254	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1260	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1262	ND (0.1)		8082A		1	07/16/18 17:29		CG81307
Aroclor 1268	ND (0.1)		8082A		1	07/16/18 17:29		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*72 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*74 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*83 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*85 %*		*30-150*

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CG81342 - 3050B										
Blank										
Lead	ND	5.00	mg/kg wet							
LCS										
Lead	271	15.9	mg/kg wet	276.0		98	84-116			
LCS Dup										
Lead	264	16.4	mg/kg wet	276.0		96	84-116	3	20	
Reference										
Lead	4380	40.0	mg/kg wet	4490		97	83-113			
8082A Polychlorinated Biphenyls (PCB)										
Batch CG81307 - 3540C										
Blank										
Aroclor 1016	ND	0.05	mg/kg wet							
Aroclor 1016 [2C]	ND	0.05	mg/kg wet							
Aroclor 1221	ND	0.05	mg/kg wet							
Aroclor 1221 [2C]	ND	0.05	mg/kg wet							
Aroclor 1232	ND	0.05	mg/kg wet							
Aroclor 1232 [2C]	ND	0.05	mg/kg wet							
Aroclor 1242	ND	0.05	mg/kg wet							
Aroclor 1242 [2C]	ND	0.05	mg/kg wet							
Aroclor 1248	ND	0.05	mg/kg wet							
Aroclor 1248 [2C]	ND	0.05	mg/kg wet							
Aroclor 1254	ND	0.05	mg/kg wet							
Aroclor 1254 [2C]	ND	0.05	mg/kg wet							
Aroclor 1260	ND	0.05	mg/kg wet							
Aroclor 1260 [2C]	ND	0.05	mg/kg wet							
Aroclor 1262	ND	0.05	mg/kg wet							
Aroclor 1262 [2C]	ND	0.05	mg/kg wet							
Aroclor 1268	ND	0.05	mg/kg wet							
Aroclor 1268 [2C]	ND	0.05	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0166*		mg/kg wet	*0.02500*		*67*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0176*		mg/kg wet	*0.02500*		*70*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0198*		mg/kg wet	*0.02500*		*79*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0216*		mg/kg wet	*0.02500*		*86*	*30-150*			
LCS										
Aroclor 1016	0.5	0.05	mg/kg wet	0.5000		105	40-140			
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		100	40-140			
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		93	40-140			
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		97	40-140			
Surrogate: Decachlorobiphenyl	*0.0181*		mg/kg wet	*0.02500*		*72*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0187*		mg/kg wet	*0.02500*		*75*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0218*		mg/kg wet	*0.02500*		*87*	*30-150*			

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082A Polychlorinated Biphenyls (PCB)										
Batch CG81307 - 3540C										
Surrogate: Tetrachloro-m-xylene [2C]	*0.0214*		mg/kg wet	*0.02500*		*85*	*30-150*			
LCS Dup										
Aroclor 1016	0.5	0.05	mg/kg wet	0.5000		106	40-140	0.8	30	
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		100	40-140	0.3	30	
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		93	40-140	0.7	30	
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		96	40-140	1	30	
Surrogate: Decachlorobiphenyl	*0.0172*		mg/kg wet	*0.02500*		*69*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0178*		mg/kg wet	*0.02500*		*71*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0215*		mg/kg wet	*0.02500*		*86*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0210*		mg/kg wet	*0.02500*		*84*	*30-150*			

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
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

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807266

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

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Green Environmental, Inc. - TB/HDM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1807266
Date Received: 7/12/2018
Project Due Date: 7/19/2018
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: 3.4 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:
    Analysis:
    TAT:
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:
    b. Low Level VOA vials frozen: Date: Time: By:

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:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	245902	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	245901	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
03	245900	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
04	245899	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
05	245898	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	245897	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

2nd Review
Are barcode labels on correct containers? (Yes) / No
Are all necessary stickers attached? (Yes) / No

Completed By: Date & Time: 7/12/18 1600
Reviewed By: Date & Time: 7/12/18 1646
Delivered By: 7/12/18 1647

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1807266

Turn Time X Standard Other_____

Regulatory State: MA RI CT NH NJ NY ME Other_____

Is this project for any of the following:(please circle)
MA-MCP Navy USACE CT DEP Other_____

Reporting Limits - RCS-1

Electonic Deliverables Excel Access PDF

Co. Name: Green Environmental Inc.
Project #: 18149
Project Name: Oxbow Rd Bridge
Contact Person: Kristen Awed Ladas
Address: 246C Weymouth St.
City: Rockland
State: MA
Zip: 02370
PO #: 18149
Tel: 617-479-0550
Fax: 617-479-5150
email: kawed@greenenvironmental.com

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis: Lead	Analysis: PCBs
1	7/11/18	10:45	G	PC	PC1 - WES		1	~~AG~~	8oz	X	X
2	"	11:05	G	"	PC2 - WECP		1	AG	8oz	X	X
3	"	11:10	G	"	PC3 - EES		1	AG	8oz	X	X
4	"	11:20	G	"	PC4 - EENEP		1	AG	8oz	X	X
5	"	11:25	G	"	PC5 - CEB		1	AG	4oz	X	X
6	7/11/18	11:30	G	PC	PC6 - CWB		1	AG	4oz	X	X

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ✓ Yes ____ No

Seals Intact ____ Yes ____ No NA:___

Cooler Temperature: 3.4 ICE RC

Internal Use Only
[✓] Pickup
[ ] Technician___

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Sampled by: KA / RL

Comments: Bridge Paint Samples

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
7-12-18 1:22	7/12/18 1322	7/12/18 1530	7/12/18 1552
Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)

By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIA

Please fax to the laboratory all changes to Chain of Custody

1 (White) Lab Copy
2 (Yellow) Client Receipt

A00824 - 55

Proposal No. 608858-125266

Appendix E

GREEN ENVIRONMENTAL

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Kristen Awed Ladas
Green Environmental, Inc.
296 Weymouth Street Unit C
Rockland, MA 02370

RE: Oxbow Rd Bridge (18149)
ESS Laboratory Work Order Number: 1807267

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 7:03 pm, Jul 19, 2018

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.

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

SAMPLE RECEIPT

The following samples were received on July 12, 2018 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1807267-01	SS1-NW	Soil	6010C, 8082A
1807267-02	SS2-NE	Soil	6010C, 8082A
1807267-03	SS3-SE	Soil	6010C, 8082A
1807267-04	SS4-SW	Soil	6010C, 8082A
1807267-05	SS5-BB	Soil	6010C, 8082A

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

PROJECT NARRATIVE

No unusual 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 Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - 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
8260B - VOA
8270D - SVOA
8270D 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 04-1.1 - EPH
MADEP 04-2.1 - 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
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - 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
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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1807267-01 through 1807267-05**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	(X) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) 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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	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 (X) 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 protocols(s)?	Yes (X) 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 (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

All negative responses must be addressed in an attached laboratory narrative.

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.

Signature: Laurel Stoddard Date: July 19, 2018

Printed Name: Laurel Stoddard Position: Laboratory Director

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS1-NW
Date Sampled: 07/11/18 10:30
Percent Solids: 88

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**33.2** (3.95)		6010C		1	KJK	07/14/18 17:51	2.86	100	CG81342

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS1-NW
Date Sampled: 07/11/18 10:30
Percent Solids: 88
Initial Volume: 20.4
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1221	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1232	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1242	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1248	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1254	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1260	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1262	ND (0.06)		8082A		1	07/16/18 17:48		CG81307
Aroclor 1268	ND (0.06)		8082A		1	07/16/18 17:48		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*57 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*60 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*89 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*94 %*		*30-150*

ESS Laboratory
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BAL Laboratory
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of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS2-NE
Date Sampled: 07/11/18 10:40
Percent Solids: 88

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**14.5** (4.96)		6010C		1	KJK	07/14/18 17:55	2.3	100	CG81342

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS2-NE
Date Sampled: 07/11/18 10:40
Percent Solids: 88
Initial Volume: 19.4
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1221	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1232	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1242	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1248	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1254	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1260	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1262	ND (0.06)		8082A		1	07/16/18 18:07		CG81307
Aroclor 1268	ND (0.06)		8082A		1	07/16/18 18:07		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*65 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*69 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*95 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*98 %*		*30-150*

ESS Laboratory
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BAL Laboratory
The Microbiology Division of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS3-SE
Date Sampled: 07/11/18 10:50
Percent Solids: 89

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**40.3** (4.70)		6010C		1	KJK	07/14/18 17:59	2.38	100	CG81342

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS3-SE
Date Sampled: 07/11/18 10:50
Percent Solids: 89
Initial Volume: 19.3
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1221	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1232	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1242	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1248	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1254	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1260	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1262	ND (0.06)		8082A		1	07/16/18 18:26		CG81307
Aroclor 1268	ND (0.06)		8082A		1	07/16/18 18:26		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*59 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*63 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*93 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*98 %*		*30-150*

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS4-SW
Date Sampled: 07/11/18 11:00
Percent Solids: 86

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**55.6** (4.94)		6010C		1	KJK	07/14/18 18:03	2.36	100	CG81342

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS4-SW
Date Sampled: 07/11/18 11:00
Percent Solids: 86
Initial Volume: 19.6
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-04
Sample Matrix: Soil
Units: mg/kg dry
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1221	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1232	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1242	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1248	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1254	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1260	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1262	ND (0.06)		8082A		1	07/16/18 18:45		CG81307
Aroclor 1268	ND (0.06)		8082A		1	07/16/18 18:45		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*64 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*68 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*97 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*100 %*		*30-150*

ESS Laboratory
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BAL Laboratory
The Microbiology Division of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS5-BB
Date Sampled: 07/11/18 11:15
Percent Solids: 96

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Lead	**7.14** (4.44)		6010C		1	KJK	07/14/18 18:34	2.34	100	CG81342

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge
Client Sample ID: SS5-BB
Date Sampled: 07/11/18 11:15
Percent Solids: 96
Initial Volume: 20.4
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1807267
ESS Laboratory Sample ID: 1807267-05
Sample Matrix: Soil
Units: mg/kg dry
Analyst: CAD
Prepared: 7/13/18 17:06

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1221	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1232	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1242	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1248	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1254	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1260	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1262	ND (0.05)		8082A		1	07/16/18 19:04		CG81307
Aroclor 1268	ND (0.05)		8082A		1	07/16/18 19:04		CG81307

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*63 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*67 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*102 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*99 %*		*30-150*

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CG81342 - 3050B										
Blank										
Lead	ND	5.00	mg/kg wet							
LCS										
Lead	271	15.9	mg/kg wet	276.0		98	84-116			
LCS Dup										
Lead	264	16.4	mg/kg wet	276.0		96	84-116	3	20	
Reference										
Lead	4380	40.0	mg/kg wet	4490		97	83-113			
8082A Polychlorinated Biphenyls (PCB)										
Batch CG81307 - 3540C										
Blank										
Aroclor 1016	ND	0.05	mg/kg wet							
Aroclor 1016 [2C]	ND	0.05	mg/kg wet							
Aroclor 1221	ND	0.05	mg/kg wet							
Aroclor 1221 [2C]	ND	0.05	mg/kg wet							
Aroclor 1232	ND	0.05	mg/kg wet							
Aroclor 1232 [2C]	ND	0.05	mg/kg wet							
Aroclor 1242	ND	0.05	mg/kg wet							
Aroclor 1242 [2C]	ND	0.05	mg/kg wet							
Aroclor 1248	ND	0.05	mg/kg wet							
Aroclor 1248 [2C]	ND	0.05	mg/kg wet							
Aroclor 1254	ND	0.05	mg/kg wet							
Aroclor 1254 [2C]	ND	0.05	mg/kg wet							
Aroclor 1260	ND	0.05	mg/kg wet							
Aroclor 1260 [2C]	ND	0.05	mg/kg wet							
Aroclor 1262	ND	0.05	mg/kg wet							
Aroclor 1262 [2C]	ND	0.05	mg/kg wet							
Aroclor 1268	ND	0.05	mg/kg wet							
Aroclor 1268 [2C]	ND	0.05	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0166*		mg/kg wet	*0.02500*		*67*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0176*		mg/kg wet	*0.02500*		*70*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0198*		mg/kg wet	*0.02500*		*79*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0216*		mg/kg wet	*0.02500*		*86*	*30-150*			
LCS										
Aroclor 1016	0.5	0.05	mg/kg wet	0.5000		105	40-140			
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		100	40-140			
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		93	40-140			
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		97	40-140			
Surrogate: Decachlorobiphenyl	*0.0181*		mg/kg wet	*0.02500*		*72*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0187*		mg/kg wet	*0.02500*		*75*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0218*		mg/kg wet	*0.02500*		*87*	*30-150*			

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082A Polychlorinated Biphenyls (PCB)										
Batch CG81307 - 3540C										
Surrogate: Tetrachloro-m-xylene [2C]	*0.0214*		mg/kg wet	*0.02500*		*85*	*30-150*			
LCS Dup										
Aroclor 1016	0.5	0.05	mg/kg wet	0.5000		106	40-140	0.8	30	
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		100	40-140	0.3	30	
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		93	40-140	0.7	30	
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		96	40-140	1	30	
Surrogate: Decachlorobiphenyl	*0.0172*		mg/kg wet	*0.02500*		*69*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0178*		mg/kg wet	*0.02500*		*71*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0215*		mg/kg wet	*0.02500*		*86*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0210*		mg/kg wet	*0.02500*		*84*	*30-150*			

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CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

Notes and Definitions

U	Analyte included in the analysis, but not detected
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

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: Green Environmental, Inc.
Client Project ID: Oxbow Rd Bridge

ESS Laboratory Work Order: 1807267

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

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Green Environmental, Inc. - TB/HDM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1807267
Date Received: 7/12/2018
Project Due Date: 7/19/2018
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: 3.4 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:
    Analysis:
    TAT:
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:
    b. Low Level VOA vials frozen: Date: Time: By:

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:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	245909	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	245908	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
03	245905	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
03	245906	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
04	245907	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
05	245903	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
05	245904	Yes	NA	Yes	2 oz. Jar - Unpres	NP	

2nd Review
Are barcode labels on correct containers? (Yes) / No
Are all necessary stickers attached? (Yes) / No

Completed By: Date & Time: 7/12/18 1600
Reviewed By: Date & Time: 7/12/18 1644
Delivered By: 7/12/18 1644

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 180726?

Turn Time ___X___ Standard Other_____

Regulatory State: MA RI CT NH NJ NY ME Other_____

Is this project for any of the following:(please circle)
MA-MCP Navy USACE CT DEP Other_____

Reporting Limits - RCS-1

Electonic Deliverables Excel Access PDF

Co. Name: Green Environmental, Inc.	Project #: 18149	Project Name: Oxbow Rd Bridge	
Contact Person: Kristen Awed Ludas	Address: 2460 Weymouth St.		
City: Rockland	State: MA	Zip: 02370	PO #: 18149
Tel.: 617-479-0550	Fax: 617-479-5150	email: kawed@greenenvironmental.com	

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis: Lead	Analysis: PCBs
1	7/11/18	10:30	G	S	SS1 - NW		1	AG	8oz	X	X
2	"	10:40	"	"	SS2 - NE		1	AG	8oz	X	X
3	"	10:50	"	"	SS3 - SE		2	AG	2oz	X	X
4	"	11:00	"	"	SS4 - SW		1	AG	8oz	X	X
5	7/11/18	11:15	G	S	SS5 - BB		2	AG	2oz	X	X

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ___√___Yes _____No

Seals Intact ____ Yes _____No NA:___

Cooler Temperature: 3.4 ICE 2C

Internal Use Only
[√] Pickup
[ ] Technician___

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Sampled by : KA/RL

Comments: Surficial Soil adjacent to Bridge

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
7-12-18 1:22	7/12/18 1322	7/12/18 1530	7/12/18 1552
Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)

* By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIA

Please fax to the laboratory all changes to Chain of Custody

1 (White) Lab Copy
2 (Yellow) Client Receipt

Appendix 9.11 – Preliminary Hydraulic Report

Preliminary Hydraulic Analysis

06/03/2019
Charlemont
Bridge No. C-05-042 (0G1)
Project File No. 608858
East Oxbow Road / East Oxbow Brook

Alternative	Description	Design Flood Elevation (ft) NAVD (10-year)	Free Board (ft)	Base Flood Elevation (ft) NAVD	"NO-RISE" Required? (Y/N)	"LOMR" Required? (Y/N)	Pier Design Scour Depth (ft)	Pier Check Scour Depth (ft)	Abutment Design Scour Depth (ft) (25-year)	Abutment Check Scour Depth (ft) (50-year)	Notes & Recommendations
Existing	Single Span Skewed ~37 deg Clear span (skewed) = 41.1-ft Hydraulic span (square) = 32.9-ft Low Chord = 642.18-ft	640.66	1.52	642.18	N	N	N/A	N/A	5.64	6.06	Does not meet Requirement Channel bed erosion and headcut at downstream face of crossing
Alt-1	Single Span Skewed ~37 deg Clear span (skewed) = 54-ft Hydraulic span (square) = 43.1-ft Low Chord = 643.52-ft	640.35	3.17	642.02	N	N	N/A	N/A	5.12[a]	5.12[a]	Meets freeboard requirement The proposed substructure design should account potential head cut migration and channel incision. Recommend lowering chan. inv. from 638-ft to 637-ft (US) & 635.4-ft (DS) to better match the existing stream profile beyond the crossing. A natural channel shape with banks set approximately 20-ft apart should be formed through the crossing.

a – includes 4.1-ft of long-term degradation due to headcut migration and channel incision.

cc: Stephen Soma, P.E., Project Manger

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DOCUMENT A00830

ARMY CORPS OF ENGINEERS PERMIT APPLICATION

And

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION WATER QUALITY CERTIFICATION APPLICATION

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Enter your transmittal number → X289412 (Transmittal Number)

Your unique Transmittal Number can be accessed online:
https://www.mass.gov/service-details/transmittal-form-number-for-massdep-permit-application-payment

Massachusetts Department of Environmental Protection

Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: MassDEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

Copy 1 - the original must accompany your permit application. **Copy 2** must accompany your fee payment. **Copy 3** should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP
P.O. Box 4062
Boston, MA 02211

*** Note:**
For BWSC Permits, enter the LSP.

A. Permit Information

1. Permit Code: 4-to-7-character code from permit instructions	2. Name of Permit Category
BRP WW 11	401 Water Quality Certification- Minor Project

3. Type of Project or Activity: The Replacement of Bridge C-05-042

B. Applicant Information – Firm or Individual

1. Name of Firm - Or, if party needing this approval is an individual enter name below: Massachusetts Department of Transportation- Highway Division

2. **Last Name** of Individual	3. **First Name** of Individual	4. MI

5. Street Address: 10 Park Plaza- Room 7360

6. City/Town	7. State	8. Zip Code	9. Telephone #	10. Ext. #
Boston	MA	02116	857-262-0757	

11. Contact Person	12. e-mail address
Courtney Walker	courtney.l.walker@dot.state.ma.us

C. Facility, Site or Individual Requiring Approval

1. Name of Facility, Site or Individual: Bridge #C-05-042

2. Street Address: East Oxbow Road over Oxbow Brook

3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #
Charlemont	MA	01339		

8. DEP Facility Number (if Known)	9. Federal I.D. Number (if Known)	10. BWSC Tracking # (if Known)

D. Application Prepared by (if different from Section B)*

1. Name of Firm or Individual: CHA Consulting, Inc. (CHA)

2. Address: 141 Longwater Drive, Suite 104

3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #
Norwell	MA	02061	(781) 982-7700	

8. Contact Person	9. LSP Number (BWSC Permits only)
Chris Wall	

E. Permit - Project Coordination

1. Is this project subject to MEPA review? ☐ yes ☒ no
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit:

EOEA File Number

F. Amount Due

DEP Use Only

Permit No:

Rec'd Date:

Reviewer:

Special Provisions:

1. ☒ **Fee** Exempt: city, town, county, or district of the Commonwealth; federally recognized Indian tribe housing authority; municipal housing authority; the MBTA; or state agency if fee is $100 or less. *There are no fee exemptions for BWSC permits, regardless of applicant status.*
2. ☐ Hardship Request - payment extensions according to 310 CMR 4.04(3)(c).
3. ☐ Alternative Schedule Project (according to 310 CMR 4.05 and 4.10).
4. ☐ Homeowner (according to 310 CMR 4.02).

Check Number	Dollar Amount	Date

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Jamey Tesler, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

Joint Application for:

Pre-Construction Notification Under the CWA §404

U.S. Army Corps of Engineers (USACE) – New England District

and

§401 Water Quality Certification

Massachusetts Department of Environmental Protection

BRP WW 11 – Minor Fill / Excavation Project Certification

Bridge Replacement, Bridge No. C-05-042, East Oxbow Road over Oxbow Brook

MassDOT Project File #608858

Charlemont, Massachusetts

August 2023

October 4, 2023

Heidi Davis
Massachusetts Department of Environmental Protection
Wetlands Program
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Water Quality Certification
East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)
Charlemont, MA
MassDOT Project 608858
Transmittal #X289412, Fill Project Certification

Dear Ms. Davis,

The Massachusetts Department of Transportation, Highway Division (MassDOT) is submitting this 401 Water Quality Certification (WQC) application for the replacement of a bridge over Oxbow Brook on East Oxbow Road in Charlemont, MA under the MassDOT bridge exemption. The bridge replacement is the functional equivalent and in similar alignment to the existing bridge.

The project requires a 401 WQC and authorization under Section 404 as it will temporarily disturb an estimated 25 square feet (sf) of Waters of the US associated with Oxbow Brook.

A pre-application meeting for this project was held on June 20, 2023 with the Massachusetts Department of Environmental Protection. The project proponent 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.

If you require any additional information regarding the subject project, please contact me at (857) 262-0757 or by email at courtney.l.walker@dot.state.ma.us.

Sincerely,

Courtney Walker

Courtney Walker
Wetlands & Water Resources Coordinator
MassDOT Highway Division, Environmental Services

Cc: Shahpar Negah, MassDOT
Kylie Abouzeid, MassDOT
Tyler Lewis, MassDEP
Dan Vasconcelos, US Army Corps of Engineers

Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Gina Fiandaca, Secretary & CEO

massDOT
Massachusetts Department of Transportation

October 4, 2023

Dan Vasconcelos
Regulatory Division
Department of the Army
New England District, Corps of Engineers
696 Virginia Road
Concord, MA 01742

RE: Pre-Construction Notification Application
East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)
Charlemont, MA
MassDOT Project 608858

Dear Mr. Vasconcelos,

The Massachusetts Department of Transportation, Highway Division (MassDOT) is submitting this application for Pre-Construction Notification Application for proposed replacement of the bridge on East Oxbow Road over Oxbow Brook in Charlemont, MA under the MassDOT bridge exemption.

The project requires a 401 WQC and authorization under Section 404 as it will temporarily disturb an estimated 25 square feet (sf) of Waters of the US associated with Oxbow Brook.

If you require any additional information regarding the project, please contact me at (857) 262-0757 or by email at courtney.l.walker@dot.state.ma.us.

Sincerely,

Courtney Walker

Courtney Walker
Wetlands & Water Resources Coordinator
MassDOT Highway Division, Environmental Services

Cc: Shahpar Negah, MassDOT
Kylie Abouzeid, MassDOT
Heidi Davis, MassDEP
Tyler Lewis, MassDEP
Justin Maynard, Charlemont Conservation Commission

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

Public Notice

Massachusetts Department of Environmental Protection
Division of Wetlands and Waterways
MassDEP Boston Office
100 Cambridge Street, Suite 900
Boston, MA 02108

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 #C-05-042, East Oxbow Road over Oxbow Brook in the Town of Charlemont, Massachusetts by the Massachusetts Department of Transportation – Highway Division, Ten Park Plaza, Room 7360, Boston, MA 02116. The main objective of this project is to replace a structurally deficient bridge with a new bridge on similar alignment and same functional equivalent. There will also be some minor roadway approach reconstruction. 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.

BRP WW 11 Minor Project Certification Form

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wetlands and Waterways

BRP WW 10 Major Project Certification
BRP WW 11 Minor Project Certification

401 water Quality Certification for Fill and excavation Projects in waters and Wetlands

X289412
Transmittal Number #

A. Applicant Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

1. Which permit category are you applying for?

_ BRP WW 10 X BRP WW 11

2. Applicant/Owner:

Massachusetts Department of Transportation (MassDOT) - Highway Division
Name

10 Park Plaza, Room 7360
Address

Boston | MA | 02116
City/Town | State | Zip Code

Courtney Walker
Contact Person

Telephone (home) | (857)-262-0757 (work)

3. Authorized Agent

CHA Consulting, Inc. (CHA)
Name

141 Longwater Drive, Suite 104
Address

Norwell | MA | 02061
City/Town | State | Zip Code

Chris Wall
Contact Person

Telephone (home) | 860-969-0965 (work)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wetlands and Waterways

BRP WW 10 Major Project Certification
BRP WW 11 Minor Project Certification

401 water Quality Certification for Fill and excavation Projects in waters and Wetlands

X289412
Transmittal Number #

B. Project Information

1. Project Location:

East Oxbow Road- Bridge No. C-05-042
Address

Charlemont | MA | 01339
City/Town | State | Zip Code

Oxbow Brook
Nearest or Adjacent Waterbody

2. Project Name (if any):

Replacement of Bridge No. C-05-042- East Oxbow Road over Oxbow Brook

3. a. Describe project purpose:

Replacement of a structurally deficient bridge

b. Is the project

X water-dependent ___ non water-dependent

4. a. provide a brief description of the proposed project (See Application Instructions and include a copy of the Notice of intent, if any.):

Replacement of existing 44' single span bridge with a 67'-8" single span bridge consisting of steel stringers with a composite concrete deck. See attached narrative for additional details.

b. Notice of Intent File number (if any): N/A (Bridge exempt)

5. Identify the loss in square feet of each type of resource area (see Application Instructions for additional information.):

a. Bordering vegetated wetland: 0 (perm.), 0 (temp.) square feet

b. Isolated vegetated wetland: 0 square feet

c. Land under water: 0 (perm.), 25 (temp.) square feet

d. Total cumulative loss of a. + b. + c.: 0 (perm.), 25 (temp.) = 25 (total) square feet

e. Salt marsh: 0 square feet

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wetlands and Waterways

BRP WW 10 Major Project Certification
BRP WW 11 Minor Project Certification

401 water Quality Certification for Fill and excavation Projects in waters and Wetlands

X289412
Transmittal Number #

B. Project information (cont.)

6. a. Will the proposed project occur in any wetlands or waters designated as "Outstanding Resource Waters"?

   ___ Yes X No

   If yes has public notice been published in the Environmental Monitor?

   X Yes ___ No To Be Published
   Date of Publication

   b. Is this project a subdivision or any part of a subdivision? ___ Yes X No

   c. Is the project categorically subject to MEPA? ___ Yes X No

   If yes, has final action been taken? ___ Yes ___ No

   If yes, please include copy of MEPA certificate.

7. Alternatives Analysis:

   As related to the project purpose, attach a detailed description of alternatives to the proposed project that were considered and why none are available that avoid adverse impacts to wetlands and waters.

   If no alternatives are available, describe how the activity will minimize or mitigate the adverse impacts to wetlands and waters.

   See application instructions for information required. Attach required documentation.

C. Additional Information

1. Is any of your proposed work exempt from the Massachusetts Wetlands Protection Act or taking place in a federal non-state wetland?

   ___ Yes X No If yes, see Application Instructions for additional information needed.

2. Public notice to a newspaper of general circulation within the area of the proposed activity must be published within 10 days of the date of this application. Is proof of public notice submitted?

To be submitted. X Yes ___ No (See Application Instructions for additional information)

D. Certification

Application is hereby made for water quality certification.

"I certify that I am familiar with the work proposed and that to the best of my knowledge and belief the information contained in this application is true, complete, and accurate."

Courtney Walker
Applicant's Signature
Courtney Walker
Print name
Christopher J. Wall
Agent's Signature
Chris Wall
Print Name
10/03/2023
Date

Pre-Construction Notification Form

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 - Massachusetts Dept. of Transportation, Highway Div.

E-mail Address - courtney.l.walker@dot.state.ma.us

6. APPLICANT'S ADDRESS:

Address- 10 Park Plaza- Room 7360

City - Boston State - MA Zip - 02116 Country - USA

7. APPLICANT'S PHONE NOs. with AREA CODE

a. Residence b. Business c. Fax d. Mobile

857-262-0757

8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)

First - Chris Middle - Last - Wall

Company - CHA Consulting, Inc. (CHA)

E-mail Address - cwall@chacompanies.com

9. AGENT'S ADDRESS:

Address- 141 Longwater Drive, Suite 104

City - Norwell State - MA Zip - 02061 Country - USA

10. AGENT'S PHONE NOs. with AREA CODE

a. Residence b. Business c. Fax d. Mobile

781-982-7700

STATEMENT OF AUTHORIZATION

11. I hereby authorize, CHA Consulting, Inc. 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

10/4/2023 — DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

Charlemont Bridge Replacement, Bridge No. C-05-042 - East Oxbow Road over Oxbow Brook, Charlemont, MA

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)

Oxbow Brook

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)

East Oxbow Road over Oxbow Brook

City: Charlemont State: MA Zip: 01339

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)

Latitude: 42.629070 °N Longitude: 72.783.898 °W

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: NA Municipality:

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

Coming from the U.S. Army Corps of Engineers New England District, one would take MA-2 West to Greenfield, MA and then merge on I-91 South and drive for 22 miles. One would then proceed to take Exit 43 and merge onto MA- 2W and drive 13 miles until East Oxbow Road which would be on ones right hand side. The project bridge is located a 1/2 mile up East Oxbow Road right before the junction of Hawk Hill Road. The trip should take 1 hour and 51 minutes depending on traffic.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

GP-23

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

The proposed project activities include the replacement of the existing bridge and roadway reconstruction. The structure will be a 67'-8" single span bridge consisting of steel stringers with a composite concrete deck. The existing curb-to-curb width on the bridge will be widened to a minimum of 22'-0" to allow for two travel lanes. The out-to-out width will be 24'-10", which requires widening of the approach roadway on both sides to transition at the bridge. Please see attached Project Narrative for additional information related to the project.

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

Appropriate sedimentation and erosion controls in the form of compost filter tubes, silt fences and required BMPs will be employed and utilized during all phases of construction to minimize as well as avoid additional impacts to the adjacent environmental resource areas. All sedimentation and erosion control measures will be maintained throughout all phases of construction. BMPs and compost filter tubes shall be used as the limit of work. Please see attached Project Narrative for additional information related to the project.

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

The purpose of the activity is to replace a structurally deficient bridge with a new bridge and roadway reconstruction.

A Routine Inspection conducted October 21, 2019, indicated that the beams were deficient, with moderate to heavy rusting, delamination, and section loss. The paint system throughout the entire superstructure is peeling with areas of 100% loss. Please see attached Project Narrative for additional information related to the project.

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
25 to WOTUS	8	NA	Temporary	Water Control Measures

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*)

Indiana Bat (Myotis Sodalis)
Northern Long Eared Bat (Myotis Septentrionalis)
- See Appendix F

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*)

Review of the State and National Registers of Historic Places and the Inventory of Historic and Archaeological Assets revealed that there are no National-Register-listed or inventoried area or properties within or adjacent to the project area. Kurt Jergensen, MassDOT Historic Bridge Specialist also reviewed the bridge and determined it to be ineligible for listing on the National Register- See Appendix E

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":

NA

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 [X] 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.

The proposed activity does require a general 401 WQC

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*)

Please see attached Project Narrative and attachments for additional information related to the project.

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	10/4/2023	Christopher J. Wall	10/03/2023
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.

Appendix:

Appendix A – Project Narrative

Appendix B – Figures

Appendix C – Site Photographs

Appendix D – Wetland Delineation Report

Appendix E – SHPO/THPO Correspondence

Appendix F – Rare Species Consultation

Appendix G – Project Specifications

Appendix H – List of Abutters

Appendix I – Environmental Permit Plans

Appendix A – Project Narrative

Application for Water Quality Certification
Project Narrative
Bridge Replacement (C-05-042)
East Oxbow Road over Oxbow Brook; Charlemont, Massachusetts

1. Existing Conditions

On behalf of the Massachusetts Department of Transportation- Highway Division (the applicant), Clough, Harbour, and Associates, Inc. (CHA) is submitting this joint application for an USACE 404 Pre-Construction Notification and Water Quality Certification for the proposed replacement of the existing structurally deficient Bridge No. C-05-042, which carries East Oxbow Road over Oxbow Brook in the Town of Charlemont, Massachusetts. East Oxbow Road, which is a rural local road, is situated in a rural area approximately seven miles from the Massachusetts-Vermont border. The existing bridge is a single-span structure consisting of four steel beams with reinforced concrete deck. The bridge is 44' long with a curb-to-curb width of approximately 14'-2" and a skew of 45°. The existing substructure consists of two concrete spill-through abutments with short wingwalls. Each abutment is supported by two rectangular concrete columns and footings. The current out-to-out width is 17'-2". There are currently no existing sidewalks at the project site. Current stormwater management is country drainage. A two-foot wide vegetated swale exists to the east of the roadway which flows under the road via a 12'' diameter culvert and outlets to the west near Oxbow Brook. Existing utilities include overhead wires.

The purpose of the project is to address items identified through inspections. A routine inspection conducted October 21, 2019, indicated that the beams were deficient, with moderate to heavy rusting, delamination, and section loss. The paint system throughout the entire superstructure is peeling with areas of 100% loss.

Environmental Resources

Oxbow Brook originates in the Town of Charlemont approximately 1.3 miles upstream from the subject crossing near Pocumtuck Mountain. From its headwaters, Oxbow Brook flows southerly for 2.2 miles until its confluence with the Deerfield River. The Oxbow Brook drainage area at the crossing site is estimated to be 1.26 square miles. The watershed is predominately undeveloped with approximately 94% forest cover. Near the bridge location the watershed land use is predominately forested, with limited low density residential development. The area surrounding the project site is bordered to the north by forested uplands and residential land; to the south by Route 2, to the east by undeveloped forested land; and to the west by forested land with scattered residential development.

According to the FEMA Map 2501120010B (effective July 2, 1980), the project site is located within Flood Hazard Area (SFHA) Zone C.

A wetland delineation conducted on July 3, 2018 and recertified in September of 2021 by Epsilon Associates, Inc. noted that vegetated wetlands were not found on the site. The Ordinary High Water Mark (OHWM) was delineated along the bank of Oxbow Brook. The average channel bank full width is 18'+/-.

The watercourse is well defined and stable. The banks of Oxbow Brook are primarily steep and armored with rock walls. The channel bottom exhibits minimal scour and primarily consists of a rocky substrate that supports fish and other wildlife.

Vegetation

Along the northern and southern banks of Oxbow Brook on the western side of East Oxbow Road the banks are steep and dominated by vegetation species which include eastern hemlock (Tsuga canadensis), yellow birch (Betula allegheniensis), sugar maple (Acer saccharum), goldenrod (Solidago sp.) and multiflora rose (Rosa multiflora). On the northern and southern banks of Oxbow Brook on the eastern side of East Oxbow Road, the dominant plant species include eastern hemlock, a species of wood fern (Dryopteris sp.), and sugar maple.

Soils

Soils found within the project area are mapped by the Natural Resource Conservation Service (NRCS) includes Paxton Fine Sandy Loam complex with 15 to 35 percent slopes (Map #306 F) and Chatfield-Hollis complex with 15 to 25 percent slopes (Map #109 D).

Functions & Values

The principal functions and values associated with the portion of Oxbow Brook at the project bridge are fisheries and wildlife habitat. This watercourse provides potential suitable habitat to fisheries and wildlife due to its association with the Deerfield River and surrounding vegetation which provides food, shade, and spawning areas. The functions and values of the resource area will be temporarily impacted during the project. However, following the completion of the project, the functions and values of the Oxbow Brook will resume as they were prior to construction.

Short-term effects as a result of construction activities are minimized by:

- Utilizing an erosion and sedimentation control plan
- Utilizing a water handling plan
- Minimizing work area in the watercourse
- Limiting areas of disturbance in uplands
- Restoration of temporarily disturbed areas

2. Proposed Conditions

The proposed project activities include the replacement of the existing bridge and roadway reconstruction. The structure will be a 67’-8” single span bridge consisting of steel stringers with a composite concrete deck. The existing curb-to-curb width on the bridge will be widened to a minimum of 22’-0” to allow for two travel lanes. The out-to-out width will be 24’-10”, which requires widening of the approach roadway on both sides to transition at the bridge. The structure will meet the BFW x 1.2 standard; the bankfull width is 19.6 feet in the area of the bridge. No sidewalks are currently being proposed for this project. The travel way of the proposed bridge will be widened to provide two-way traffic, currently the bridge is operating as a single lane bridge with alternating traffic. The “shoulders” will be widened, but in reality no pavement markings exist now, or are proposed to delineate the shoulders.

New bridge abutments will be constructed behind the existing abutments. The new abutments are proposed to be located outside of the resource areas, thus will have no impact to the watercourse or bank. Riprap will be added to the northern and southern banks for stabilization and scour

countermeasures. Roadway improvements will include superelevation, widening, milling and overlay, full depth roadway reconstruction, and new guardrails. To maintain one travel lane during construction, a temporary bridge will be installed adjacent to the existing bridge on the west side. Temporary roadway realignment will be required to utilize the temporary bridge. Additional work for construction will include utility relocations and erosion control.

3. Anticipated Construction Sequence

Staged construction will not be utilized during this project. East Oxbow Road will remain open with one lane of alternating traffic by the use of a temporary bridge which will be installed adjacent to the existing bridge on the west side. However, due to the narrow travel way and limited ROW, short-term full road closure at the bridge is anticipated to facilitate various construction activities. A complete detour route, which is approximately a 4.7-mile loop has been developed and will be utilized during these short-term road closures. Construction will commence by the installation of an Erosion Control system. An anchored temporary barrier will be installed to provide separation between the travel way and the designated work zone area. Temporary shielding will then be put in place below the entire existing structure to catch any debris that falls during demolition. The removal of the existing superstructure will then be carried out by the contractor. The temporary cofferdam will then be installed around the existing abutments, a minimum of one foot higher than the temporary design storm elevation. While the water control measures are in place, the cutting down of the existing abutments and installation of the proposed substructure will occur; both new abutments will be constructed behind the existing abutments. Portions of the temporary cofferdam will then be removed. The installation of the new superstructure will commence. Roadway approaches will then be constructed and graded. During construction, the hydraulic opening of Oxbow Brook may be reduced to a minimum width of 21’ - 0’’ for water control. No construction equipment will be staged in the water during the course of the project. All means and methods used during construction in addition to the sequence of construction will be determined by the contractor in the field.

4. Wetland Impacts

The project proposes the full replacement of the existing project bridge. This will require temporary impacts to regulated resources. Temporary work within the watercourse for water handling will be necessary for the removal of the existing substructure and superstructure and the construction of the new substructure and superstructure. The project design will ensure that the regulated resources are protected from demolition debris. Approximately 25 square feet of impacts are anticipated to Land Under Water (LUW)/Waters of the US (WOTUS). Of those impacts, 0 square feet are permanent impacts. Temporary impacts account for 25 square feet due to the water control measures. Area impacts are presented within the table below:

Wetland Resource Impact Table	
	Land under Water/Waters of the US (sf)
Temporary	25
Permanent	0
Total	25

5. Wetland Replication

Replication is not required for this project, there will be no temporary or permanent impacts to wetlands.

6. Sedimentation and Erosion Control Measures

Appropriate sedimentation and erosion controls in the form of compost filter tubes, or equivalent (means & methods are determined by the contractor) and required BMPs will be employed and utilized during all phases of construction to minimize as well as avoid additional impacts to the adjacent environmental resource areas. All sedimentation and erosion control measures will be maintained throughout all phases of construction. BMP and compost filter tubes shall be used as the limit of work.

7. Water Control Measures

Temporary water control measures include a configuration of cofferdams, or similar approved equipment, a minimum of one foot higher than the temporary design storm elevation, around the existing abutments. The hydraulic opening may be reduced to a width of 21'- 0'' to allow enough space for work to be done under dry conditions. Water located within the work area will be pumped to a temporary dewatering and sedimentation basin which will serve to filter out sediments before the pumped water is discharged in an upland area outside of an environmentally sensitive area. At a minimum, the basin shall be constructed of an earthern berm lined with geotextile fabric and surrounded by a sediment control barrier. The size and location of the basin shall be determined based on the size of the contractors pump and the anticipated flows for the construction of the substructures in the dry. The placement of the basin will be as directed by the Engineer due to specific site conditions and staging operations of the contractor. The Engineer has the right to order the contractor to stop all excavation operations when, in his judgement, the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment.

Throughout all phases of the project, sediment and erosion controls will be utilized on the banks to limit sediment deposition within the brook. While the water control measures are in place, the removal of the existing structure and installation of the proposed substructure will occur in the dry. Subsequently, geotextile filter fabric will be placed and overlain with riprap on the north and south bank to stabilize slopes. Once the construction is complete, the temporary water control measures will be removed. All means and methods used in relation to water handling will be determined by the contractor in the field.

8. Stormwater Management

Currently a two-foot wide vegetated swale exists to the east of the roadway which flows under the road via a 18'' diameter culvert and outlets to the west near Oxbow Brook. No closed drainage systems currently exist or are proposed. An increase of approximately 1,300 square feet in impervious area is proposed due to road widening. On the eastern side of East Oxbow Road stormwater will continue to sheet flow off the road to forested areas that will provide a buffer strip before the water reaches the brook. A swale will be reconstructed/defined on the westerly side of East Oxbow Road, from the proposed bridge to Hawk Hill Road, approximately 170 feet long which will convey stormwater from the western side of East Oxbow Road and Hawk Hill Road. This swale will improve the handling of stormwater and lessen the potential impacts to Oxbow Brook. Of note, all of the eastern property within the projects limits is subject to Agricultural Preservation Restriction (APR) which prohibits any permanent impacts or easements. Due to site conditions and the location APR there are no other viable alternatives for stormwater management. Throughout the design of this project a good faith effort was

made to improve the handling of stormwater and abide by the Massachusetts Stormwater Standards. As this project is considered a redevelopment project with stormwater provisions of 314 CMR 9.06(6)(a)7, it is the opinion of CHA Consulting, Inc. that the stormwater standards have been met to the maximum extent practicable.

Massachusetts Stormwater Management Standards

1. *Standard 1 – No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

   No new stormwater conveyances or untreated discharges are proposed. The reconstruction of the proposed swale will be built in the same vicinity as the existing swale. The project complies with Standard 1.

2. *Standard 2 – Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

   An existing swale is proposed to be reconstructed/defined on the western side of East Oxbow Road which will convey stormwater flowing from Hawk Hill Road and the western side of East Oxbow Road. The stormwater will then discharge onto a stone level pad located at the end of the swale in a forested upland before it reaches East Oxbow Brook. This factor will dissipate flow velocities before the water reaches the brook. As a result, the proposed project meets Standard 2 to the maximum extent practicable.

3. *Standard 3 – Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best 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 type. 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.*

   Due to the site conditions, there are minimal opportunities to recharge ground water. Existing stormwater along East Oxbow Road flows overland as country drainage. Stormwater will continue to sheet flow off the road to forested areas which will provide a buffer strip before it reaches the brook. As a result, the proposed project meets Standard 3 to the maximum extent practicable.

4. *Standard 4 – Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).*

   Due to the site conditions, there are insufficient opportunities to implement stormwater management measures that will remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). No stormwater management systems are proposed for this project that will remove Suspended Solids. Stormwater along East Oxbow Road will flow overland as country drainage but will sheet flow off to forested areas before it reaches Oxbow Brook. As a result, the proposed project meets Standard 4 to the maximum extent practicable.

5. *Standard 5 – For land uses with higher potential pollutant loads, 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.*

   The project is located within a rural, forested area. Land use of the proposed project has a low potential pollutant load. Standard 5 does not apply.

6. *Standard 6 – 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.*

   The Brook is a coldwater fishery and is therefore considered a critical area. Stormwater is conveyed via "country drainage" allowing overland flow to the MEP prior to reaching the brook. An existing gravel swale in the NW corner of the project will be upgraded and stabilized to prevent sedimentation from reaching the brook. An existing vegetated swale on the eastern side of the roadway will remain in place to convey stormwater as in existing conditions. Further treatment of stormwater is limited due to the eastern property, within the project limits, being subject to Agricultural Preservation Restriction (APR) which prohibits any permanent impacts or easements. The installation of further SCMs were considered, however, it was determined that these would not be effective in the available ROW and would likely cause more impact due to removal of trees.

7. *Standard 7 – 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.*

   This project is a redevelopment project. The proposed project meets standards 1, 8, 9, and 10 fully. Standards 2, 3, 4, and 6, have been met to the maximum extent practicable. Standard 5 does not apply for this project.

8. *Standard 8 – 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.*

   Plans to control construction-related impacts and land disturbance activities are included in the project. The project complies with Standard 8.

9. *Standard 9 – A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

   Maintenance of the proposed bridge stormwater management systems will be implemented by the Town of Charlemont to ensure the systems function as designed. This maintenance will include, but is not limited to; road maintenance inspection, and leakoff inspections. The proposed project complies with Standard 9.

10. *Standard 10 – All illicit discharges to the stormwater management system are prohibited.*

There are currently no illicit discharges in the vicinity of the project site. Likewise, this project proposes no illicit discharges to East Oxbow Brook. The project complies with Standard 10.

9. Fisheries and Wildlife/Natural Heritage Endangered Species/Vernal Pools

The bridge is not mapped within a Natural Heritage & Endangered Species Program (NHESP) Priority & Estimated Habitat of Rare Species and Wildlife area. It is also not located within an Area of Critical Environmental Concern (ACEC) or in a designated Outstanding Resource Water (ORW) area. There are no certified or potential vernal pools within proximity to the project area. Impacts to threatened and/or endangered species are not anticipated. This portion of Oxbow Brook is located within a cold water fisheries resource. Coordination with Massachusetts Division of Fisheries and Wildlife will be carried out by the Massachusetts Department of Transportation concerning this matter.

In addition, based on the proposed activities and location of the nearest habitat, the Project "may affect, but is not likely to affect the Indiana Bat and the Northern Long Ear Bat. An Effect Determination letter for this project was submitted to the USFWS on March 23, 2023 under the FHWA Programmatic PBO for Transportation Projects within the range of the Indiana Bat and the Northern Long Ear Bat. The USFWS did not notify the lead Federal action agency or designated non Federal representative within 14 days, and therefore the project may proceed with the Proposed Action under terms of the Not Likely to Adversely Affect (NLAA) concurrence provided in the PBO as of February 5, 2018.

10. Stream Crossing Standards

This project will meet general Massachusetts River & Stream Crossing standards.

1. *Type of Crossing*

This standard specifies that bridges,3- sided box culverts, open bottom culverts, or arches are strongly preferred.

The proposed bridge meets this standard because the structure type is an open-bottom span.

2. *Embedment*

This standard specifies that all culverts should be embedded (sunk into the stream) a minimum of two feet, and round pipe culverts at least 25%.

This standard is not applicable for this project because the proposed design is not a culvert but a bridge.

3. Crossing Span
This standard specifies that the crossing spans the channel with a minimum of 1.2 times the bank full width of the stream.

The proposed bridge meets this standard because the bankfull width is 19.6 feet in the area of the bridge. Downstream from the bridge where the brook is not impacted by the roadway and bridge, the BFW is 18'+/- the new bridge will have a span of 67'+/- which meets the BFW x 1.2 standard. The grading under the new bridge will provide a BFW of approximately 22'.

4. Openness
Openness ratio (cross-sectional area / crossing length) of at least 0.82 feet (0.25 meters). The crossing should be wide and high relative to its length.

The proposed structure has an openness ratio of 9.3 feet, and therefore complies with Standard 4.

5. Substrate
This standard specifies that natural bottom substrate should be used within the crossing and it should match the upstream and downstream substrates. The substrate and design should resist displacement during floods and maintain an appropriate bottom during normal flows.

The proposed project meets this standard because the project will match current substrate. The only work within the water channel will be the installation of a temporary water coffer dam.

6. Water Depth and Velocity
This standard specifies that water depths and velocities are comparable to those found in the natural channel at a variety of flows.

The proposed project meets this standard because water depth & velocity will stay unchanged.

7. Water Depth and Velocity
This standard specifies that banks should be present on each side of the stream matching the horizontal profile of the existing stream and banks.

As part of the proposed project, riprap atop geotextile fabric is proposed at the abutments and wingwalls. East of the southern abutment a retaining wall will be installed to prevent erosion. This activity is required to ensure stability and longevity of the structure. The existing abutments will remain and be cut down to be below the channel grade. The new abutments will be constructed behind the existing ones. The proposed riprap will be placed in areas that have been excavated between the two abutments and in areas disturbed during construction to provide a stable slope. The riprap is being installed outside of regulated areas and has not been considered as an impact or fill as the grades will match existing conditions to the MEP. The banks approximately 15 feet upstream and downstream of the bridge will remain unaltered. The proposed project complies with Standard 7 to the greatest extent practical.

11. Alternatives Analysis

Integral concrete abutments are proposed behind the existing foundations to increase the hydraulic opening, to minimize environmental impacts, and to ease construction. Considering the project parameters, roadway geometry, site accessibility, constructability, and substructure arrangement, the following options were believed to be the most viable for this project:

Option 1– No Build

There are no advantages to this alternative and is not practicable. The bridge will continue to deteriorate and ultimately pose a danger to the traveling public.

Option 2 – Spread Prestressed Concrete Deck Beams

Spread box beams create a deeper superstructure. Formwork is required to construct the composite concrete deck, which increases construction time. Advantages include little maintenance which will overtime likely lessen the impacts to the environment in relation to needed work to be done in regulated areas over the life cycle of the bridge, low life cycle costs, and avoidance of corrosion or deterioration. Disadvantages include larger construction equipment which could potentially have an adverse effect on regulated areas including Oxbow Brook which as stated previously is a cold water fisheries resource.

Option 3 – Steel Stringers with a Composite Concrete Deck

Steel stringers are a viable option. Steel stringers will be much lighter than concrete beams, so a smaller crane or equipment can be utilized which is optimal in uneven terrain which is present at this project site. Since the bridge has a low clearance over water, hot-dip galvanized steel should be used to provide the best protection. Any type of abutment can be used with steel stringers. Advantages include adjustable beam size and spacing, and the ability to follow vertical roadway profiles by cambering the beams. The lightest beam option allows for smaller/lighter construction equipment which will lessen the impacts in regulated areas.

While all three alternates were considered during the preliminary engineering design of the project it was determined after 25% design that Option 3- Steel Stringers with a Composite Concrete Deck was the chosen alternate for the final design of the bridge replacement due to its minimal impacts to the environment.

CHA Consulting, Inc. did make a good faith effort to protect Oxbow Brook; a cold water fisheries resource. The ability to maneuver equipment in uneven terrain at the project site was a critical deciding factor in the selection of the above alternative in trying to keep disturbance to a minimum and not have an adverse effect to this valuable resource. The applicant respectfully requests that MassDEP and the United States Army Corps of Engineers find these measures adequately protective of the interests identified under Section 401 and Section 404 of the Clean Water Act Regulations and issue a 401 WQC and 404 permit under the Massachusetts General Permit approving the work shown on the accompanying plan set.

Project Specifications included in permit:

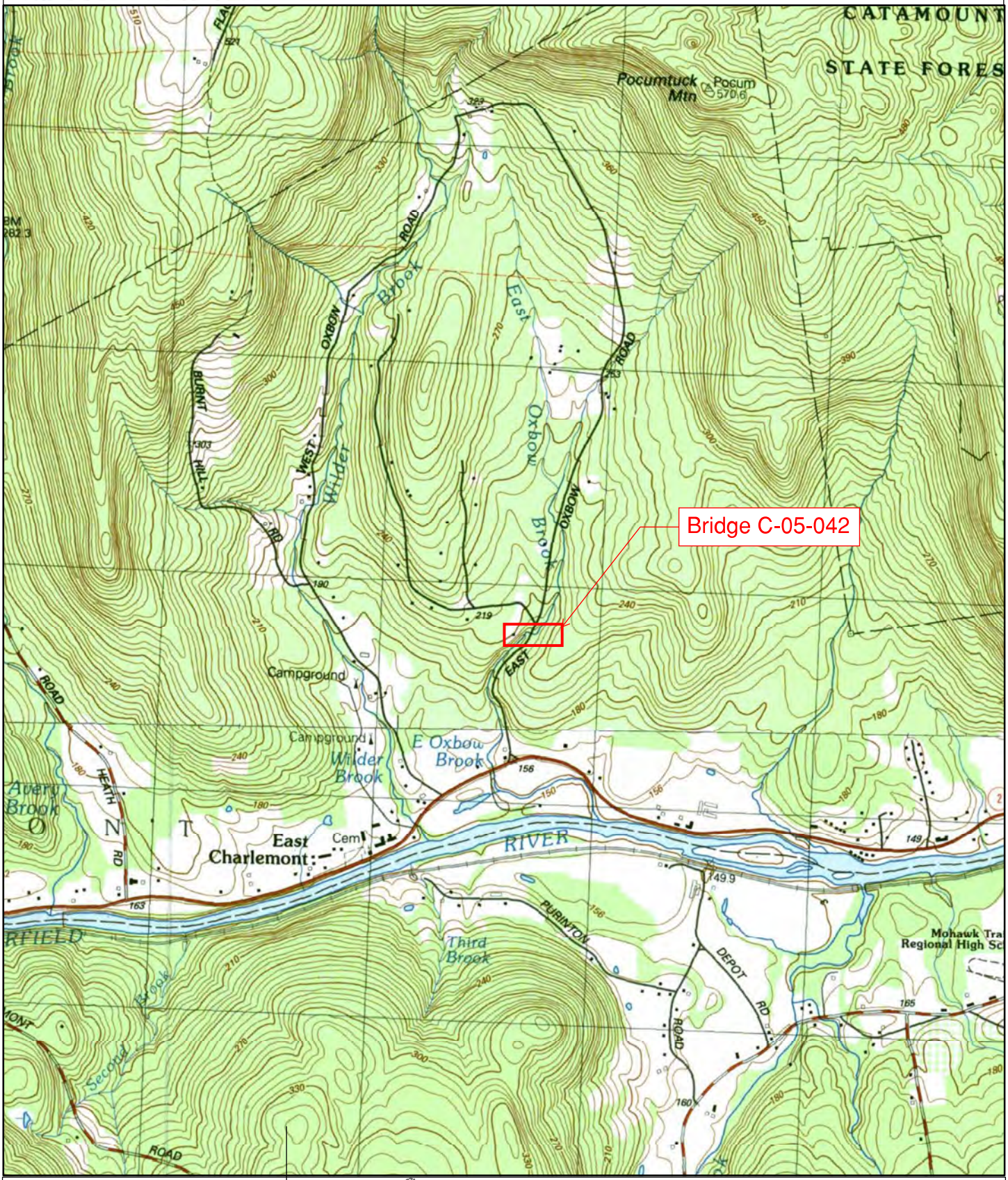
Northern Long-Eared Bat Protection
General Requirements for Demolition and Work Involving Painted Steel
Item 767.121- Sediment Control Barrier
Item 767.9- Jute Mesh
Item 991.1- Control of Water – Structure No. C-05-042
Item 994.01- Temporary Protective Shielding – Bridge No. C-05-042 (0G1)

Appendix B – Figures
B.1 – USGS Site Locus Map
B.2 – Areas of Critical Environmental Concern Map
B.3 – FEMA Flood Insurance Rate Map
B.4 – NRCS Soil Survey Map

USGS TOPOGRAPHIC MAP

BRIDGE NO. C-05-042 CHARLEMONT, MA

EAST OXBOW ROAD OVER OXBOW BROOK



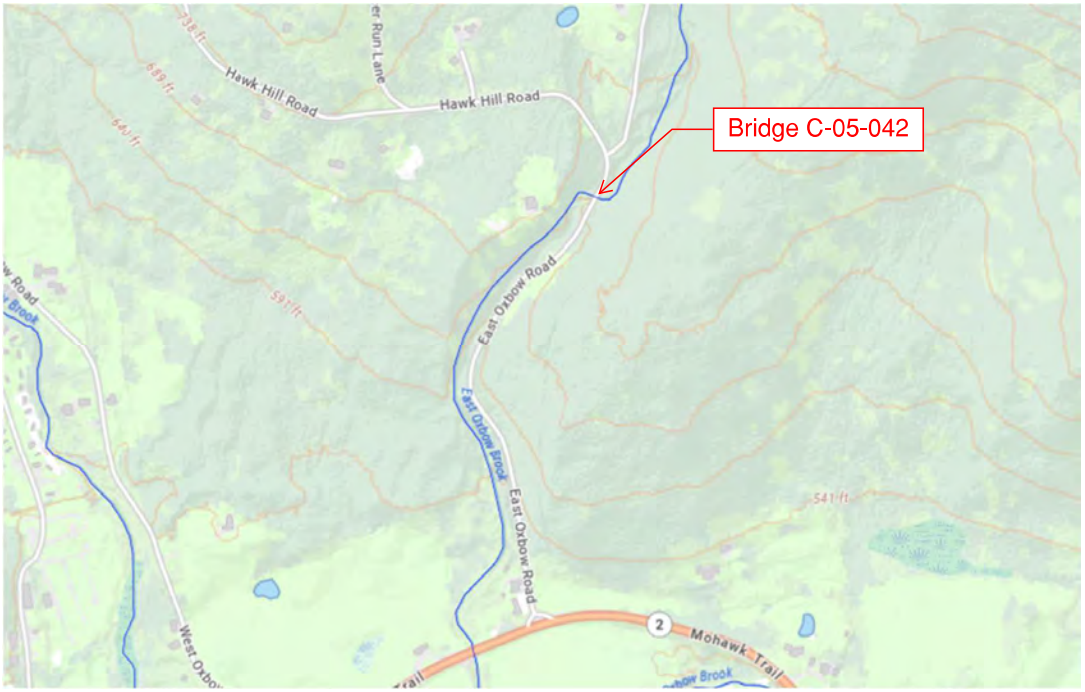
N USGS TOPOGRAPHIC MAP
CHARLEMONT
MASSACHUSETTS

Created: JULY 2021

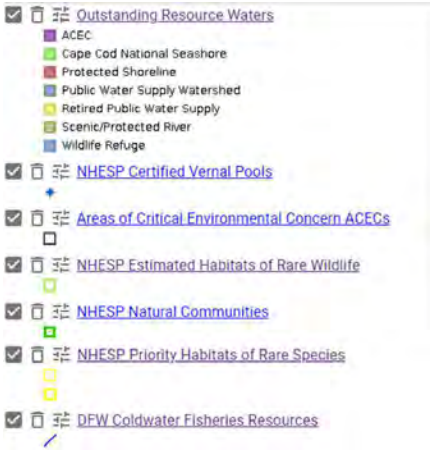
1 INCH = 2,000 FEET

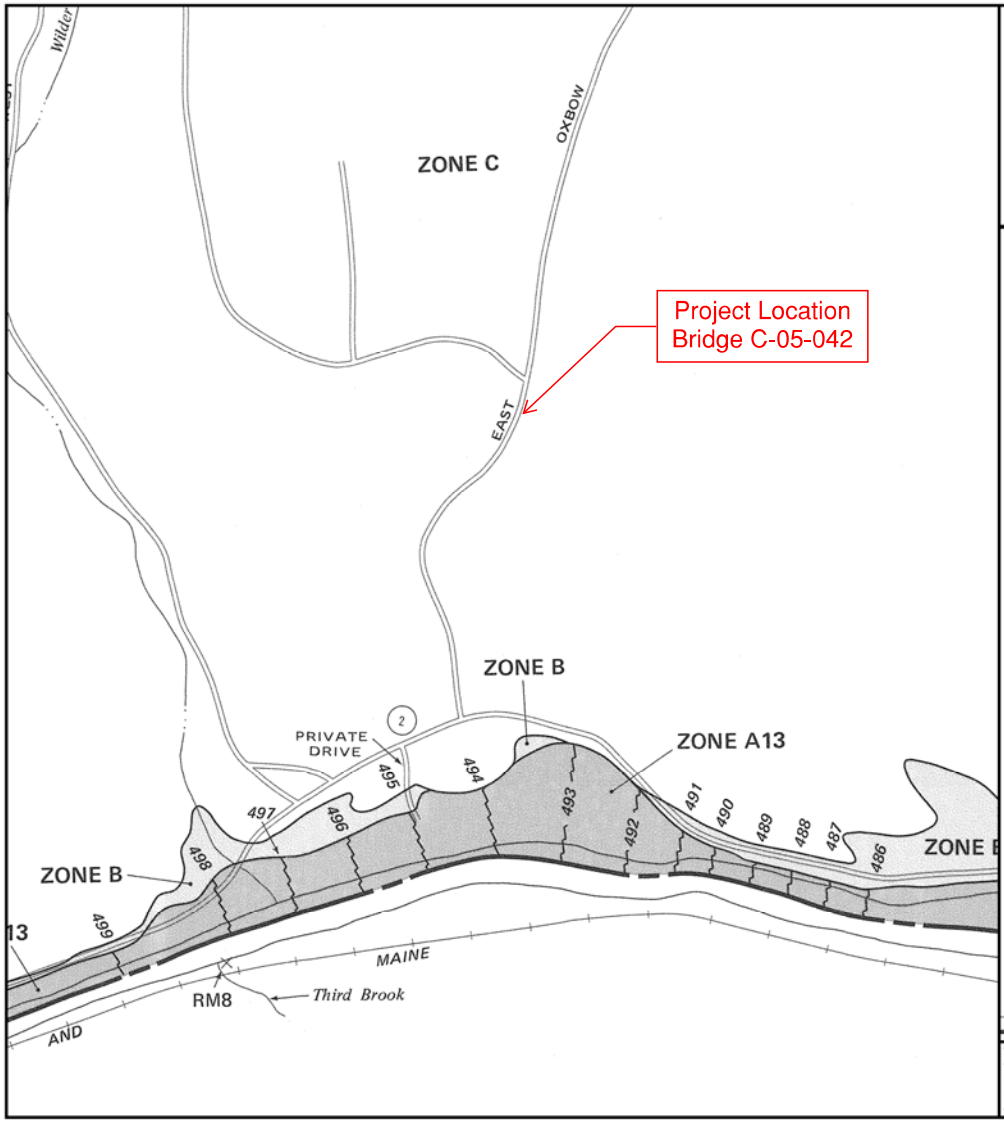
0 1,500 3,000 4,500 6,000 Feet

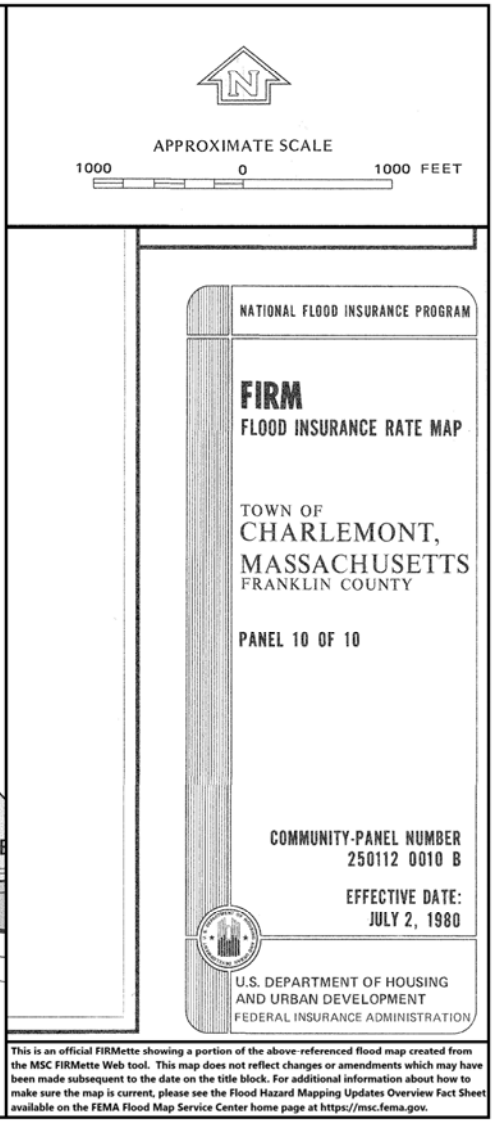
AREAS OF CRITICAL ENVIRONMENTAL CONCERN



Selected Layers







*NO DIGITAL DATA AVAILABLE

Soil Map—Franklin County, Massachusetts
(Charlemont- C-05-042)

Soil Map—Franklin County, Massachusetts
(Charlemont- C-05-042)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Franklin County, Massachusetts
Survey Area Data: Version 17, Sep 9, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
109D	Chatfield-Hollis complex, 15 to 25 percent slopes, rocky	0.0	10.7%
306F	Paxton fine sandy loam, 15 to 35 percent slopes, very stony	0.3	89.3%
Totals for Area of Interest		**0.3**	**100.0%**

Appendix C – Site Photographs

SITE PHOTOGRAPHS

NORTH APPROACH

SOUTH APPROACH

EAST ELEVATION

WEST ELEVATION

TYPICAL UNDERSIDE

LOOKING DOWNSTREAM

LOOKING UPSTREAM

Appendix D – Wetland Delineation Report

MEMORANDUM

Date: July 11, 2018

To: Mr. Amer Raza and Ms. Sue McArthur, MassDOT

From: Epsilon Associates, Inc.

Subject: Wetland Delineation Memo – East Oxbow Road over Oxbow Brook, Charlemont, MA.

Epsilon Associates, Inc. ("Epsilon") is pleased to provide the following Wetland Resource Area Delineation Report to the Massachusetts Department of Transportation ("MassDOT") for wetland resource areas delineated in the vicinity of Bridge C-05-042 on East Oxbow Road in Charlemont, Massachusetts (the "Study Area"). This report describes the resource areas delineated on July 3, 2018 by Epsilon. Figures 1 and 2 in Attachment A depict the Study Area.

Jurisdictional state and federal wetland resource areas and waters of the U.S. delineated by Epsilon include Inland Bank ("Bank) and Riverfront Area ("RFA") associated with Oxbow Brook, a USGS-mapped perennial stream that is tributary to the Deerfield River. No bordering or isolated vegetated wetlands were delineated.

Existing Site Conditions

The Study Area consists of Bridge C-05-042 on East Oxbow Road in Charlemont, Massachusetts and approximately 50 feet on each side around the bridge (See Figure 2). The bridge is located just south of the intersection of East Oxbow Road and Hawk Hill Road. The Study Area is bordered to the north by forested uplands and residential land; to the south by Route 2; to the east by undeveloped forested land; and to the west by forested land with scattered residential development. The site photographs provided in Attachment B depict existing conditions within the Study Area at the time of the delineation.

The FEMA FIRM Community Panel Number 2501120010B dated July 2, 1980 for this area indicates that no portion of the Study Area is located within mapped 100-year floodplain (see Attachment A, Figure 3).

According to the current Natural Heritage and Endangered Species Program (Natural Heritage Atlas, 2017), there is no mapped Priority or Estimated Habitat within the Study Area, nor any mapped potential or certified vernal pools (see Attachment A, Figure 3 – Environmental Constraints Map).

Epsilon ASSOCIATES INC.

Wetland Delineation Methodology

The Ordinary High-Water Mark ("OHWM") of Oxbow Brook was delineated in accordance with U.S. Army Corps of Engineers regulations as evidenced by "the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

For the purposes of this delineation, the Mean Annual High Water ("MAHW") line of the river was presumed to be coincident with the OHWM, and separate lines were not determined to be necessary. A 200-foot Riverfront Area extends from the banks of Oxbow Brook and is protected under the state regulations (310 CMR 10.58).

Wetland Resource Areas & Waters of the U.S.

One river, Oxbow Brook (identified as Bank Series C and D), was delineated. No other wetlands were identified within the Study Area. A more detailed description of the delineated resource areas is provided in Table 1-1 below. Land Under Water Bodies and Waterways, as defined under the Wetlands Protection Act regulations and 401 Water Quality Certification regulations, is contained below Inland Bank within the approximate mean low water levels of Oxbow Brook.

A non-jurisdictional channel was noted north of Oxbow Brook that conveys roadway drainage from upland areas into Oxbow Brook. According to the Wetlands Protection Act, because there are no wetlands upgradient or bordering the stream, it is not jurisdictional as per 310 CMR 10.04 (stream definition).

Refer to Attachment B, Site Photographs for more information depicting the existing conditions of the delineated resource areas. Attachment C contains the wetland sketch that was provided to project surveyors.

Table 1-1 Description of Wetland Resource Areas & Waters of the U.S. Delineated within the Study Area

Wetland Series	Bank[1]	Land Under Water[2]	Riverfront Area[3]	Description of Wetland Flag Series
C1 to C4 open, C1a to C7a open	✓	✓	✓	This series delineates the northern and southern banks of Oxbow Brook on the western side of East Oxbow Road. The banks were steep and dominant vegetation species included eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula allegheniensis*), sugar maple (*Acer saccharum*), goldenrod (*Solidago* sp.) and multiflora rose (*Rosa multiflora*). The stream flows south underneath East Oxbow Road, ultimately discharging to the Deerfield River. The stream contained 0 to 8 inches of water at the time of the delineation and was approximately 20 to 25 feet wide. The streambed contained many boulders. A non-jurisdictional channel was noted north of the river that conveys roadway drainage from upland areas into Oxbow Brook. According to the Wetlands Protection Act, because there are no wetlands upgradient or bordering the stream, it is not jurisdictional as per 310 CMR 10.04 (stream definition).
D1 to D10 open, D1a to D4a open	✓	✓	✓	This series delineates the northern and southern banks of Oxbow Brook on the eastern side of East Oxbow Road. Dominant plant species included eastern hemlock, a species of wood fern (*Dryopteris* sp.), and sugar maple. A 36-inch plastic culvert conveys flow to the stream beneath East Oxbow Road.

1 According to 310 CMR 10.54, a Bank is the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and upland. The upper boundary of a Bank is the first observable break in the slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level. Banks are likely to be significant to public or private water supply, to ground water supply, to flood control, to storm damage prevention, to the prevention of pollution and to the protection of fisheries and wildlife habitat. Where Banks are composed of concrete, asphalt or other artificial impervious material, said Banks are likely to be significant to flood control and storm damage prevention.

2 According to 310 CMR 10.56, 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 Land Under Water Bodies and Waterways is the mean annual low water level. LUW is likely to be significant to public and private water supply, to ground water supply, to flood control, to storm damage prevention, to prevention of pollution and to protection of fisheries and wildlife habitat. where such land is composed of concrete, asphalt or other artificial impervious material, said land is likely to be significant to flood control and storm damage prevention.

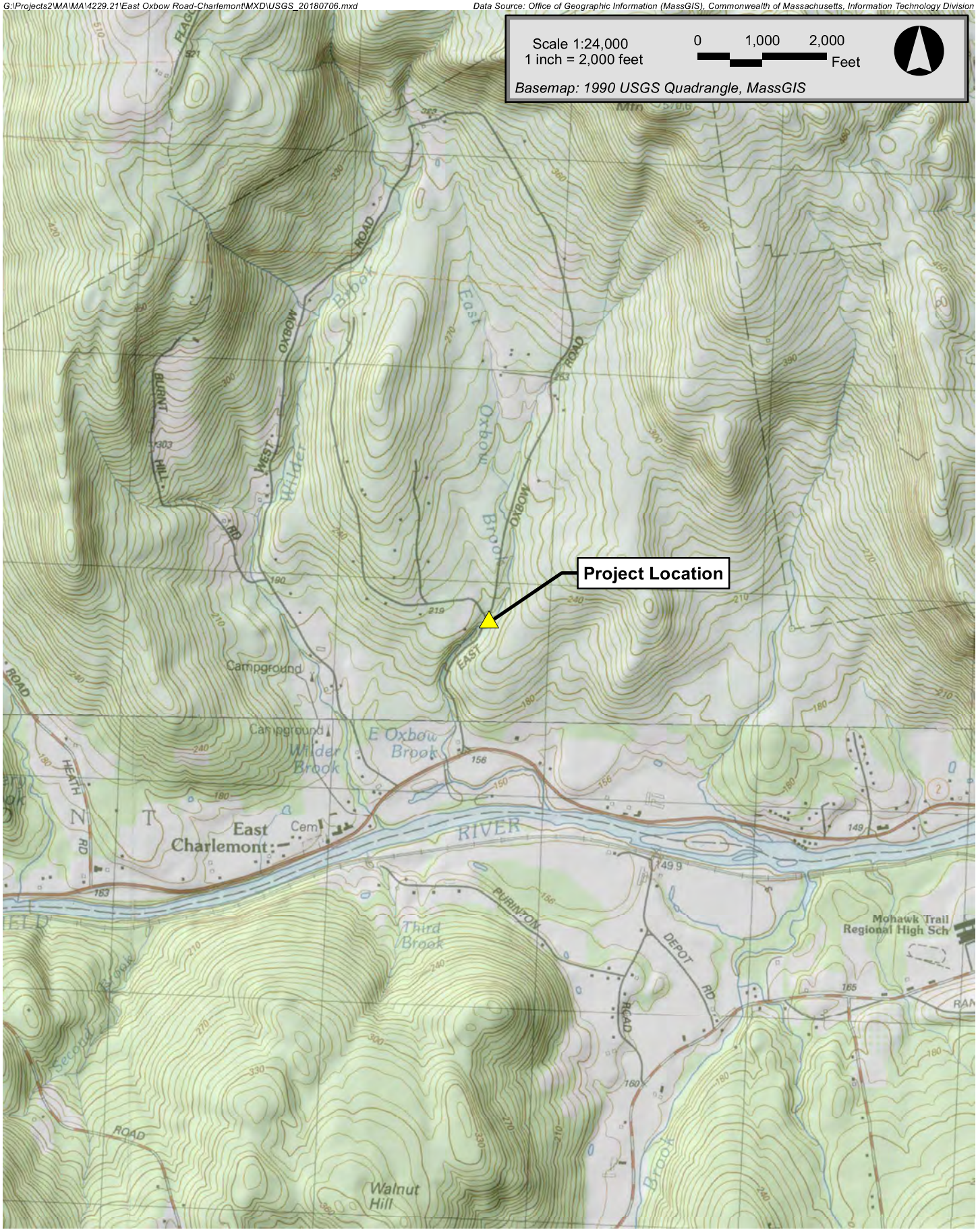
3 According to 310 CMR 10.58, a Riverfront Area is the area of land between a river's mean annual high water line and a parallel line measured horizontally. The riverfront area may include or overlap other resource areas or their buffer zones. The riverfront area does not have a buffer zone. Riverfront areas are likely to be significant to protect the private or public water supply; to protect groundwater; to provide flood control; to prevent storm damage; to prevent pollution; to protect land containing shellfish; to protect wildlife habitat; and to protect the fisheries.

Attachment A

Figures

G:\Projects2\MA\MA\4229.21\East Oxbow Road-Charlemont\MXD\USGS_20180706.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



East Oxbow Road Charlemont, Massachusetts

Epsilon Associates Inc.

Figure 1

USGS Locus Map

G:\Projects2\MA\MA\4229.21\East Oxbow Road-Charlemont\MXD\Aerial_20180706.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

East Oxbow Road Charlemont, Massachusetts

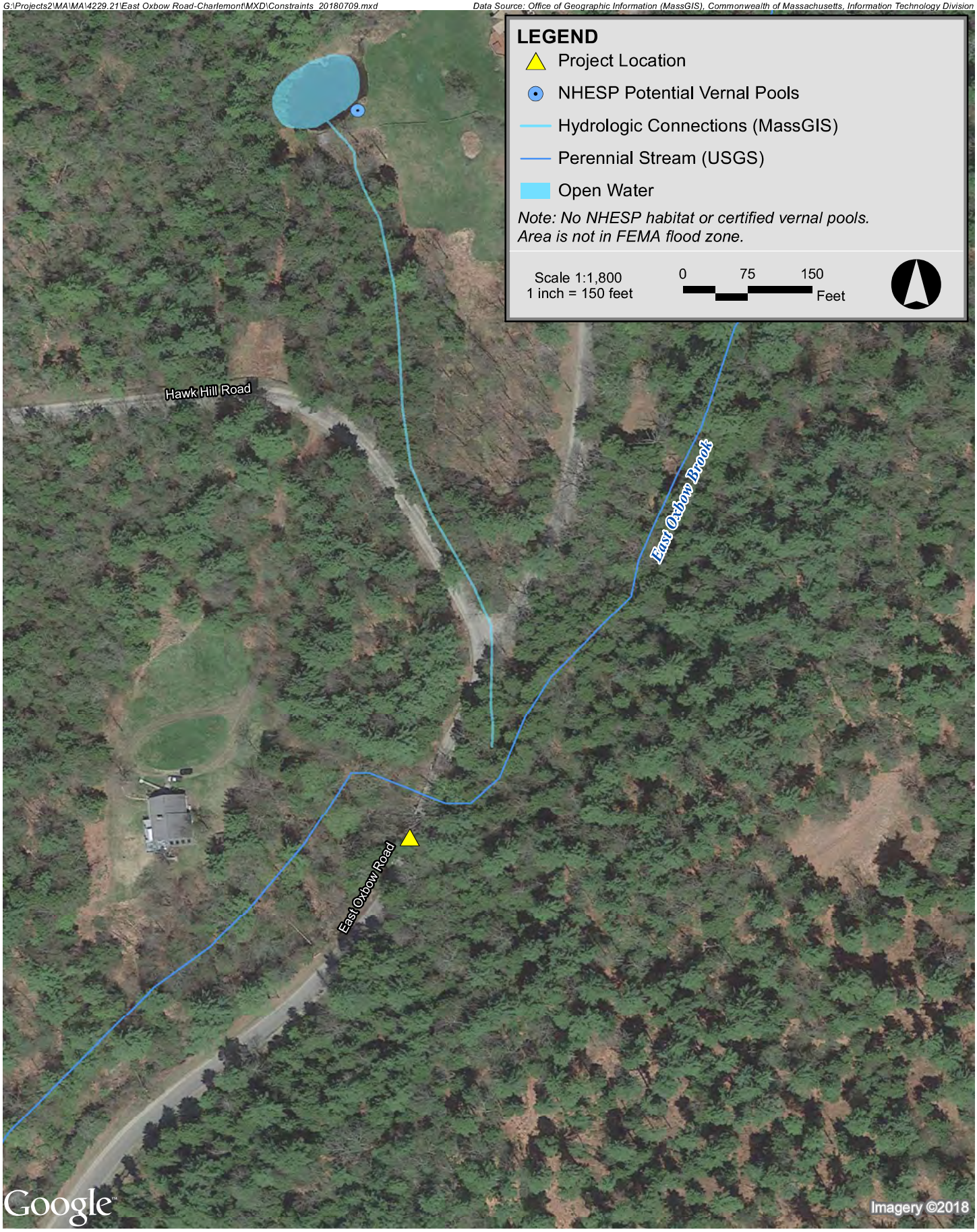
Epsilon Associates Inc.

Figure 2

Aerial Locus Map

G:\Projects2\MA\MA\4229.21\East Oxbow Road-Charlemont\MXD\Constraints_20180709.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



East Oxbow Road Charlemont, Massachusetts

Epsilon Associates Inc.

Figure 3

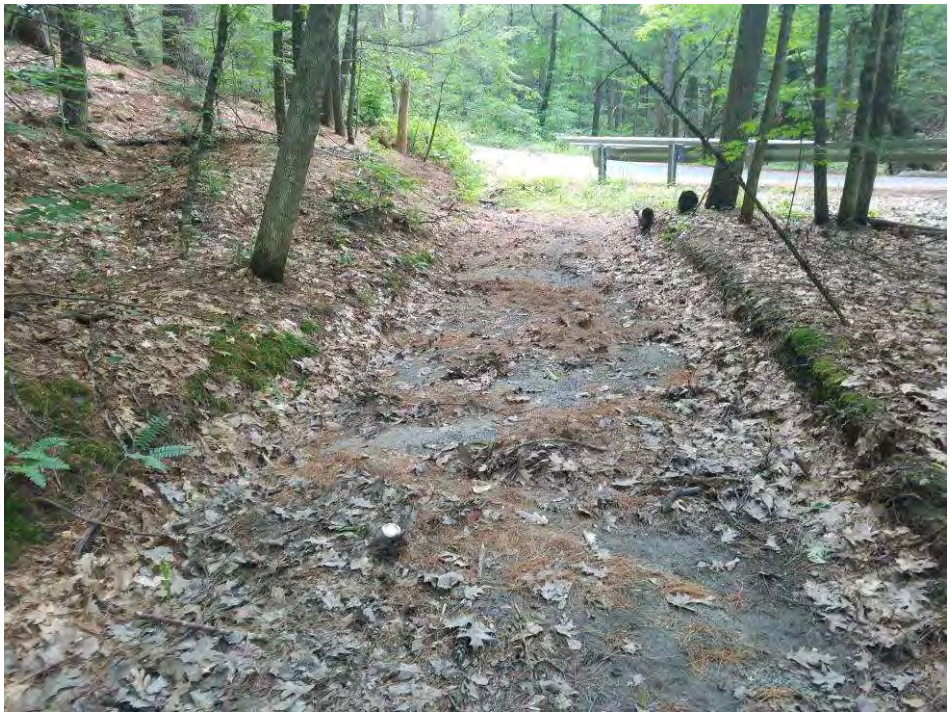
Environmental Constraints Map

Attachment B

Site Photographs

Looking east along Oxbow Brook from East Oxbow Road.

Looking west along the river from the bridge on East Oxbow Road.



Non-jurisdictional channel conveying roadway runoff to Oxbow Brook from East Oxbow Road.

Looking south at Oxbow Brook and the bridge along East Oxbow Road.

Culvert conveying flow to Oxbow Brook from the eastern side of East Oxbow Road.

Attachment C

Wetland Sketch


Epsilon Wetland Delineation
C1 to C4 open (Bank)
C1a to C7a open (Bank)
D1 to D10 open (Bank)
D1a to D4a open (Bank)
Hawk Hill Rd
E Oxbow Rd
Oxbow Brook
D1 to D10
C1 to C4
D1a to D4a
C1a to C7a
E Oxbow Rd
Oxbow Brook
E Oxbow Rd

Appendix E – SHPO/THPO Correspondence

Proposal No. 608858-125266

CULTURAL RESOURCES PROJECT RECORD

City/Town:	Charlemont	Project #	608858	Date Cleared	2/14/2022
Project Name	Bridge replacement, C-05-042, East Oxbow Road over Oxbow Brook	Date Filed	2/14/2022	Finding Under Review	☐
		FHWA to MHC			
Project Type:	Bridge Replacement	Early Coord. Letter Sent: ☐			
Review:	Section 106 (PA)	Comment Received: ☐ MHC ☐ LHC		Reviewer:	KJ
Finding:	Stip VB - No historic properties affected			Consultant	
Comments					

Determination based on: ☑ Scope of Work ☑ Plans ☑ 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 JMH

CULTURAL RESOURCES PROJECT RECORD

Summary of MassDOT Highway Division Finding
(Appendix 1 and Section V.B. Projects only)

The Massachusetts Department of Transportation (MassDOT) proposes to replace Bridge C-05-042, which carries East Oxbow Road over Oxbow Brook in Charlemont. Bridge C-05-042, constructed in 1940, is comprised of a single-span steel stringer superstructure supported on reinforced concrete abutments, with galvanized steel guardrail railings.

The proposed work will include full replacement of the bridge on existing alignment with a wider structure, to accommodate two full travel lanes, replacing a single 14'-wide lane on the existing bridge. The proposed new bridge will consist of a single-span steel stringer superstructure supported by new precast reinforced concrete integral abutments on micropile footings, with reinforced concrete CT-TL2 railings, also known as Texas rail. Work will also include roadway reconstruction along the bridge approaches, approximately 200' to the north and 300' to the south of the bridge and replacement of existing guardrail along the bridge approaches.

The road will remain open during construction, with traffic detoured to a temporary bridge located immediately to the west of the existing structure. An 18'-wide Acrow panel bridge on precast concrete abutments will provide a single 12'-wide travel lane. The temporary approach roadway will also be approximately 18'-wide, with sheet piles holding temporary fill placed as needed, to provide a level road surface. In addition to construction of the temporary bridge and road, utilities along the west side of East Oxbow Road will be shifted temporarily to the west, beyond the temporary bridge. The temporary roadway construction and temporary utility relocation will require substantial tree clearing and stump grubbing within 50' to the west of the roadway. The trees to be removed are mixed deciduous trees less than 24" in diameter. The area will be restored and new trees will be planted once the temporary road and utilities are removed.

Review of the State and National Registers of Historic Places, and the Inventory of Historic and Archaeological Assets, revealed that there are no National Register-listed or Inventoried area or properties within or adjacent to the project area. Bridge C-05-042 will be removed and replaced. Kurt Jergensen, MassDOT Historic Bridge Specialist, reviewed the bridge and determined it to be ineligible for listing in the National Register. The bridge is a typical mid-20th century steel stringer structure with no architectural character and standard engineering details.

A review of the MHC archaeological base maps revealed no recorded sites in the vicinity of the project area. Although the Deerfield River floodplain to the south of the project area is sensitive for pre-contact Native American resources, it is the opinion of the MassDOT Archaeologist that the project's direct area of potential effect has low sensitivity based on the impacts of past roadway and bridge construction and unfavorable environmental conditions (slope). The surrounding area slopes downward towards Oxbow Brook, with grades ranging from Elevation 700 feet approximately 150 feet east and west of the bridge to Elevation 635 feet beneath the bridge. The soils within the project area consist of thin deposits of glacial till overlying bedrock. Significant cobbles and boulders are visible within and adjacent to the brook. The temporary Acrow panel bridge proposed on the west side of the existing bridge alignment will require earth fill to raise and support its shallow foundations.

An Early Coordination letter was sent to the Charlemont Historical Commission on November 1, 2021. Tribal notification was sent to the Aquinnah Wampanoag THPO, the Mashpee Wampanoag THPO, Stockbridge-Munsee THPO and Narragansett THPO on February 16, 2022, in accordance with the permitting requirements of the US Army Corps of Engineers. Any responses received will be considered.

Based on the nature and location of the proposed work, with no National Register-listed or -eligible resources present within or adjacent to the project area, the project meets the exemption requirements under Stipulation V.B of the Section 106 Programmatic Agreement and no further review of the proposed project is necessary.

Reviewer's Initials: _____

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

PROJECT NOTIFICATION FORM

Project Name:	Replacement of Bridge C-05-042 (MassDOT 608858)
Location /Address:	East Oxbow Road over Oxbow Brook
City/Town:	Charlemont
Project Proponent	
Name:	Massachusetts Department of Transportation
Address:	10 Park Plaza
City/Town/Zip/Telephone:	Boston, MA 02116 / T: 207-590-4999

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)**
Federal Highway Administration	Federal Aid funding
Army Corps of Engineers	Section 404 of the Clean Water Act

Project Description (narrative):

The Massachusetts Department of Transportation (MassDOT) proposes to replace Bridge C-05-042, which carries East Oxbow Road over Oxbow Brook in Charlemont. Bridge C-05-042, constructed in 1940, is comprised of a single-span steel stringer superstructure supported on reinforced concrete abutments, with galvanized steel guardrail railings.

The proposed work will include full replacement of the bridge on existing alignment with a wider structure, to accommodate two full travel lanes, replacing a single 14'-wide lane on the existing bridge. The proposed new bridge will consist of a single-span steel stringer superstructure supported by new precast reinforced concrete integral abutments on micropile footings, with reinforced concrete CT-TL2 railings, also known as Texas rail. Work will also include roadway reconstruction along the bridge approaches, approximately 200' to the north and 300' to the south of the bridge and replacement of existing guardrail along the bridge approaches.

The road will remain open during construction, with traffic detoured to a temporary bridge located immediately to the west of the existing structure. An 18'-wide Acrow panel bridge on precast concrete abutments will provide a single 12'-wide travel lane. The temporary approach roadway will also be approximately 18'-wide, with sheet piles holding temporary fill placed as needed, to provide a level road surface. In addition to construction of the temporary bridge and road, utilities along the west side of East Oxbow Road will be shifted temporarily to the west, beyond the temporary bridge. The temporary roadway construction and temporary utility relocation will require substantial tree clearing and stump grubbing within 50' to the west of the roadway. The trees to be removed are mixed deciduous trees less than 24" in diameter. The area will be restored and new trees will be planted once the temporary road and utilities are removed.

APPENDIX A (continued)

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Bridge C-05-042 will be removed and replaced. Kurt Jergensen, MassDOT Historic Bridge Specialist, reviewed the bridge and determined it to be ineligible for listing in the National Register. The bridge is a typical mid-20th century steel stringer structure with no architectural character and standard engineering details. Photographs of the bridge are enclosed.

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).

Bridge C-05-042 will be removed and replaced on the same alignment, with a structure seven feet wider than existing. A temporary bridge and temporary roadway will be constructed immediately to the west of the existing bridge. The temporary crossing and roadway will be removed once construction is complete and the area will be restored.

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.

Review of the State and National Registers of Historic Places, and the Inventory of Historic and Archaeological Assets of the Commonwealth, revealed that there are no State or National Register-listed resources or Inventoried areas or properties within or adjacent to the project area.

A review of the MHC archaeological base maps revealed no recorded sites in the vicinity of the project area. Although the Deerfield River floodplain to the south of the project area is sensitive for pre-contact Native American resources, it is the opinion of the MassDOT Archaeologist that the project's direct area of potential effect has low sensitivity based on the impacts of past roadway and bridge construction and unfavorable environmental conditions (slope). The surrounding area slopes downward towards Oxbow Brook, with grades ranging from Elevation 700 feet approximately 150 feet east and west of the bridge to Elevation 635 feet beneath the bridge. The soils within the project area consist of thin deposits of glacial till overlying bedrock. Significant cobbles and boulders are visible within and adjacent to the brook. The temporary Acrow panel bridge proposed on the west side of the existing bridge alignment will require earth fill to raise and support its shallow foundations.

What is the total acreage of the project area?

Woodland	<2	acres	Productive Resources:		
Wetland		acres	Agriculture		acres
Floodplain		acres	Forestry		acres
Open Space		acres	Mining/Extraction		acres
Developed		acres	Total Project Acreage	<2	acres

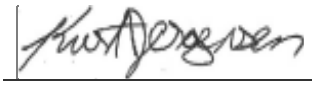
What is the acreage of the proposed new construction? <1 acres

APPENDIX A (continued)

What is the present land use of the project area?
The proposed project work will primarily take place within the existing bridge and roadway footprint and immediately adjacent disturbed areas within the existing Town Layout. Land to the west of the bridge, where a temporary detour road will be constructed and utilities will be temporarily relocated, consists of deciduous forest on steep slopes.

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:** 2/15/2021

Name: Kurt Jergensen

Address: 10 Park Plaza

City/Town/Zip: Boston, MA 02116

Telephone: 207-590-4999

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

From:	Jergensen, Kurt E. (DOT)
To:	Robinson, David S (EEA)
Cc:	Harwood, Jameson (DOT)
Subject:	Charlemont, Br. C-05-042 replacement (MassDOT #608858)
Date:	Wednesday, February 16, 2022 3:39:00 PM
Attachments:	C-05-042 PNF.doc Locus map.pdf 25% BR Plans.pdf 25% HD Plans.pdf

Dear Mr. Robinson,

MassDOT is submitting the enclosed information regarding the above-noted project to the Board of Underwater Archaeological Resources to meet the Section 106 consultation requirements of the U. S. Army Corps of Engineers. 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 very much.

Kurt Jergensen
Historic Bridge Specialist
Environmental Services
MassDOT, Highway Division
Ten Park Plaza, Boston, MA 02116
Cell: 207-590-4999

From:	Jergensen, Kurt E. (DOT)
To:	Bettina Washington
Cc:	tcrm2@wampanoagtribe-nsn.gov
Subject:	Charlemont, Br. C-05-042 replacement (MassDOT #608858)
Date:	Wednesday, February 16, 2022 3:27:00 PM
Attachments:	C-05-042 PNF.doc Locus map.pdf 25% BR_Plans.pdf 25% HD_Plans.pdf

Dear Ms. Washington,

MassDOT is submitting the enclosed information regarding the above-noted project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the U. S. Army Corps of Engineers. 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 very much.

Kurt Jergensen
Historic Bridge Specialist
Environmental Services
MassDOT, Highway Division
Ten Park Plaza, Boston, MA 02116
Cell: 207-590-4999

From: Jergensen, Kurt E. (DOT)
To: David Weeden
Cc: 106Review@mwtribe-nsn.gov; Harwood, Jameson (DOT)
Subject: Charlemont, Br. C-05-042 replacement (MassDOT #608858)
Date: Wednesday, February 16, 2022 3:31:00 PM
Attachments: C-05-042 PNF.doc
Locus map.pdf
25% BR_Plans.pdf
25% HD_Plans.pdf

Dear Mr. Weeden,

MassDOT is submitting the enclosed information regarding the above-noted project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the U. S. Army Corps of Engineers. 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 very much.

Kurt Jergensen
Historic Bridge Specialist
Environmental Services
MassDOT, Highway Division
Ten Park Plaza, Boston, MA 02116
Cell: 207-590-4999

From:	Jergensen, Kurt E. (DOT)
To:	tashtesook@aol.com
Cc:	Harwood, Jameson (DOT)
Subject:	Charlemont, Br. C-05-042 replacement (MassDOT #608858)
Date:	Wednesday, February 16, 2022 3:34:00 PM
Attachments:	C-05-042 PNF.doc Locus map.pdf 25% BR_Plans.pdf 25% HD_Plans.pdf

Dear Mr. Brown,

MassDOT is submitting the enclosed information regarding the above-noted project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the U. S. Army Corps of Engineers. 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 very much.

Kurt Jergensen
Historic Bridge Specialist
Environmental Services
MassDOT, Highway Division
Ten Park Plaza, Boston, MA 02116
Cell: 207-590-4999

From: Jergensen, Kurt E. (DOT)
To: thpo@mohican-nsn.gov
Cc: Harwood, Jameson (DOT)
Subject: Charlemont, Br. C-05-042 replacement (MassDOT #608858)
Date: Wednesday, February 16, 2022 3:35:00 PM
Attachments: C-05-042 PNF.doc
Locus map.pdf
25% BR_Plans.pdf
25% HD_Plans.pdf

Dear Mr. Allison,

MassDOT is submitting the enclosed information regarding the above-noted project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the U. S. Army Corps of Engineers. 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 very much.

Kurt Jergensen
Historic Bridge Specialist
Environmental Services
MassDOT, Highway Division
Ten Park Plaza, Boston, MA 02116
Cell: 207-590-4999

Appendix F – Rare Species Consultation

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: August 21, 2023
Project code: 2022-0033441
Project Name: 608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK

Subject: Concurrence verification letter for the '608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK' 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 August 21, 2023 to verify that the **608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK** (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, and may affect, but 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

608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK

DESCRIPTION

608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK

This project proposes full replacement of this existing SD bridge.

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/@42.629089449999995,-72.78386426152227,14z

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

- *AllBridges_Report Submittal_2021-reduced.pdf https://ipac.ecosphere.fws.gov/project/RPARO6NQZJFBHMJT7AJMRAGH6E/projectDocuments/114258160*

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?

    No

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.

    No

27. Is the bridge **within** a known maternity colony's home range[1]?

    [1] Contact your local FWS office for more information if you are uncertain about where the nearest known maternity colony is located.

    No

28. Have presence/probable absence (P/A) summer surveys[1][2] been conducted for this project with at least one survey point **within** suitable habitat and **within** 0.25 miles of the bridge[3][4]?

    [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, P/A summer surveys were conducted within 0.25 miles of the bridge

    SUBMITTED DOCUMENTS

    - *AllBridges_Report Submittal_2021-reduced.pdf https://ipac.ecosphere.fws.gov/project/RPARO6NQZJFBHMJT7AJMRAGH6E/projectDocuments/114258160*

29. 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, Indiana bats and/or NLEBs were not detected during the P/A surveys

30. Did the local Service Field Office verify[1] that this presence/probable absence (P/A) summer survey can be used for determining Indiana bat and/or NLEB absence from the bridge?

    [1] Coordination with local US Fish and Wildlife Service Field Office regarding the applicability of P/A surveys for this use is required.

    Yes, the local FWS office confirmed that this P/A survey can be used to assume Indiana bats and/or NLEBs are absent from the bridge

31. Will the bridge removal, replacement, and/or maintenance activities include installing new or replacing existing **permanent** lighting?

    No

32. 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

33. 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

34. 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

35. Will the project install new or replace existing **permanent** lighting?

    No

36. 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

37. 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

38. 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

39. 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

40. Will the project raise the road profile **above the tree canopy**?

    No

41. 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.

42. 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

43. 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.

44. 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

45. **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.

0.5

4. Please describe the proposed bridge work:

   It will be a one span, two travel lane wide bridge - it consists of steel beams and concrete deck bridge, supported on drilled-mini-piles. There will also be a temporary bridge constructed to allow passage as the existing bridge is only one lane wide and stage construction is not feasible.

5. Please state the timing of all proposed bridge work:

   Spring 2024-Spring 2026

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 July 27, 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: Hana Isihara
Address: 10 Park Plaza
City: Boston
State: MA
Zip: 02116
Email hana.l.isihara@dot.state.ma.us
Phone: 6178964454

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

Appendix G – Project Specifications

NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service (USFWS) has listed the northern long-eared bat (NLEB) as threatened under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. 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.

On July 29 - August 2, 2021, Normandeau, 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 2020 survey guidelines. The survey did not detect northern long-eared bat, and as stated within the survey guidelines, the survey is valid for five years. Due to the 5-year validity of the negative presence/absence survey, it is recommended that the contractor conduct all activities that could result in stressors to the bats such as tree removal/trimming, bridge and/or structure removal/maintenance, lighting, or use of percussive, by July 29, 2026. 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.

Due to the negative survey results, the project is eligible for a May Affect, Not Likely to Adversely Affect (NLAA) determination, without 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 USFWS NLAA). Therefore, the project has completed Section 7 consultation through the Endangered Species Act, and no AMMs apply to the project.

The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB, including all applicable AMMs. NLEB Bat information (https://www.fws.gov/midwest/endangered/mammals/nleb/) shall be made available to all personnel.

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.

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

REV. 2022.02.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

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

Item 767.121 will be measured by the length, in Foot, of sediment control barrier placed as directed by the Engineer.

BASIS OF PAYMENT

Item 767.121 will be 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 767.9 **JUTE MESH** **SQUARE YARD**

REV. 2022.02.01 (REV. DATE TO BE REMOVED BY CONTRACTS)

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following.

The work under this item shall consist of furnishing and installing jute mesh fabric to prevent soil erosion. Jute mesh shall be placed over all areas of exposed soil in locations shown on the plans or as required by the Engineer.

MATERIALS

Jute netting or similar material shall be new, unused, undyed, and unbleached 100% biodegradable yarn (no polypropylene) and of uniform plain weave. The materials should weigh approximately 1.0 (+/- 5%) pounds per linear yard (assuming a 4-foot width).

Shall meet the following minimum requirements:

Open Area:	70-75%
Mesh Size:	approximately 1/2 inch with an open area of 60-65%.
Roll Weight:	approximately 1.0 (+/- 5%) pounds per linear yard
Warp Ends:	78 per linear yard
Weft Ends:	41 per linear yard
Recommended flow:	6 fps (1.8 m/s)
Functional Longevity:	6-9 months

Anchoring devices shall be 11-gauge steel staples 6-inch minimum length. In loose soils the length of the staples shall be 9-inches.

For areas that will be routinely mowed anchoring devices shall consist of minimum 8” wooden stakes. Longer stakes shall be used where loose soils or other conditions obligate, as required by the Engineer.

CONSTRUCTION METHODS

Area shall be seeded prior to installation of jute netting.

Installation shall be such as to ensure continuous contact with soil without folds or wrinkles. Jute netting shall be laid such that upslope fabric is placed over lower slope fabric by a minimum of 3 feet. Adjoining rolls shall be overlapped a minimum 6 inches. The netting shall extend beyond at least 1 foot beyond the edge of the seeded area.

The Contractor shall bury the ends of the jute netting 6-8 inches in anchor trenches at top and bottom of slopes.

Jute netting shall be anchored in place with vertically driven metal staples. The staples shall be driven in until their tops are flush with the soil. Staples shall be placed at 12-inch intervals along

the top of a slope and in staggered courses along the face of the slope to achieve a minimum of 3 staples per square yard, or at manufacturer's recommendations for the given site conditions.

Contractor shall reseed all trenched and otherwise disturbed areas with specified seed mix. The Contractor shall maintain the jute netting and make satisfactory repairs of any areas damaged until acceptance of seed establishment.

METHOD OF MEASUREMENT

Jute Mesh will be measured by the number of Square Yards complete in place, including anchoring, as measured across the surface of grade and does not include buried or overlapped portions. The quantity measured for payment shall not exceed that shown on the plans or as directed by the Engineer.

Mesh that becomes loose or that is not otherwise functioning to stabilize soil shall be repaired and new or additional jute matting installed as required at the Contractor's expense. Soil erosion shall be repaired, and area shall be raked and reseeded with the original specified mix as required by the Engineer at the Contractors expense.

BASIS OF PAYMENT

Item 767.9 will be paid for at the contract unit price per Square Yard, which price shall include all labor, materials, equipment, trenching, placing, and stapling of jute fabric, reseeding of trenched and disturbed areas, and all incidental costs required to complete the work.

ITEM 991.1 **CONTROL OF WATER – STRUCTURE NO. C-05-042** **LUMP SUM**

The work to be performed under this Item shall include all temporary water diversion dams, pumping, and other measures necessary for sufficient water control to accomplish demolition and construction of the proposed substructure in the dry. Furthermore, all water control operations shall be in compliance with the approved environmental permits included in these bid documents. Also, this Item includes all water pollution prevention, including sediment control and flood prevention of the excavated areas at the structure for demolition, reconstruction, and riprap placement, necessary to complete the bridge replacement.

Temporary water diversion dam type and location shall be determined by the Contractor or as directed by the Engineer. All work areas shall be within the existing right of way and acquired easements. The minimum temporary hydraulic opening shown on the plans shall be maintained throughout construction. The top of the water diversion dam shall be at least one foot above the temporary design flood elevation shown on the plans. Dewatering shall be conducted to ensure that all concrete is placed and satisfactorily cured in the dry.

It is the responsibility of the Contractor to determine the need and extent of dewatering required based on his/her proposed construction methods. Furthermore, the Contractor shall submit methods and materials he proposes to use for the Engineer's approval.

CONSTRUCTION METHODS

Plans and calculations (if applicable) for all water control measures shall be developed by the Contractor for this Item. These plans and calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts and shall be submitted for the approval of the Engineer prior to the start of construction.

The Contractor shall use such equipment and shall perform his operations in such a manner that disturbances of the soil in the foundation area will be prevented. The Contractor shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the adjacent existing structures or supporting soils.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway. The pumping discharge shall not be allowed to enter directly into the waterway. The water from the work areas shall be pumped to a dewatering basin. This basin shall be constructed so as to allow for the pumped water to pass through the basin with sediments settling out before outletting. At a minimum, the basin shall be constructed of an earthen berm lined with geotextile fabric and surrounded by staked straw bales. The basin shall meet or exceed the following criteria:

A. The size and location of the basin shall be determined based on the size of the Contractors pump and the anticipated flows for the construction of the substructures in the dry.
B. The outlet/weir of the dewatering basin shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the basin.

ITEM 991.1 (Continued)

The Contractor shall maintain the dewatering operations in working condition, including periodic removal of accumulated sediment within the basin, to the satisfaction of the Engineer. The water pump and hoses for dewatering shall be in good working condition and of adequate power and size for the operation. At no time shall said discharge be directly released into adjacent resource areas.

The Contractor shall inspect straw bales that surround the outlet daily and shall immediately replace any that are damaged. Additional erosion control shall be employed, as necessary, to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the contract.

Placement of the basin will be as directed by the Engineer due to specific site conditions and staging operations of the Contractor and the time at which the actual excavation work is being performed. The Engineer has the right to order the Contractor to stop all excavation operations when, in his/her judgement, the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment.

Pumping shall be conducted in a manner, which will not adversely affect the freshly placed concrete within the excavation. The work zone may be flooded provided the concrete has reached initial set and the flooding of the temporary water diversion dam does not produce a water velocity that damages the work.

BASIS OF PAYMENT

Item 991.1 shall be paid for at the Contract Lump Sum price, which shall include all labor, materials, tools, equipment, accessories, and incidental costs to complete the work as described under this Item. Work consists of, but is not limited to, design for flood prevention of excavated areas, water pollution prevention, dewatering operations, and the installation, removal, and satisfactory disposal of the water control system from the project site at the completion of construction. The removal and disposal of the sediment material collected from the dewatering system shall also be included under this Item.

ITEM 994.01 TEMPORARY PROTECTIVE SHIELDING LUMP SUM
BRIDGE NO. C-05-042 (0G1)

GENERAL

Work done under this Item consists of designing, furnishing, installing, maintaining, and removing of a temporary protective shielding system on, adjacent to, and under the bridge. The work shall include removing and disposing of the protective shield after work is completed.

This Item covers the shielding required for the proposed demolition of portions or all of the existing superstructure as applicable. The proposed shielding system shall prevent debris from falling into the water during the demolition process.

Work platforms, containment systems and debris shields for construction activities other than superstructure demolition are not included under this Temporary Protective Shielding item and shall be considered incidental to the work unless specifically stated otherwise within the contract documents.

The Contractor shall submit calculations and detailed drawings of the proposed shielding to the Engineer for approval. These calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. Acceptance of the shielding design by the Engineer is required prior to installation of the shielding system.

MATERIALS

All materials used to construct the temporary protective shielding shall be new.

All materials used in the shielding system shall become the property of the Contractor and shall be removed from the site at the completion of the Project.

DESIGN

The shielding shall conform to the following:

1. The intent is for the Contractor to shield all existing spans of the existing bridge prior to any demolition.
2. The protective shield may be constructed of tongue and groove or ship lap timbers with 6 mil polyethylene overlaid to seal the shielding or the Contractor may propose an alternate shielding system approved by the Engineer and accepted by the Department.
3. Shielding shall have all spaces along the perimeter and at the seams sealed to prevent dust and debris from escaping and falling below the bridge. The protective shield shall be sufficiently tight to prevent leakage of slurry from cutting tools, dust, chips or other small debris to the surface below.
4. Shielding used at or adjacent to demolition and shall be designed to safely withstand all loads that it will be subjected to, including all construction and dead loads, but not less than 100 pounds per square foot; to be stiff enough to limit deflection to l/2 inch under maximum loads; and to be sealed tightly at all joints. The allowable design stresses shall be in accordance with AASHTO Standard Specifications for Highway Bridges. The Contractor

ITEM 994.01 (Continued)

shall be responsible for developing the loads to which the shielding is anticipated to be subject to based on the Contractor's means and methods of construction.

5. The shielding shall be positively attached to the existing and/or proposed bridge such that it cannot be dislodged or shifted during construction. The attachment methods shall be designed for all intended and errant loads anticipated by the Contractor based on the Contractor's means and methods of construction, and shall be included in the design submittal.
6. The Design of the shielding shall also include a complete description of the equipment and construction methods proposed for the superstructure demolition, including deck removal and the maximum size of debris anticipated during excavation of the deck area (i.e. 1 ft. x 1 ft. hammered sections or 2 ft. x 4 ft. wet sawcut sections). Shielding beneath areas to be excavated or beneath the path used to remove demolition debris shall be designed to withstand the maximum size of debris that could fall during excavation or removal.
7. Shielding shall be installed or removed only upon approval of the Engineer.

The Contractor may utilize the bottom flanges of the existing steel beams as supports for the temporary protective shielding where feasible. However, the Contractor will not be permitted to weld onto, drill into, or cut any existing structural members without receiving approval of the Engineer. For any proposed shielding systems that include installation of brackets along the lengths of the substructure units, the Contractor may drill and anchor into the existing substructure units as approved by the Engineer.

SUBMITTALS

A minimum of thirty (30) days prior to the start of any demolition and/or installation of protective shielding, the Contractor shall submit for review and approval a detailed temporary protective shield plan which shall include, a description of demolition and erection equipment, methods of operation, locations and sequence of sections to be removed, as well as data relative to the protective shield. The plan shall also indicate the type, size and dimensions of the materials to be used for the protective shield and the proposed methods for installation of the protective shield including connections, fasteners, erection procedures and maintenance in accordance with the information provided in this specification.

CONSTRUCTION METHODS

The Contractor shall periodically remove all accumulations of concrete and/or debris on the protective shielding so as not to exceed the design loads in the assumptions used for the design of the temporary protective shielding, or as required by the Department.

BASIS OF PAYMENT

Item 994.01 will be paid for at the Contract Lump Sum price, which shall include full compensation for the Contractor's design and plans as approved submittals, as well as for all material, labor, equipment, and incidentals necessary to furnish, install, remove, and reinstall the temporary shielding, if applicable, and all other work necessary for the proper completion of the work specified.

Appendix H – List of Abutters

List of Abutters

Stephanie Gelfan
Wolf Lowenthal
7 Hawk Hill Road
Charlemont, MA 01370

Matthew Palmeri
Bunker Palmeri
111 East Oxbow Road
Charlemont, MA 01370

Winston Jr. Healy
Jonathan Healy
Cynthia E. Healy
1929 Route 2
Charlemont, MA 01370

Appendix I – Environmental Permit Plans

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	7
PROJECT FILE NO.	608858		

TITLE SHEET
ENVIRONMENTAL PERMIT PLANS
09-29-2023

PLAN AND PROFILE OF

EAST OXBOW ROAD OVER OXBOW BROOK

(BRIDGE NO. C-05-042)

IN THE TOWN OF

CHARLEMONT

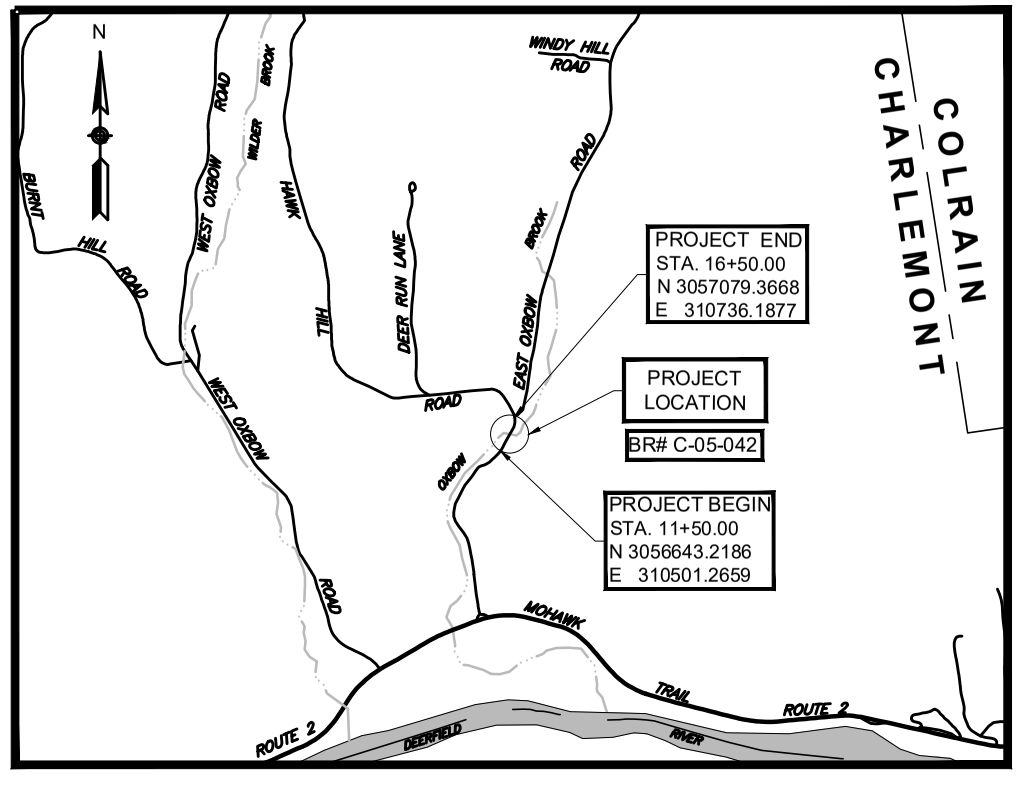
FRANKLIN COUNTY

FEDERAL AID PROJECT NO.

ENVIRONMENTAL PERMIT PLANS

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.

INDEX



0 2000 4000 6000 8000

SCALE: 1" = 2000'

LENGTH OF PROJECT = 500.00 FEET = 0.095 MILE

DATE	DESCRIPTION	REV #
09/29/23	ENVIRONMENTAL PERMIT PLAN EDITS	5
09/12/23	ENVIRONMENTAL PERMIT PLAN EDITS	4
07/11/23	PS&E SUBMISSION	3
03/09/23	100% SUBMISSION (REV 1)	2
02/27/23	100% SUBMISSION	1
10/07/22	ENVIRONMENTAL PERMIT PLANS	0

CHA
141 Longwater Drive, Suite 104
Norwell, MA 02061-1620
781-982-7700 . www.chacompanies.com

massDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER _____ DATE _____

A00830 - 97

Proposal No. 608858-125266

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 (OHW)
		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
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE 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
		ORDINARY HIGH WATER LINE

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
	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)
	2/7	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
	CW	CROSSWALK
	SWL	SOLID WHITE LINE
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE
	BYL	BROKEN YELLOW LINE
	DWL	DOTTED WHITE LINE
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE

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
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
PVMT	PAVEMENT
PWW	PAVED WATER WAY

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	7
PROJECT FILE NO.	608858		

LEGEND & ABBREVIATIONS
ENVIRONMENTAL PERMIT PLANS
09-29-2023

ABBREVIATIONS (cont.)

GENERAL

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
WCR	WHEEL CHAIR RAMP
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

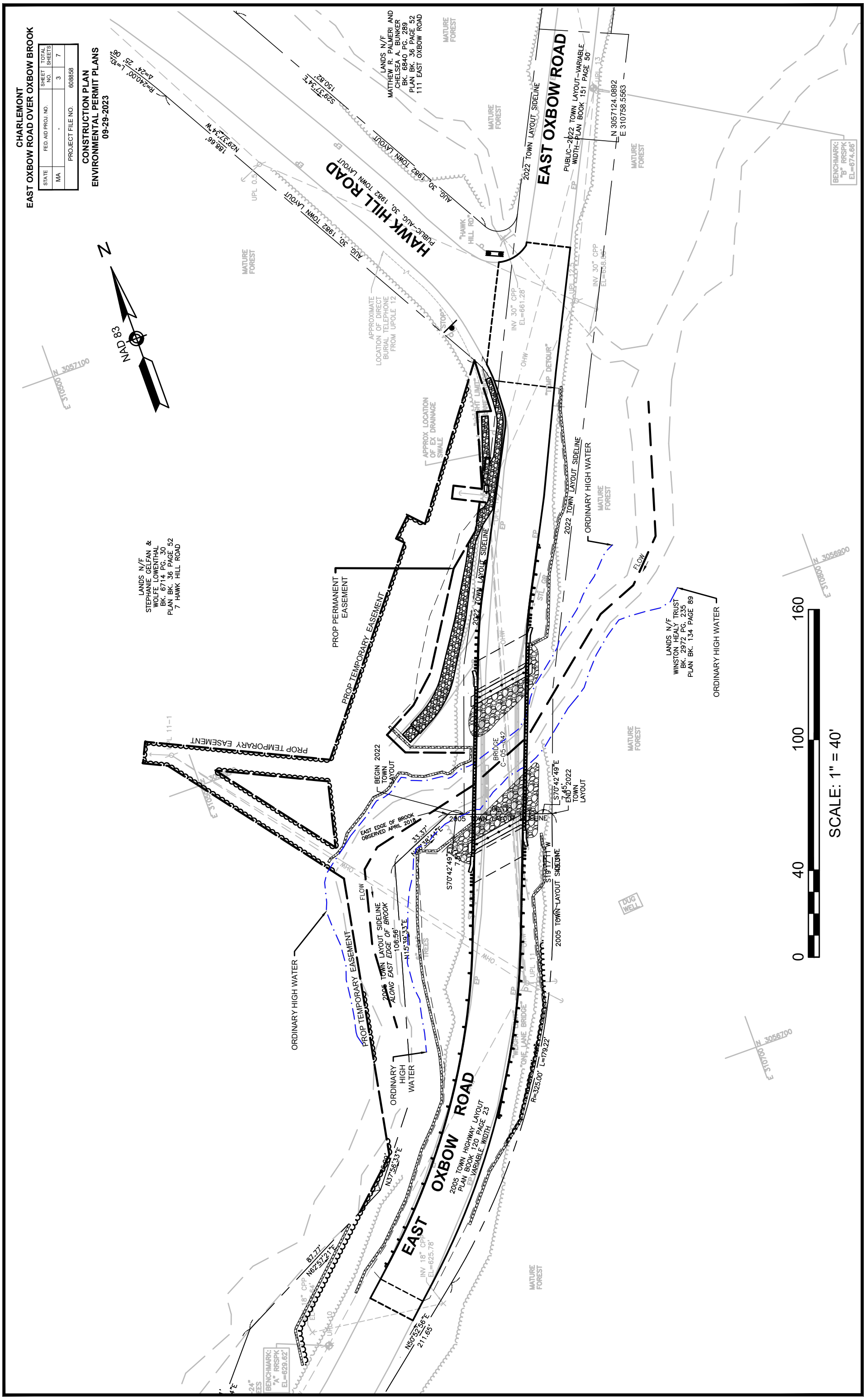
TRAFFIC SIGNAL ABBREVIATIONS

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

608858_WOC(TITLE).DWG Plotted on 29-Sep-2023 8:59 AM

A00830 - 98

Proposal No. 608858-125266


CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | - | 3 | 7
PROJECT FILE NO. 608858
CONSTRUCTION PLAN
ENVIRONMENTAL PERMIT PLANS
09-29-2023
NAD 83
N 3057100
E 310500
EAST OXBOW ROAD
HAWK HILL ROAD
"HAWK HILL RD"
2022 TOWN LAYOUT SIDELINE
PUBLIC-2022 TOWN LAYOUT-VARIABLE WIDTH-PLAN BOOK 151 PAGE 50
N 3057124.0892
E 310758.5563
BENCHMARK: "B" RRSPK EL=674.66'
LANDS N/F MATTHEW R. PALMERI AND CHELSEA A. BUNKER BK. 6840 PG. 289 PLAN BK. 36 PAGE 52 111 EAST OXBOW ROAD
AUG. 30, 1982 TOWN LAYOUT
PUBLIC-AUG. 30, 1982 TOWN LAYOUT
S29°37'34"E 150.82'
N29°37'34"W 188.66'
R=2400.00' L=104.08' Δ=2°-25'-08"
MATURE FOREST
UPL 0.5
UPL 13
UPL 12.5
UPL 11-1
UPL 10
APPROXIMATE LOCATION OF DIRECT BURIAL TELEPHONE FROM UPOLE 12
INV 30" CPP EL=661.28'
INV 30" CPP EL=658.08'
"STOP"
"TMP DETOUR"
APPROX LOCATION OF EX DRAINAGE SWALE
LANDS N/F STEPHANIE GELFAN & WOLFE LOWENTHAL BK. 6714 PG. 30 PLAN BK. 36 PAGE 52 7 HAWK HILL ROAD
PROP PERMANENT EASEMENT
PROP TEMPORARY EASEMENT
ORDINARY HIGH WATER
FLOW
2022 TOWN LAYOUT SIDELINE
STL GR
BEGIN 2022 TOWN LAYOUT
BRIDGE C-05-42
2005 TOWN LAYOUT SIDELINE
EAST EDGE OF BROOK OBSERVED APRIL 2018
2005 TOWN LAYOUT EAST EDGE OF BROOK
106.56'
N15°39'33"E
33.37'
N60°18'44"E
S70°42'49"E 7.85'
S70°42'49"E 745'
END 2022 TOWN LAYOUT
S19°17'11"W
LANDS N/F WINSTON HEALY TRUST BK. 2972 PG. 235 PLAN BK. 134 PAGE 89
DUG WELL
TREES
ORDINARY HIGH WATER
ORDINARY HIGH WATER
N37°56'33"E 86.99'
87.77'
N62°57'21"E
N50°52'56"E 211.65'
EAST OXBOW ROAD
2005 TOWN HIGHWAY LAYOUT PLAN BOOK 120 PAGE 23 VARIABLE WIDTH
ONE LANE BRIDGE
R=325.00' L=179.22'
INV 18" CPP EL=625.78'
INV 24" CPP EL=629.44'
BENCHMARK: "A" RRSPK EL=629.62'
N 3056900
E 310800
N 3056700
E 310700
0
40
100
160
SCALE: 1" = 40'

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	7
PROJECT FILE NO.	608858		

IMPACT PLAN
ENVIRONMENTAL PERMIT PLANS
09-29-2023

NAD 83

ORDINARY HIGH WATER
2005 TOWN LAYOUT SIDELINE
ALONG EAST EDGE OF BROOK
ORDINARY HIGH WATER
EAST EDGE OF BROOK DESCRIBED APRIL 2016
FLOW
TEMPORARY BRIDGE
BEGIN 2022 TOWN LAYOUT
RIPRAP (M2.02.0)
2005 TOWN LAYOUT SIDELINE
2022 TOWN LAYOUT SIDELINE
FOREST
BARRIER
BRIDGE C-05-042
EAST OXBOW ROAD
EAST OXBOW ROAD
TEMPORARY LUW IMPACT 25 S.F.
WEIGHT LIMIT "ONE LANE BRIDGE"
2005 TOWN LAYOUT SIDELINE
END 2022 TOWN LAYOUT
PROP TEMPORARY SUPPORT OF EXCAVATION & CONTROL OF WATER (TYP)
PROP SEDIMENT CONTROL BARRIER (TYP)
DUG WELL
MATURE FOREST
2022 TOWN LAYOUT SIDELINE
ORDINARY HIGH WATER
MATURE FOREST
ORDINARY HIGH WATER
APP OF SWA

LEGEND – ENVIRONMENTAL PLAN:

- TEMP. LUW/WOTUS IMPACT AREA (25 SF)
- PERM. LUW/WOTUS IMPACT AREA (0 SF)

NOTE: PROPOSED RIPRAP SHALL CONFORM TO THE MATERIAL REQUIREMENTS OF SECTION M.2.02.0 OF STANDARD SPECIFICATIONS. SEE BRIDGE PLANS FOR LIMITS OF PROPOSED RIPRAP.
NO VEGETATED WETLANDS EXIST IN THE PROJECT AREA.

0 20 50 100

SCALE: 1" = 20'

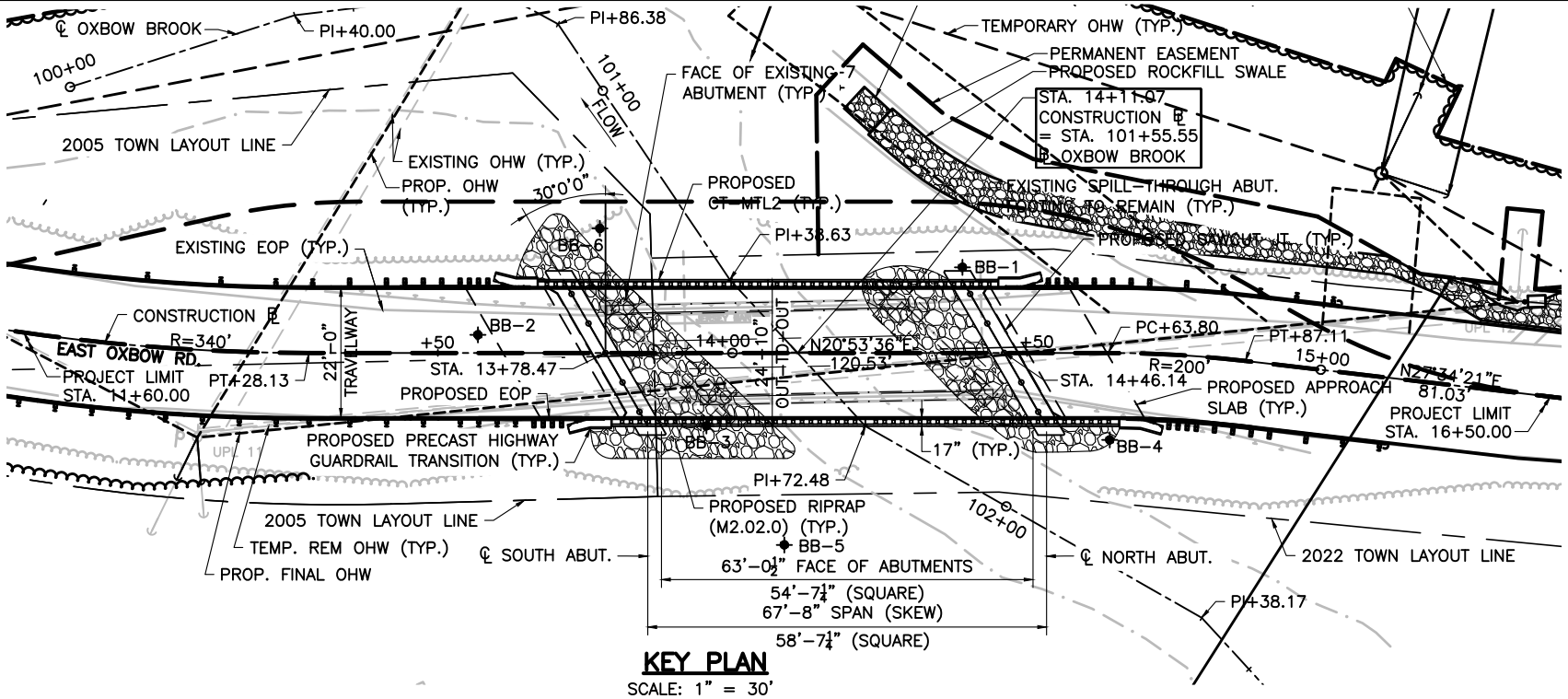
A00830 - 100

Proposal No. 608858-125266

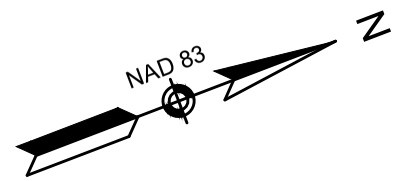
CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

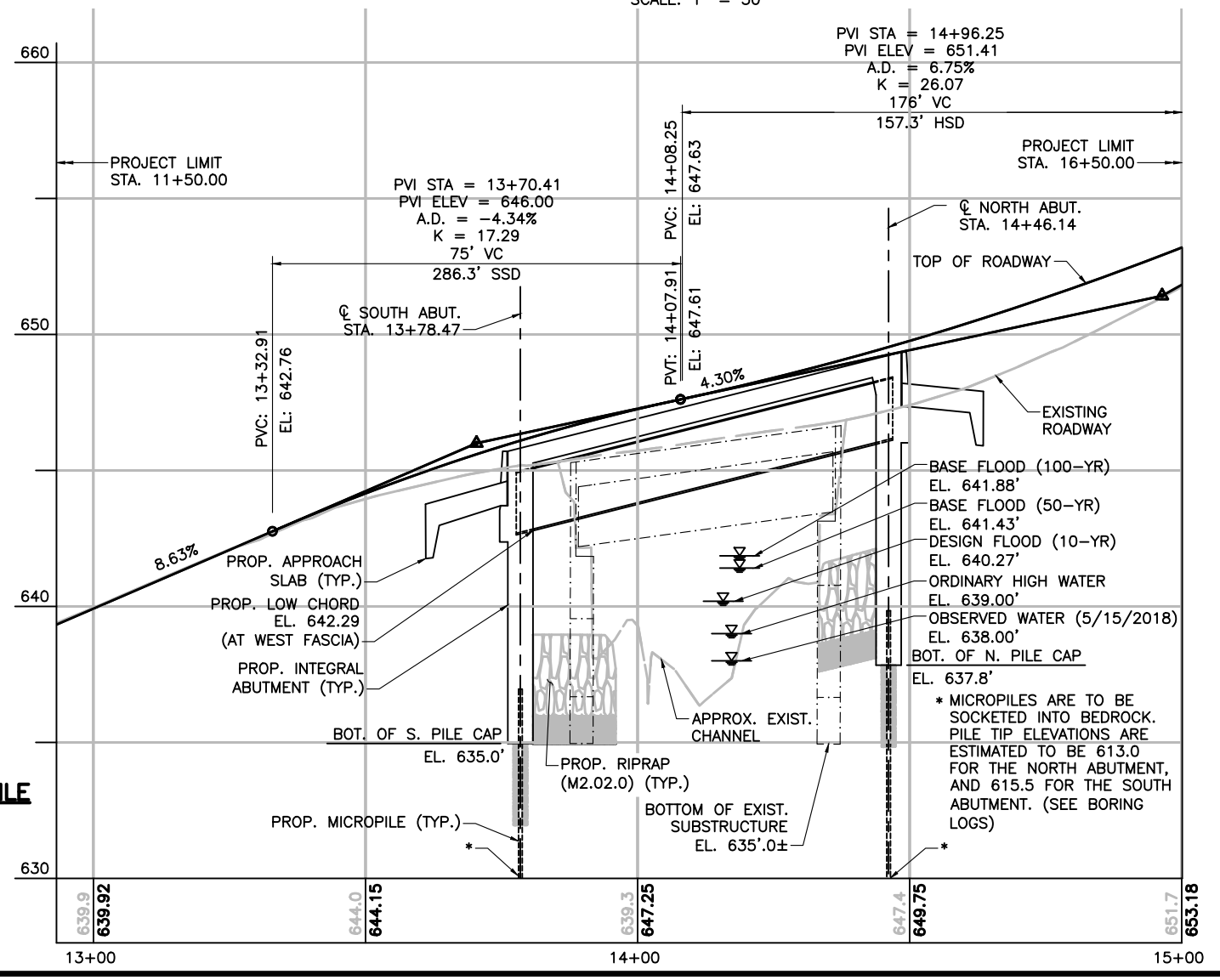
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	7
PROJECT FILE NO.	608858		

KEY PLAN
ENVIRONMENTAL PERMIT PLANS
09-29-2023

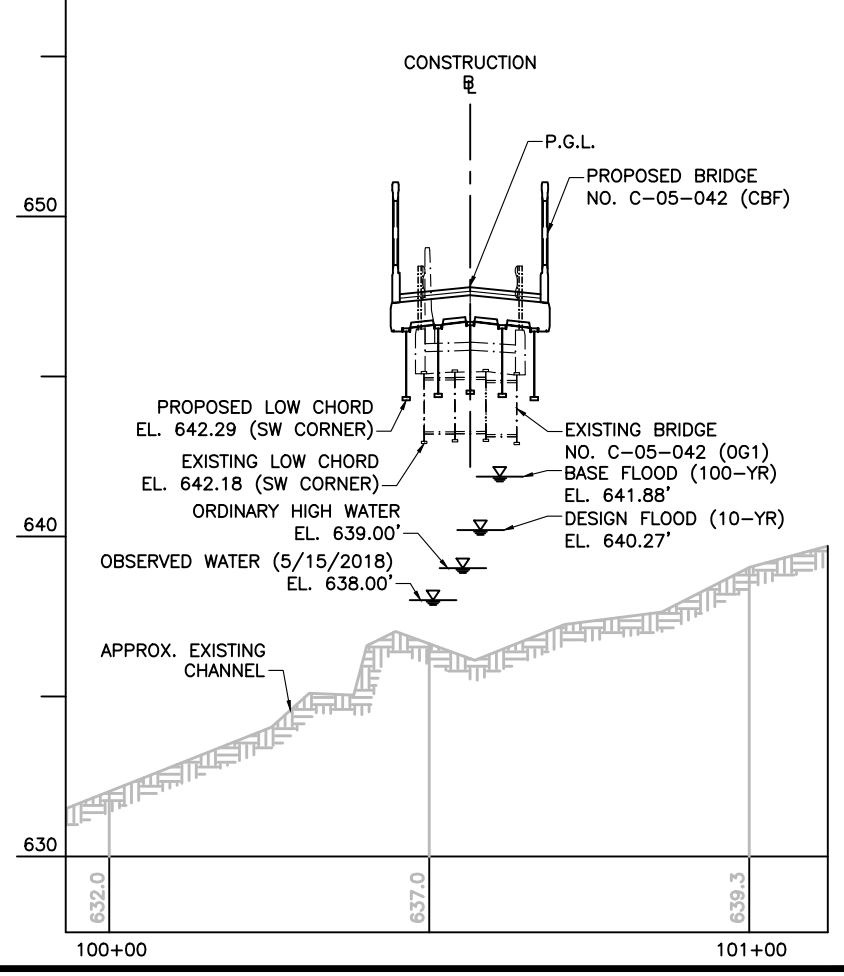


KEY PLAN
SCALE: 1" = 30'





EAST OXBOW ROAD PROFILE
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 6'



OXBOW BROOK PROFILE
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 6'

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	7
PROJECT FILE NO.	608858		

WATER HANDLING PLAN
ENVIRONMENTAL PERMIT PLANS
09-29-2023

TEMPORARY WATER CONTROL DESIGN DATA:

1. CONSTRUCTION DURATION LESS THAN ONE YEAR:
   DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY): 50% (2-YEARS)
   DESIGN FLOOD DISCHARGE: 79 CUBIC FEET PER SECOND
   TEMPORARY DESIGN WATER SURFACE ELEVATION: 639.38 FT, NAVD
   MINIMUM TOP OF TEMPORARY COFFERDAM ELEVATION: 640.38 FT, NAVD

2. CONSTRUCTION DURATION MORE THAN ONE YEAR BUT LESS THAN TWO YEARS:
   DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY): 20% (5-YEARS)
   DESIGN FLOOD DISCHARGE: 136 CUBIC FEET PER SECOND
   TEMPORARY DESIGN WATER SURFACE ELEVATION: 640.11 FT, NAVD
   MINIMUM TOP OF TEMPORARY COFFERDAM ELEVATION: 641.11 FT, NAVD

N
NAD 83

NO GROUND DISTURBANCE IN REGULATED AREA. CLEARING OF LIMBS FOR TEMPORARY OVERHEAD WIRE.

PROP TEMPORARY SUPPORT OF EXCAVATION & CONTROL OF WATER (TYP)

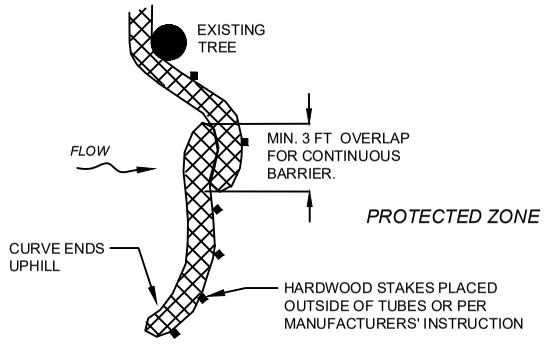
ORDINARY HIGH WATER

FLOW

0 30 60 100

SCALE: 1" = 30'

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	7
PROJECT FILE NO.	608858		



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE

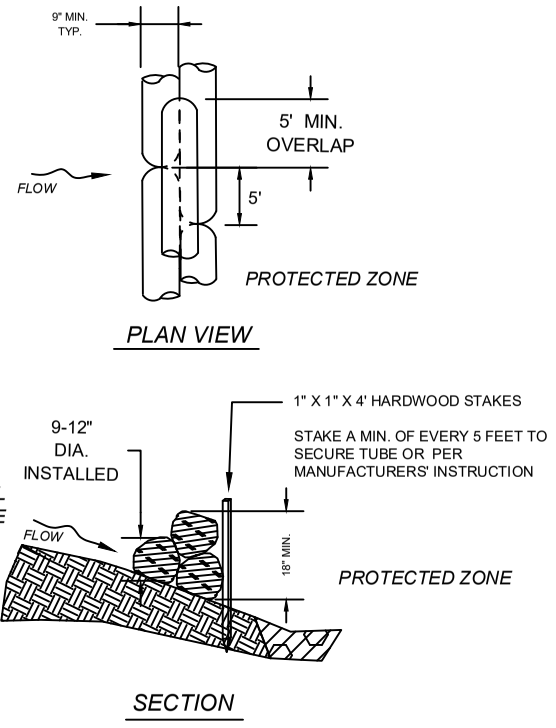
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

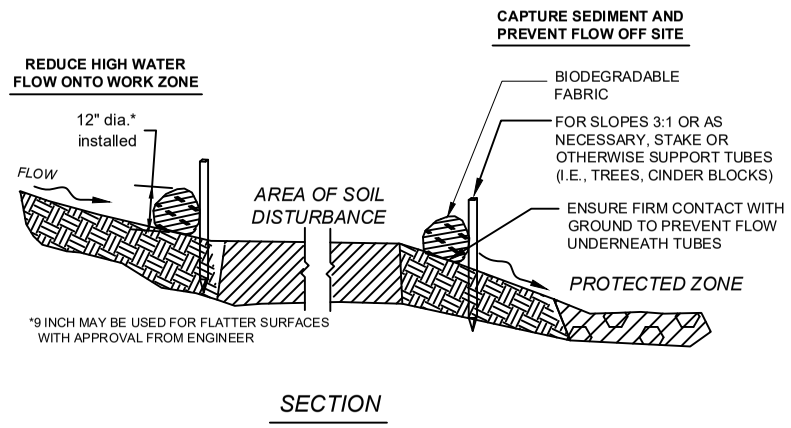
COMPOST FILTER TUBE

NOT TO SCALE



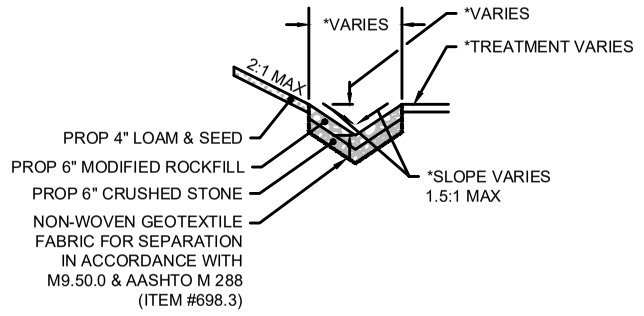
COMPOST FILTER TUBE BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE



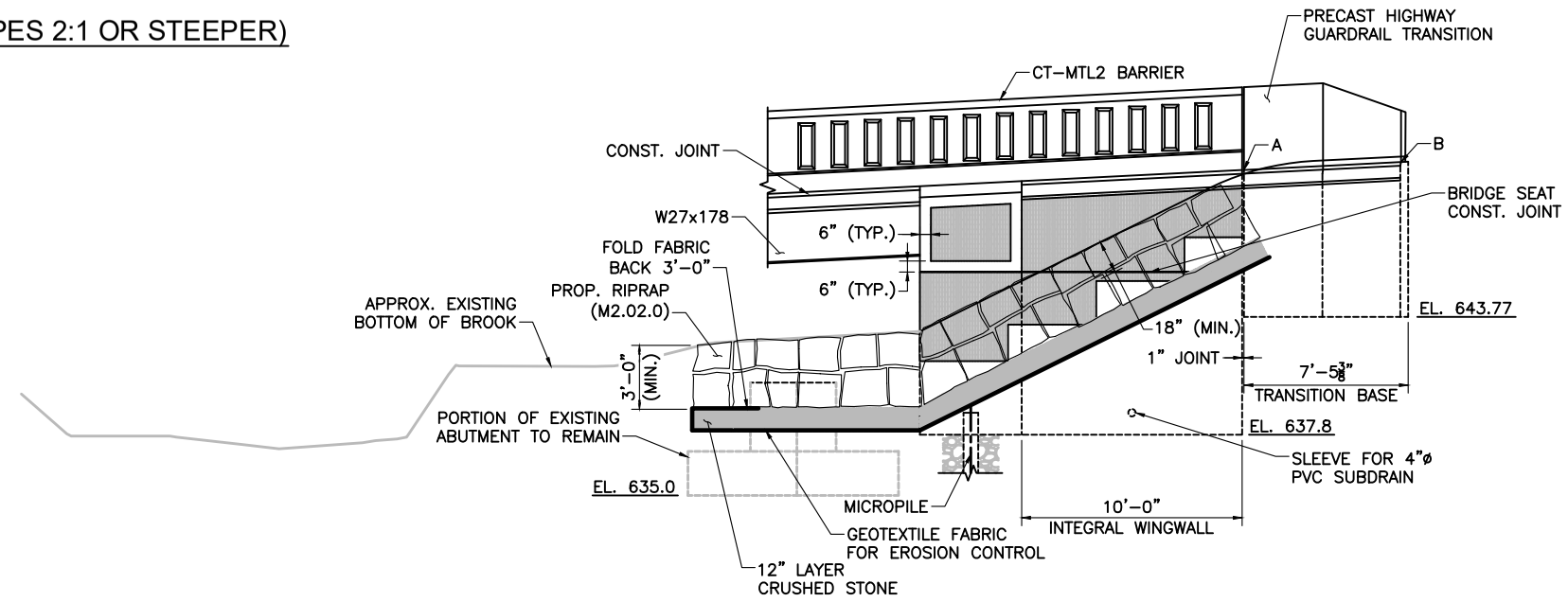
SEDIMENT BARRIER - COMPOST FILTER TUBES

NOT TO SCALE



TYPICAL ROCKFILL SWALE

NOT TO SCALE



PROPOSED NORTHEAST ELEVATION

NOT TO SCALE

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December 6, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114
ATTN: Heidi Davis

RE: 401 WATER QUALITY CERTIFICATION
Administrative Completeness and Technical Deficiency Review (October 25, 2023)
401 WQC Transmittal No: X289412
MassDOT Proj. No. 608858

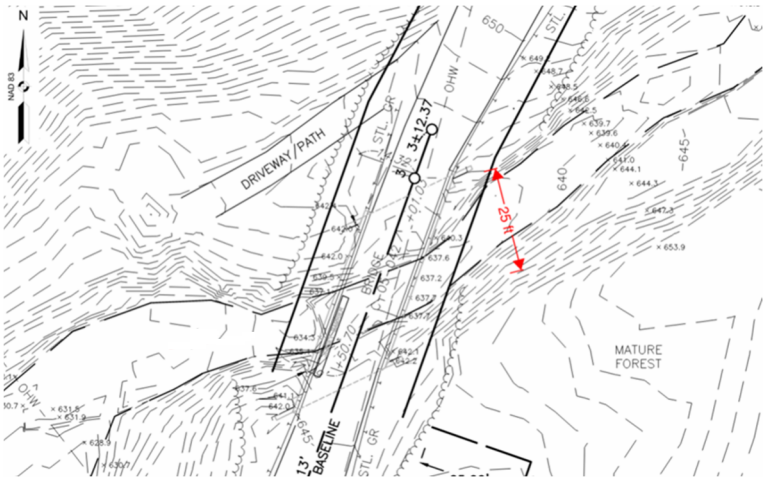
AT: East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)
Charlemont, MA

1. **The Ordinary High Water Mark (OHWM) boundaries depicted on the plans do not appear to follow the delineated OHWM boundary flags. The boundaries must be corrected and any changes in permanent or temporary impacts to Land Under Water (LUW) based on the revised boundaries need to be calculated and depicted.**

   Plans have been updated to follow the delineated OHW flags and impacts have been recalculated.

2. **Please identify how the bankfull width was determined. If bankfull coincides with the OHWM boundaries noted in the previous comment, please provide revised Stream Crossing Standards calculations for the crossing span and openness ratio.**

   The 25’ bankfull width measurement was taken at a location east of the bridge that was free of impediments and is representative of the brook in the project area. The 25 ft measurement was taken using field indicators including change in bank slope and soil characteristics. The proposed structure provides a 54 ft opening perpendicular to the flow, much greater than the 1.2 x BFW of 30 ft. Image and explanation provided in Environmental Resources section of narrative.

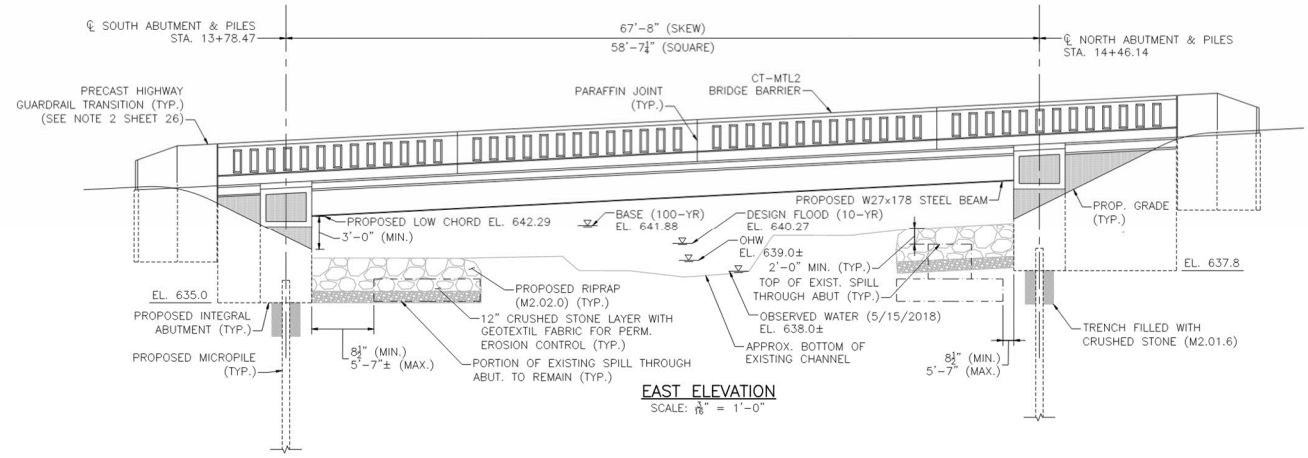


3. **The narrative states that a retaining wall will be constructed east of the southern abutment. The wall needs to be depicted on the plans to understand its extent relative to the OWHM boundary and wildlife passage under the bridge.**

   The retaining wall to the east of the southern abutment is no longer a part of this project and all mention has been removed from the narrative.

4. **It is not clear whether a wildlife passage bench or other measures to promote wildlife passage above the rip-rap under the bridge have been considered or are practicable. If a wildlife passage bench cannot be provided, modified rock fill should be considered to promote wildlife passage.**

   An existing natural shelf will remain undisturbed on the north side under the bridge which will serve as a wildlife passage area. See attached image for more detail. The Riprap is being placed only in the area disturbed by the removal of the existing abutment. Image and explanation provided in Proposed Conditions section of narrative.



5. **Perimeter sediment controls need to extend around the proposed final grading in the northeast quadrant on the plans.**

   Plans have been updated to extend sediment controls around the proposed final grading in the northeast quadrant.

6. **Sheet 5 of the plans (Key Plan) has a leader pointing to the end of the proposed rockfill swale, but the label is cut off at the top of the page. Please clarify what is proposed at the end of the swale. There should also be an evaluation of whether this feature can be modified to function as a Stormwater Control Measure (SCM) such as a water quality swale to further meet the Stormwater Management Standards to the maximum extent practicable.**

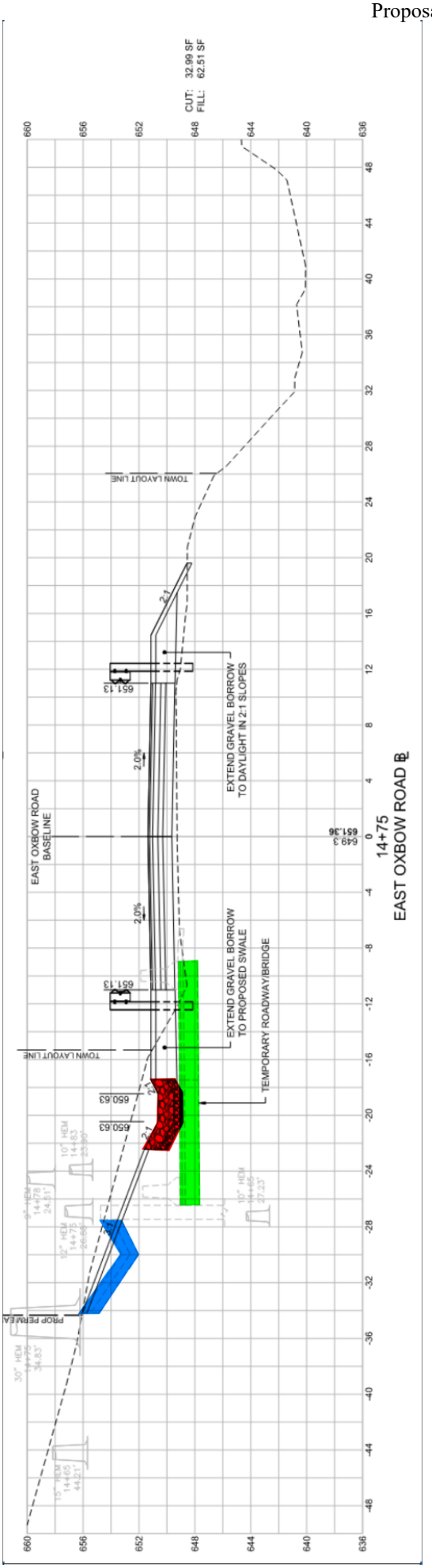
   The leader on sheet 5 of the Key Plans has been corrected. A stone for drainage end is proposed at the end of the swale. An initial evaluation has determined that we will not have space to construct an

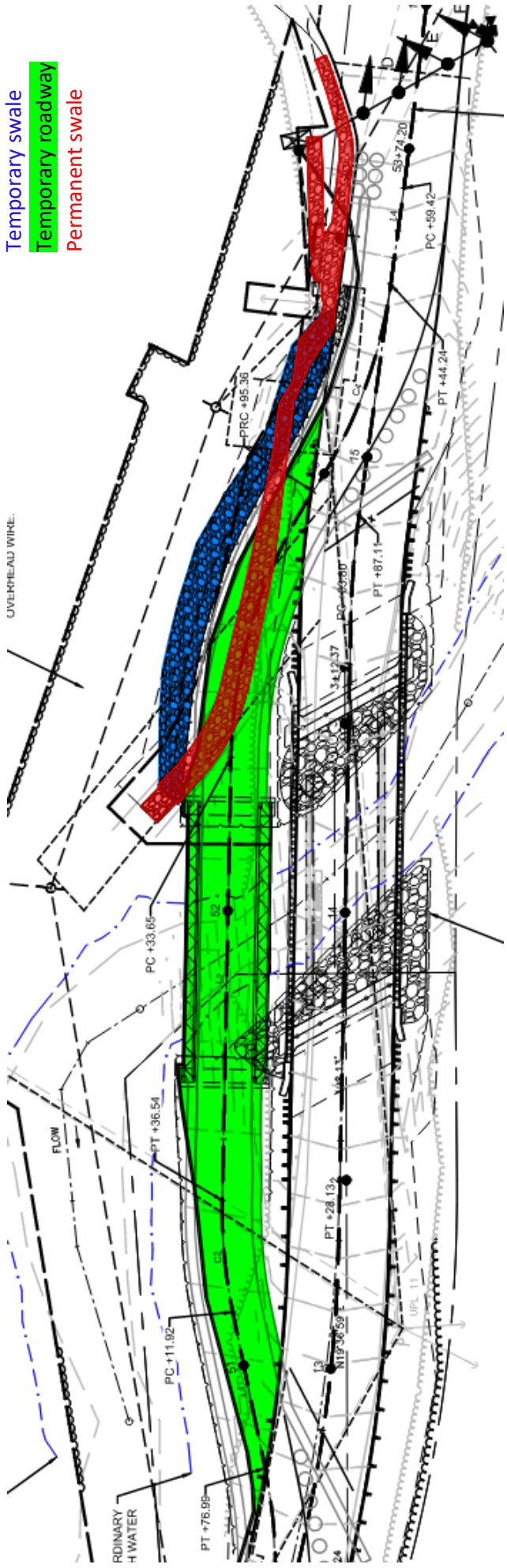
appropriate stormwater control measure (SCM). We have also included the following justification in Proposed Conditions section of the revised application:

The proposed rockfill swale and stone for drainage end to be constructed will replace the existing dirt swale in the northeast area of the project. The area has limiting terrain with steep slopes leading to the brook on one side and a steep long cut slope on the other side. There is no available Town of Charlemont ROW for the creation of stormwater control measures within the project limits, and the property in the area of the swale is privately owned and subject to Chapter 61 Conservation Easement Restrictions.

7. **Sheet 6 of the plans (Water Handling Plan) depicts an unlabeled linear rock-lined feature that intersects and overlaps the proposed rockfill swale. Please clarify whether this is a proposed temporary drainage feature, an access road, or other feature.**

   Sheet 6 has been modified to show the callout and a cross-section has been added to make the stages of the work more clear. The northwestern linear rock feature is a temporary swale, and its corresponding temporary access road runs beneath the permanent linear rock swale to be constructed after the temporary roadway is removed. Clarification has been added to the plans as well as the Anticipated Construction Sequence section of the narrative. A clearer view of the temporary swale layout can be found on page 6 of the Key Plans. On the following page, please see the cross-section and its corresponding markups with the snippet of page 6 of the Permit Plans for a better view of what's happening.


CUT: 32.99 SF
FILL: 62.51 SF
EAST OXBOW ROAD BASELINE
EXTEND GRAVEL BORROW TO DAYLIGHT IN 2:1 SLOPES
EXTEND GRAVEL BORROW TO PROPOSED SWALE
TEMPORARY ROADWAY/BRIDGE
TOWN LAYOUT LINE
651.13
650.63
649.3
651.36
2.0%
14+75
EAST OXBOW ROAD


Temporary swale
Temporary roadway
Permanent swale
PC +59.42
PT +44.24
PRC +95.36
PT +87.11
PC +33.65
PT +36.54
PT +28.13
PC +11.82
PT +76.89
FLOW

8. **Please provide the required Stormwater Checklist signed and stamped by a Registered Professional Engineer.**

   The Stormwater Checklist has been included as a separately bound document to the revised application.

9. **The Operations and Maintenance Plan for the proposed rockfill swale or any other SCMS to be implemented by the Town of Charlemont needs to be provided. The information provided is not sufficient to understand required items such as, but not limited to, the inspection frequency, when maintenance is required, and maintenance actions to be taken.**

   The Operations and Maintenance Plan has been included as a separately bound document to the revised application.

10. **A plan to stabilize and restore the slopes once the temporary bridge is removed needs to be provided.**

    Notes and details from the Construction Plans have been added to sheet 7 the Environmental Permit Plans showing proposed means to stabilize and restore the slopes once the temporary bridge is removed. All disturbed areas will be restored with 4” of loam, 1’’ compost blanket, part shade roadside seed mix and jute mesh.

Updated Permit Plans

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	7
PROJECT FILE NO.	608858		

TITLE SHEET
ENVIRONMENTAL PERMIT PLANS
12-01-2023

PLAN AND PROFILE OF

EAST OXBOW ROAD OVER OXBOW BROOK

(BRIDGE NO. C-05-042)

IN THE TOWN OF

CHARLEMONT

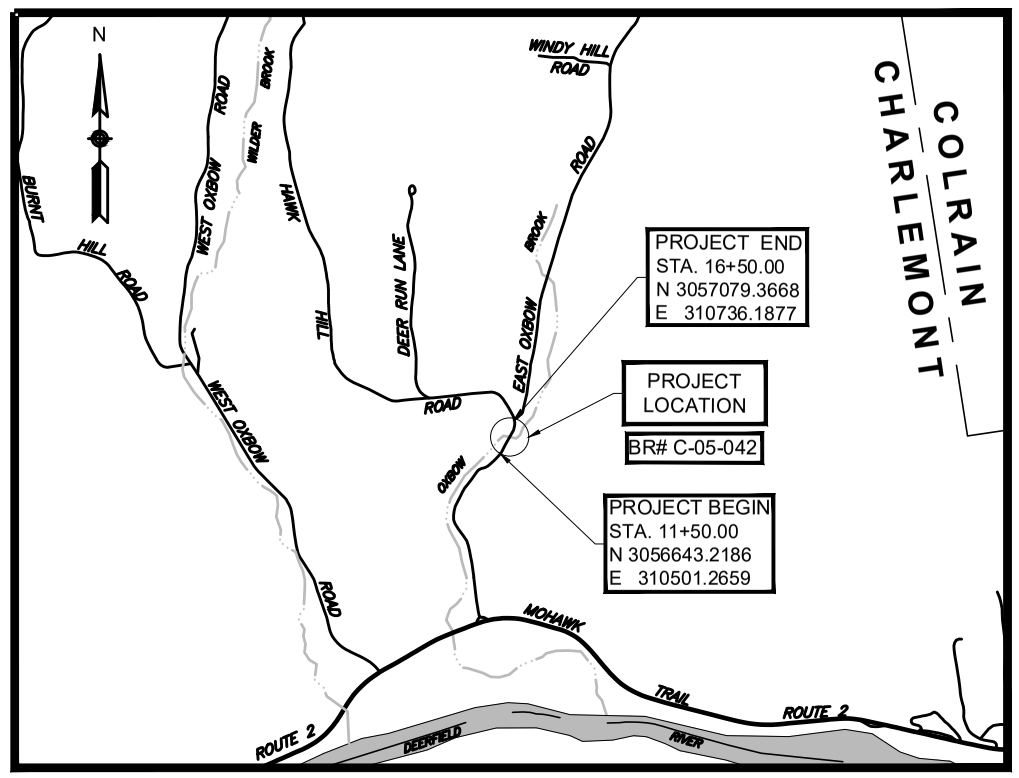
FRANKLIN COUNTY

FEDERAL AID PROJECT NO.

ENVIRONMENTAL PERMIT PLANS

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.

INDEX



0 2000 4000 6000 8000

SCALE: 1" = 2000'

LENGTH OF PROJECT = 500.00 FEET = 0.095 MILE

DATE	DESCRIPTION	REV #
12/01/23	ENVIRONMENTAL PERMIT PLAN EDITS	7
11/16/23	ENVIRONMENTAL PERMIT PLAN EDITS	6
09/29/23	ENVIRONMENTAL PERMIT PLAN EDITS	5
09/12/23	ENVIRONMENTAL PERMIT PLAN EDITS	4
07/11/23	PS&E SUBMISSION	3
03/09/23	100% SUBMISSION (REV 1)	2
02/27/23	100% SUBMISSION	1
10/07/22	ENVIRONMENTAL PERMIT PLANS	0

massDOT Massachusetts Department of Transportation Highway Division

CHA
141 Longwater Drive, Suite 104
Norwell, MA 02061-1620
781-982-7700 · www.chacompanies.com

APPROVED

CHIEF ENGINEER **DATE**

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 (OHW)
		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
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE 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
		ORDINARY HIGH WATER LINE

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
	CW	CROSSWALK
	SWL	SOLID WHITE LINE
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE
	BYL	BROKEN YELLOW LINE
	DWL	DOTTED WHITE LINE
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE

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
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
PVMT	PAVEMENT
PWW	PAVED WATER WAY

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	7
PROJECT FILE NO.	608858		

LEGEND & ABBREVIATIONS
ENVIRONMENTAL PERMIT PLANS
12-01-2023

ABBREVIATIONS (cont.)

GENERAL

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
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

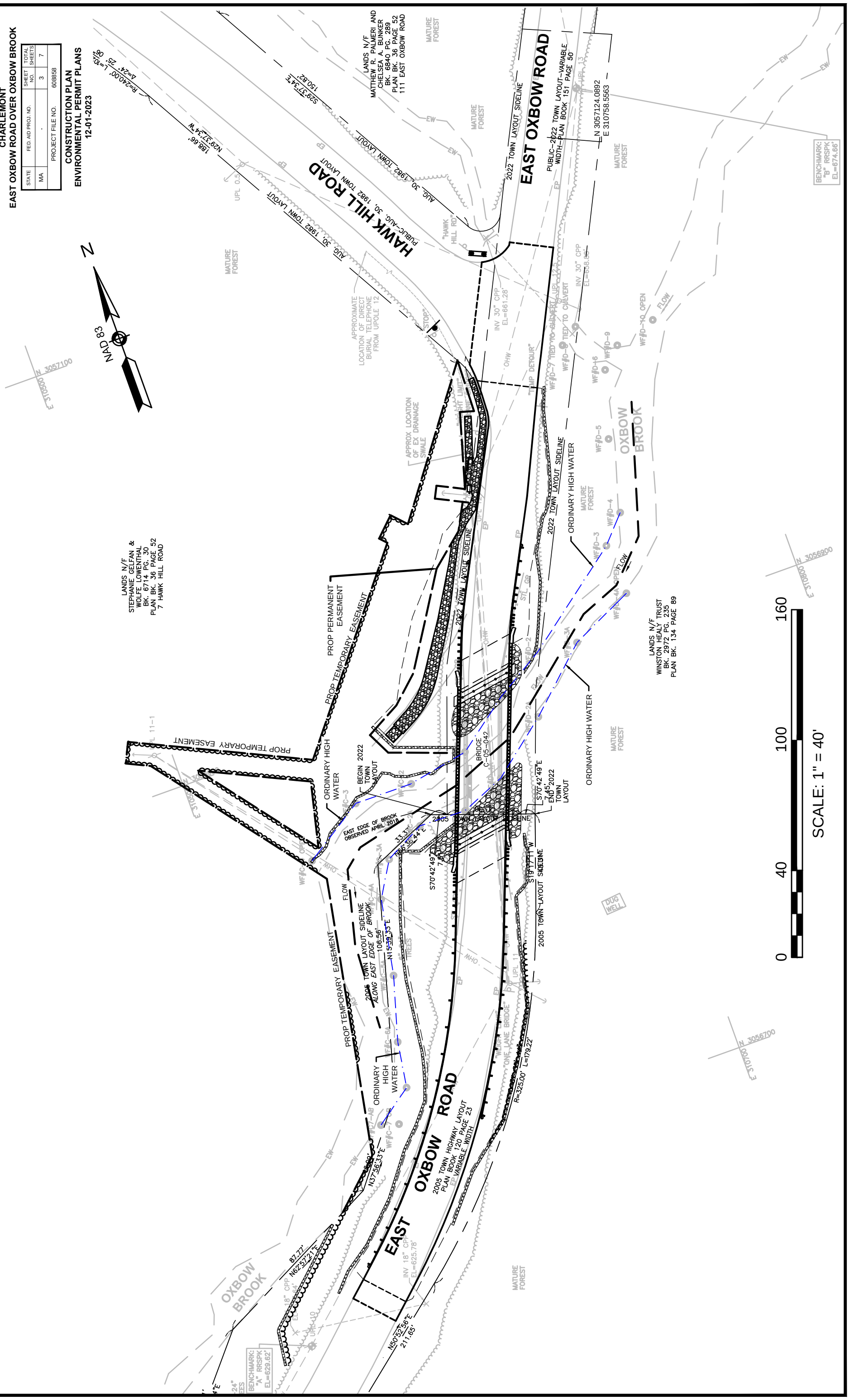
608858_WOC(TITLE).DWG Plotted on 1-Dec-2023 9:23 AM

Proposal No. 608858-125266

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	7
PROJECT FILE NO.	608858		

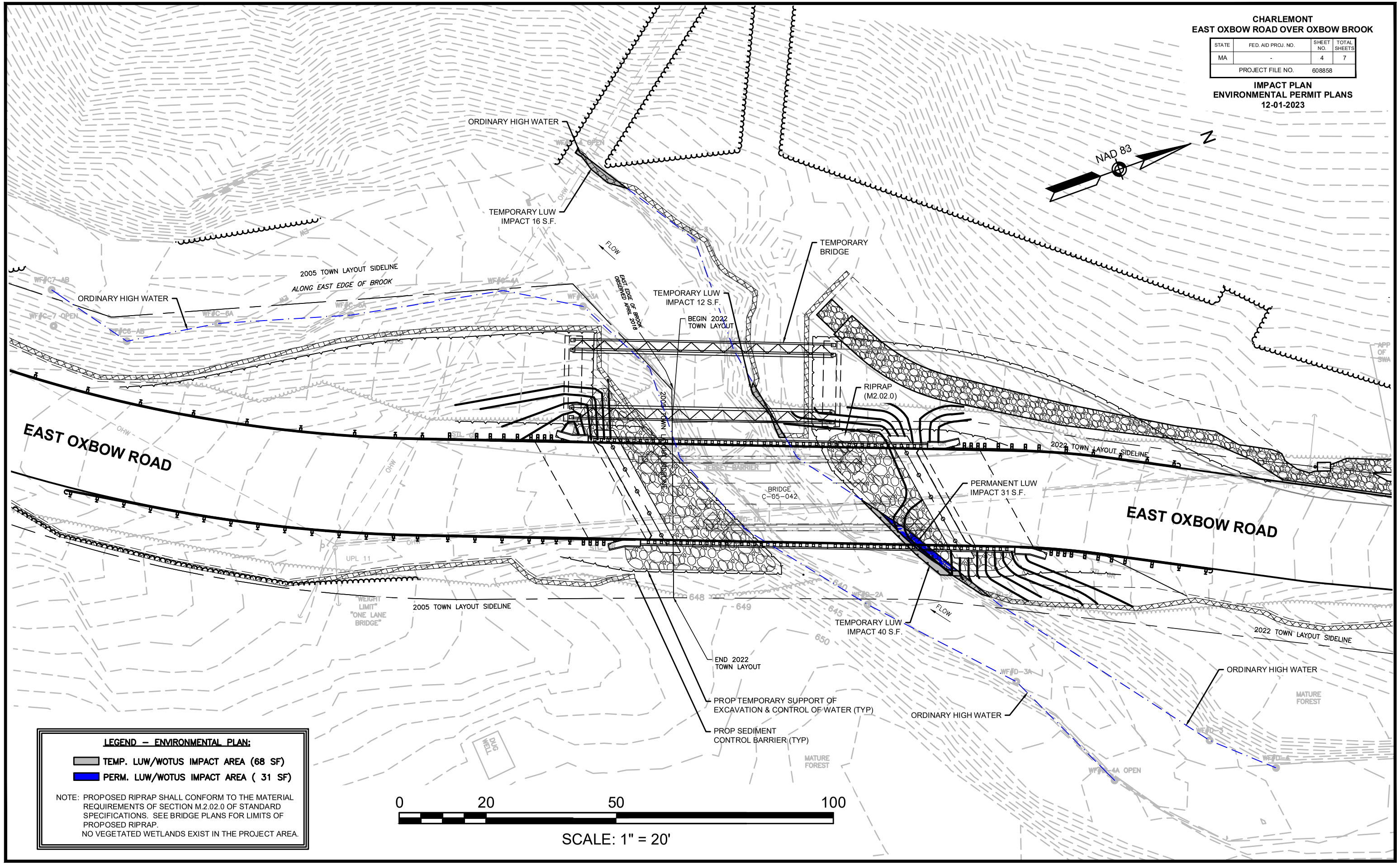
CONSTRUCTION PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023



CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	7
PROJECT FILE NO.	608858		

IMPACT PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023



LEGEND – ENVIRONMENTAL PLAN:

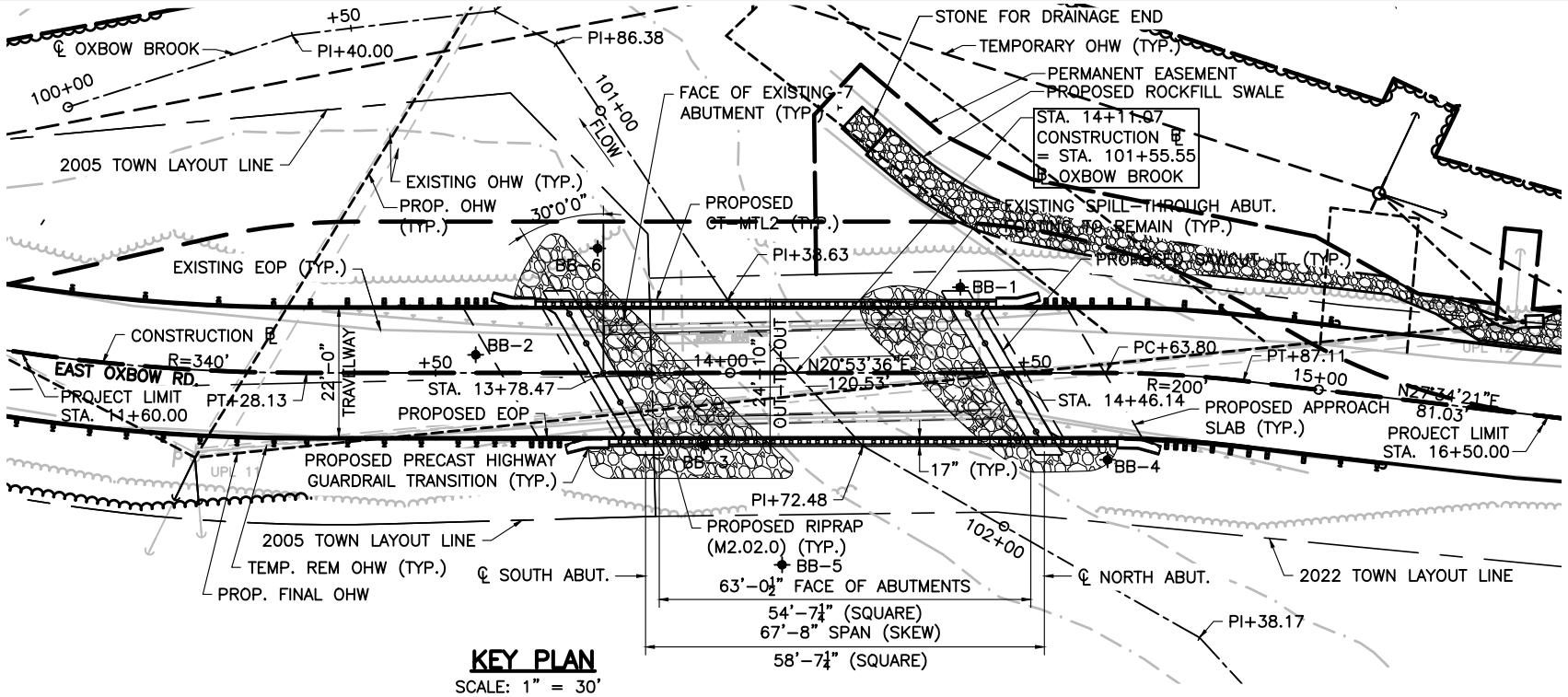
- TEMP. LUW/WOTUS IMPACT AREA (68 SF)
- PERM. LUW/WOTUS IMPACT AREA (31 SF)

NOTE: PROPOSED RIPRAP SHALL CONFORM TO THE MATERIAL REQUIREMENTS OF SECTION M.2.02.0 OF STANDARD SPECIFICATIONS. SEE BRIDGE PLANS FOR LIMITS OF PROPOSED RIPRAP.
NO VEGETATED WETLANDS EXIST IN THE PROJECT AREA.

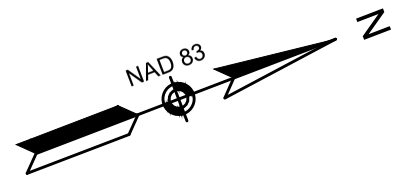
CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

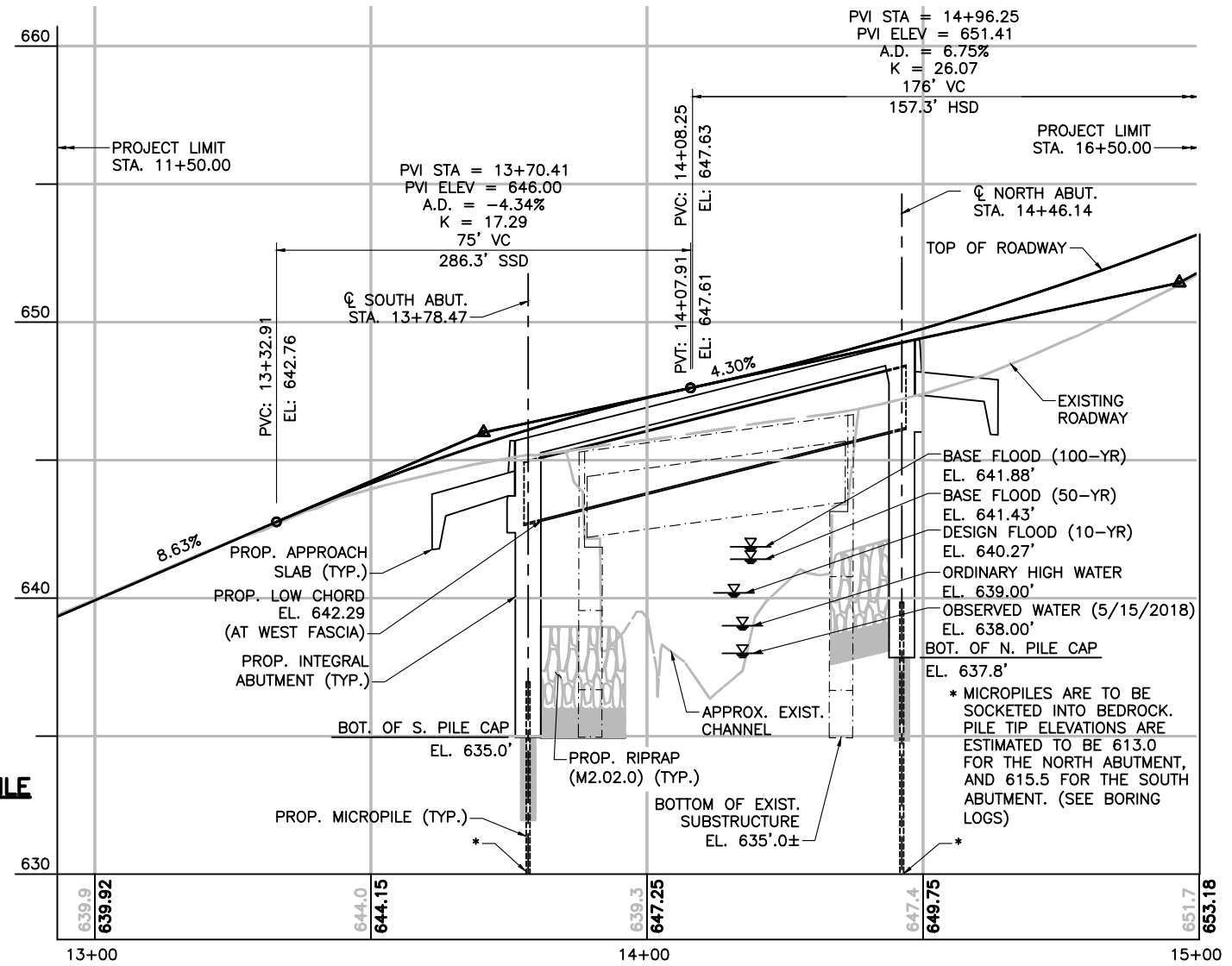
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	7
PROJECT FILE NO.	608858		

KEY PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023

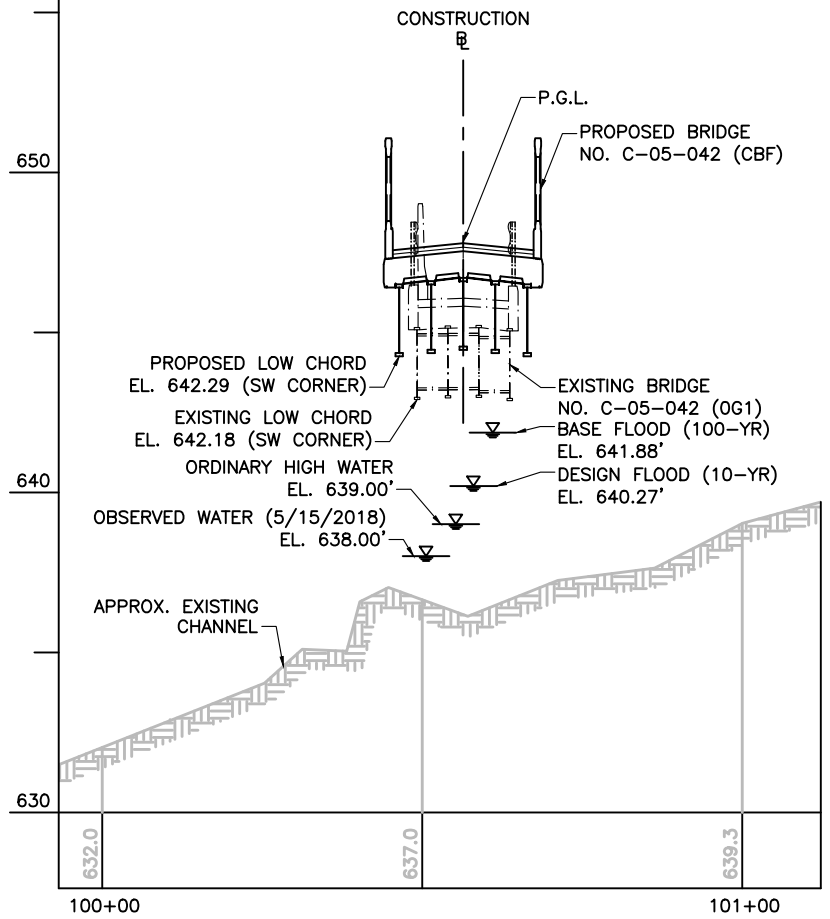


KEY PLAN
SCALE: 1" = 30'

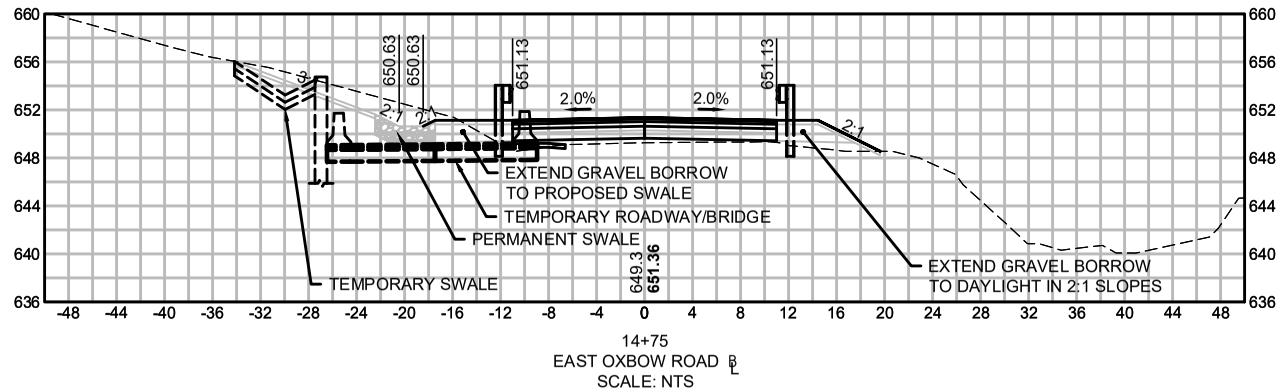




EAST OXBOW ROAD PROFILE
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 6'



OXBOW BROOK PROFILE
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 6'



14+75
EAST OXBOW ROAD ℄
SCALE: NTS

TEMPORARY WATER CONTROL DESIGN DATA:

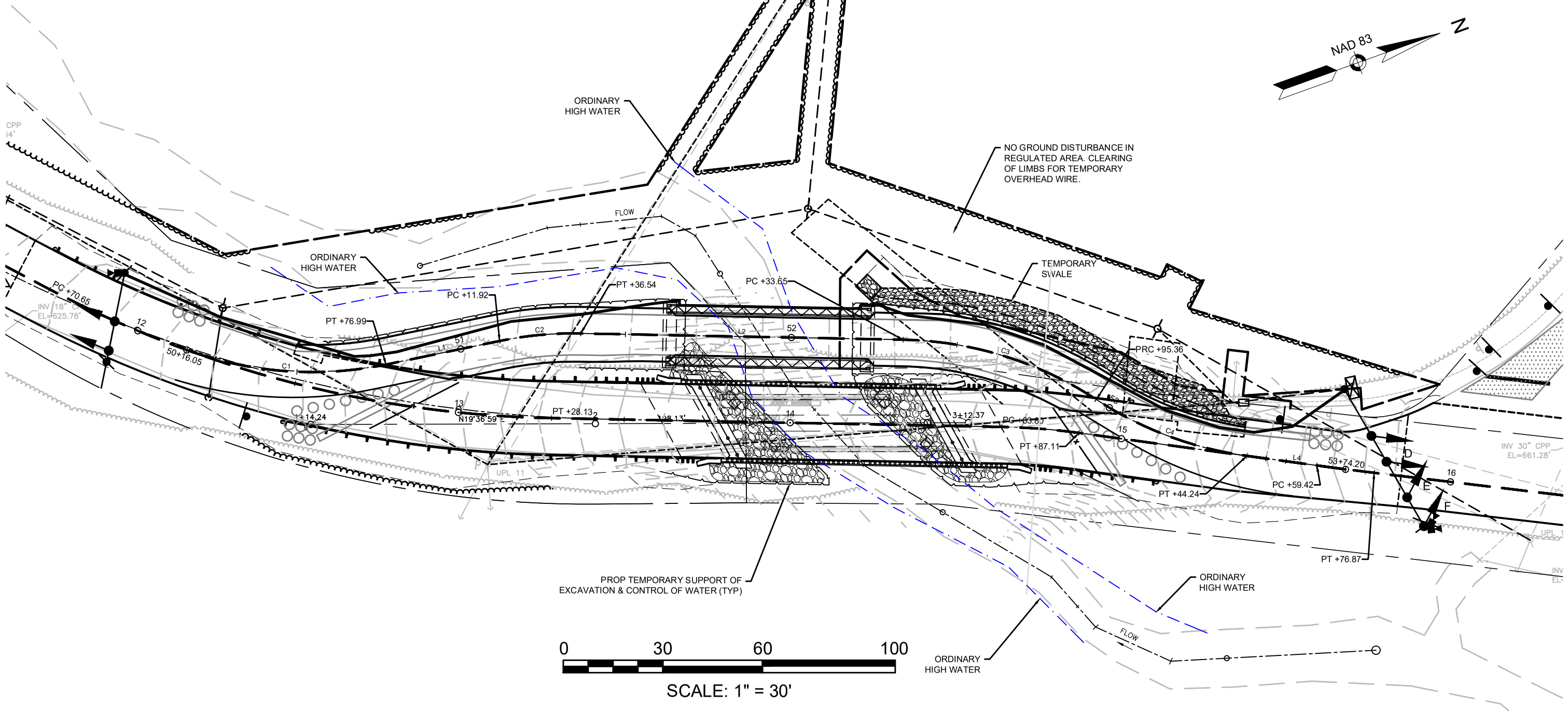
1. CONSTRUCTION DURATION LESS THAN ONE YEAR:
   DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY): 50% (2-YEARS)
   DESIGN FLOOD DISCHARGE: 79 CUBIC FEET PER SECOND
   TEMPORARY DESIGN WATER SURFACE ELEVATION: 639.38 FT, NAVD
   MINIMUM TOP OF TEMPORARY COFFERDAM ELEVATION: 640.38 FT, NAVD

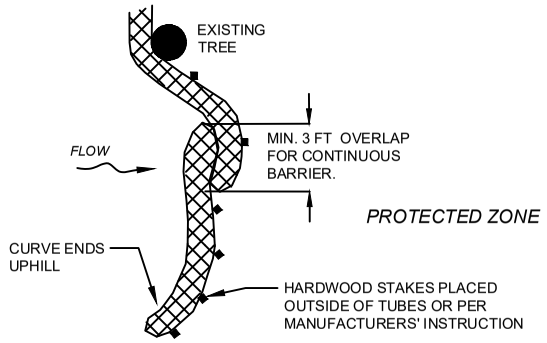
2. CONSTRUCTION DURATION MORE THAN ONE YEAR BUT LESS THAN TWO YEARS:
   DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY): 20% (5-YEARS)
   DESIGN FLOOD DISCHARGE: 136 CUBIC FEET PER SECOND
   TEMPORARY DESIGN WATER SURFACE ELEVATION: 640.11 FT, NAVD
   MINIMUM TOP OF TEMPORARY COFFERDAM ELEVATION: 641.11 FT, NAVD

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	7
PROJECT FILE NO.	608858		

WATER HANDLING PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023





PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE

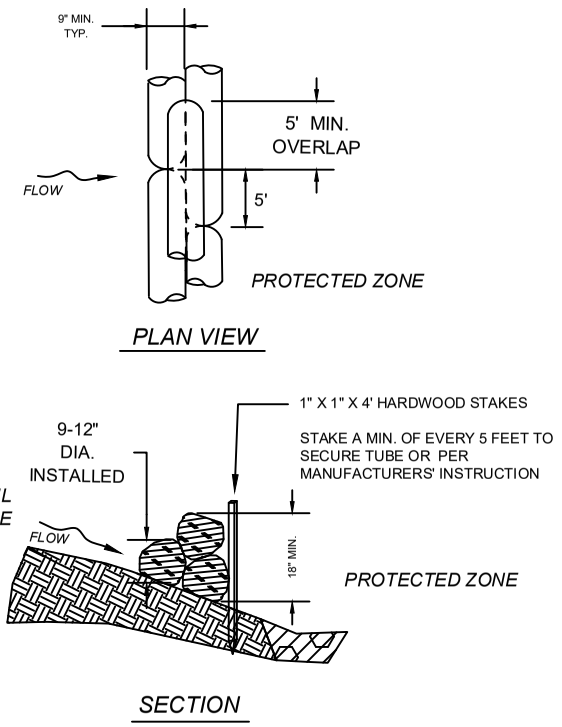
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

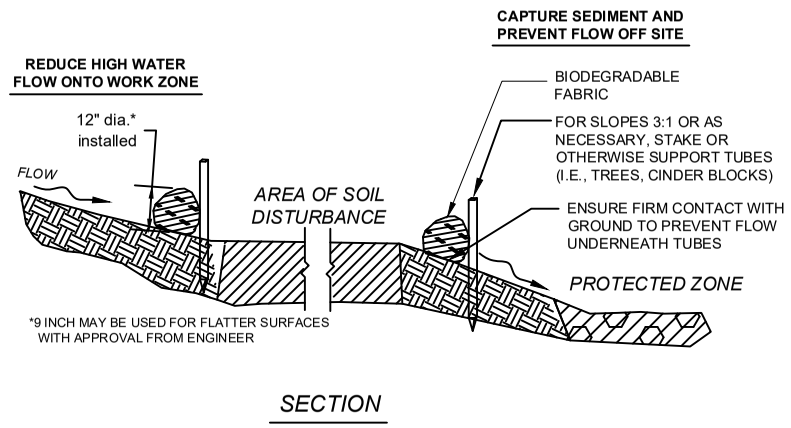
COMPOST FILTER TUBE

NOT TO SCALE



COMPOST FILTER TUBE BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE

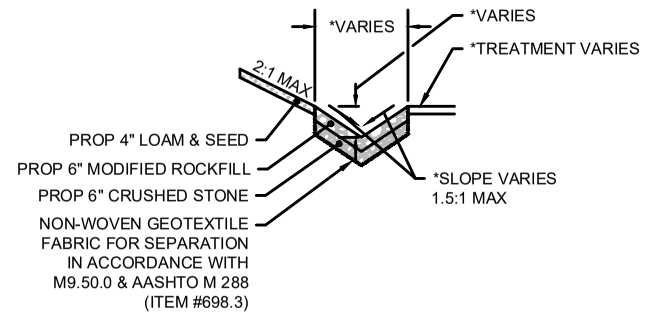


SEDIMENT BARRIER - COMPOST FILTER TUBES

NOT TO SCALE

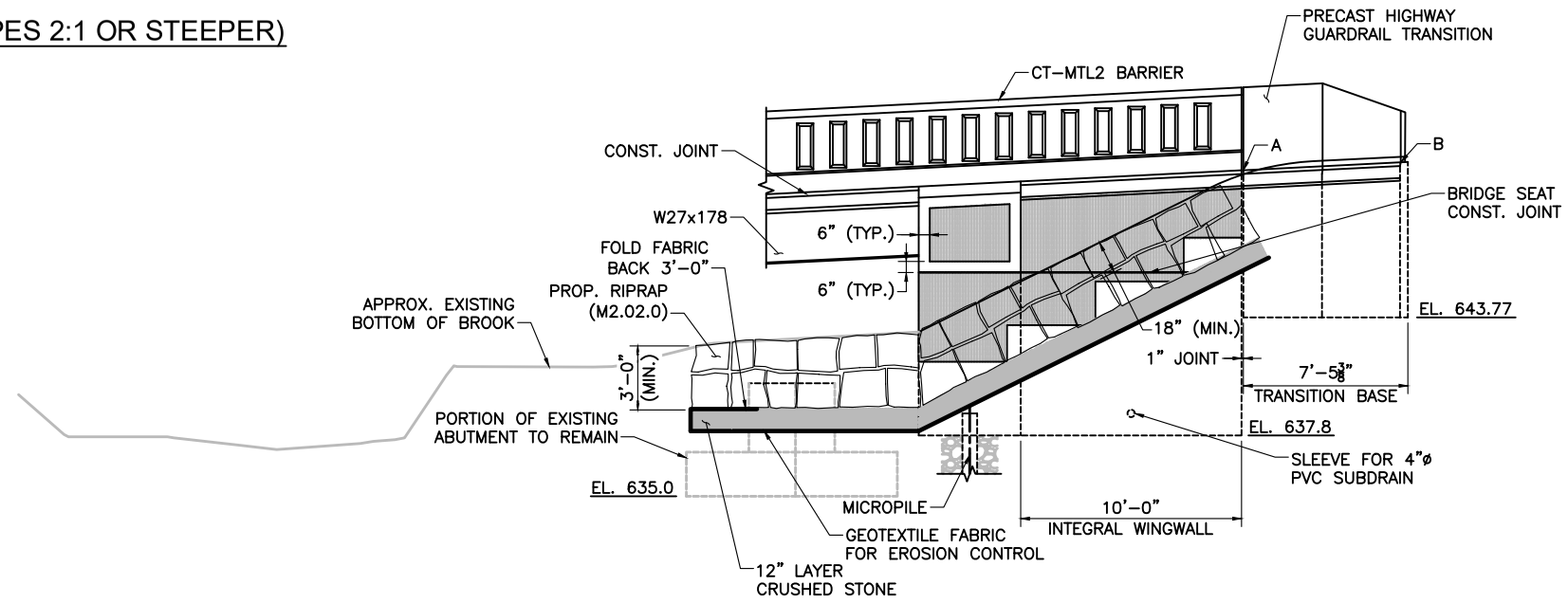
SEEDING NOTES:

STABILIZE SLOPES WITH 4" LOAM, 1" COMPOST BLANKET, PART SHADE ROADSIDE SEED MIX AND JUTE MESH.



TYPICAL ROCKFILL SWALE

NOT TO SCALE



PROPOSED NORTHEAST ELEVATION

NOT TO SCALE

Updated BRP Application Page

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wetlands and Waterways

BRP WW 10 Major Project Certification
BRP WW 11 Minor Project Certification

401 water Quality Certification for Fill and excavation Projects in waters and Wetlands

X289412
Transmittal Number #

B. Project Information

1. Project Location:

East Oxbow Road- Bridge No. C-05-042
Address

Charlemont | MA | 01339
City/Town | State | Zip Code

Oxbow Brook
Nearest or Adjacent Waterbody

2. Project Name (if any):

Replacement of Bridge No. C-05-042- East Oxbow Road over Oxbow Brook

3. a. Describe project purpose:

Replacement of a structurally deficient bridge

b. Is the project

X water-dependent ___ non water-dependent

4. a. provide a brief description of the proposed project (See Application Instructions and include a copy of the Notice of intent, if any.):

Replacement of existing 44' single span bridge with a 67'-8" single span bridge consisting of steel stringers with a composite concrete deck. See attached narrative for additional details.

b. Notice of Intent File number (if any): N/A (Bridge exempt)

5. Identify the loss in square feet of each type of resource area (see Application Instructions for additional information.):

a. Bordering vegetated wetland: 0 (perm.), 0 (temp.) square feet

b. Isolated vegetated wetland: 0 square feet

c. Land under water: 31 (perm.) 68 (temp.) = 99 (total) square feet

d. Total cumulative loss of a. + b. + c.: 31 (perm.) 68 (temp.) = 99 (total) square feet

e. Salt marsh: 0 square feet

Updated PCN Application Page

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: NA Municipality:

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

Coming from the U.S. Army Corps of Engineers New England District, one would take MA-2 West to Greenfield, MA and then merge on I-91 South and drive for 22 miles. One would then proceed to take Exit 43 and merge onto MA- 2W and drive 13 miles until East Oxbow Road which would be on ones right hand side. The project bridge is located a 1/2 mile up East Oxbow Road right before the junction of Hawk Hill Road. The trip should take 1 hour and 51 minutes depending on traffic.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

GP-23

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

The proposed project activities include the replacement of the existing bridge and roadway reconstruction. The structure will be a 67'-8" single span bridge consisting of steel stringers with a composite concrete deck. The existing curb-to-curb width on the bridge will be widened to a minimum of 22'-0" to allow for two travel lanes. The out-to-out width will be 24'-10", which requires widening of the approach roadway on both sides to transition at the bridge. Please see attached Project Narrative for additional information related to the project.

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

Appropriate sedimentation and erosion controls in the form of compost filter tubes, silt fences and required BMPs will be employed and utilized during all phases of construction to minimize as well as avoid additional impacts to the adjacent environmental resource areas. All sedimentation and erosion control measures will be maintained throughout all phases of construction. BMPs and compost filter tubes shall be used as the limit of work. Please see attached Project Narrative for additional information related to the project.

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

The purpose of the activity is to replace a structurally deficient bridge with a new bridge and roadway reconstruction.

A Routine Inspection conducted October 21, 2019, indicated that the beams were deficient, with moderate to heavy rusting, delamination, and section loss. The paint system throughout the entire superstructure is peeling with areas of 100% loss. Please see attached Project Narrative for additional information related to the project.

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
68 to WOTUS	30	NA	Temporary	E&S and Water control Measures
31 to WOTUS	20	NA	Permanent	Stabilize Channel Excavation

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

Operation and Maintenance Plan

East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)

Stormwater Management System Operation and Maintenance Plan and Long-Term Pollution Prevention Plan

Charlemont, MA

PREPARED FOR

massDOT

10 Park Plaza
Boston, MA 02116

PREPARED BY

CHA Consulting, Inc.
141 Longwater Dr, Suite 104
Norwell, MA 02061

November 8, 2023

Table of Contents

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 East Oxbow Road over Oxbow Brook (Bridge No. C-05-042) in Charlemont, MA.

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

The Town of Charlemont, MA will be responsible for the operation and maintenance of all stormwater management systems within the project area. Questions or concerns regarding activities associated with this O&M Plan should be addressed to the Charlemont Highway Department located at 42 Factory Rd, Charlemont, MA 01339, phone (413) 339-4335 ext 29.

1.2 Inspection and Maintenance Measures and Record-Keeping

The stormwater management system covered by this O&M Plan consists of the following measures:

• Rockfill drainage swale

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
Storm Discharge Points	▪ Drainage outlet	▪ Presence of flow ▪ Signs of contaminated flow

East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)

		▪ Sediment accumulation ▪ Level of erosion ▪ Scour protection condition ▪ Overall structure condition ▪ Trash/debris accumulation

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 drainage outlet includes:

- Clear inlet and remove and properly dispose of sediment, trash, leaf litter, debris, and vegetation
- Regrade areas that show signs of ponding and channelization
- Repair or replace structural components
- Repair damaged or eroded areas
- Provide or rehabilitate erosion control at the outlet
- Regrade and replace the channel materials
- Remove woody growth
- Stabilize or reconstruct eroded areas
- Treat invasive plants according to MassDOT Vegetation Management Plan

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 will include compost filter tubes, silt fences, and required BMPs, all of which will be maintained throughout all phases of maintenance activities. 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.

East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)

1.4 O&M Budget

The Town of Charlemont performs maintenance for stormwater management systems as part of their routine operation and maintenance budget for roadways and bridges. Budgets are managed by the Town of Charlemont Highway Department 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 East Oxbow Road over Oxbow Brook (Bridge No. C-05-042) in Charlemont, 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),
- Measures outlined in The Town of Charlemont's'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:

• Good housekeeping;

• Storing materials and waste products inside or under cover;

• Vehicle washing;

• Routine inspections and maintenance of SCMs;

• Spill prevention and response;

• Maintenance of lawns, gardens, and other landscaped areas;

• Storage and use of fertilizers, herbicides, and pesticides; and

• Proper management of deicing chemicals and snow.

2.1.1 Litter Pick-up

The Town of Charlemont Highway Department will conduct litter pick-up from the stormwater management facilities in conjunction with routine road maintenance activities.

East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)

2.1.2 Inspection and Maintenance of Stormwater Assets

The Town of Charlemont Highway Department 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 roadside mowing will be conducted according to standard Town of Charlemont Highway Department practices.

2.1.4 Street Sweeping

Street sweeping will be performed by the Town of Charlemont Highway Department, and will occur annually in the Spring.

2.1.5 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 East Oxbow Road over Oxbow Brook (Bridge No. C-05-042). Should an interconnection to the stormwater management system be identified during construction, 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.

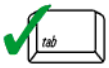
Stormwater Checklist

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.

[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.

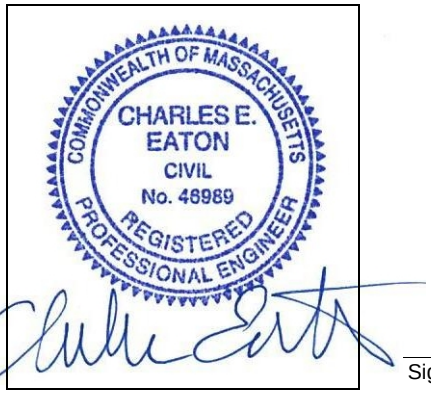
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the 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



December 6, 2023

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): conversion of erodible channel to rockfill channel

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.

Updated Page 6 of PCN/WQC Narrative

ROW for the creation of stormwater control measures within the project limits, and the property in the area of the swale is privately owned and subject to Chapter 61 Conservation Easement Restrictions.

3. Anticipated Construction Sequence

Staged construction will not be utilized during this project. East Oxbow Road will remain open with one lane of alternating traffic by the use of a temporary bridge and road, including a stormwater swale that will be installed adjacent to the existing bridge on the west side. However, due to the narrow travel way and limited ROW, short-term full road closure at the bridge is anticipated to facilitate various construction activities. A complete detour route, which is approximately a 4.7-mile loop has been developed and will be utilized during these short-term road closures. Construction will commence by the installation of an Erosion Control system. An anchored temporary barrier will be installed to provide separation between the travel way and the designated work zone area. Temporary shielding will then be put in place below the entire existing structure to catch any debris that falls during demolition. The removal of the existing superstructure will then be carried out by the contractor. The temporary cofferdam will then be installed around the existing abutments, a minimum of one foot higher than the temporary design storm elevation. While the water control measures are in place, the cutting down of the existing abutments and installation of the proposed substructure will occur; both new abutments will be constructed behind the existing abutments. Portions of the temporary cofferdam will then be removed. The installation of the new superstructure will commence. Roadway approaches will then be constructed and graded. During construction, the hydraulic opening of Oxbow Brook may be reduced to a minimum width of 21' - 0'' for water control. No construction equipment will be staged in the water during the course of the project. All means and methods used during construction in addition to the sequence of construction will be determined by the contractor in the field.

4. Wetland Impacts

The project proposes the full replacement of the existing project bridge. This will require temporary impacts to regulated resources. Temporary work within the watercourse for water handling will be necessary for the removal of the existing substructure and superstructure and the construction of the new substructure and superstructure. The project design will ensure that the regulated resources are protected from demolition debris. Approximately 99 square feet of impacts are anticipated to Land Under Water (LUW)/Waters of the US (WOTUS). Of those impacts, 31 square feet are permanent impacts. Temporary impacts account for 68 square feet due to the water control measures and sediment and erosion control. Area impacts are presented within the table below:

Wetland Resource Impact Table	
	Land under Water/Waters of the US (sf)
Temporary	68
Permanent	31
Total	99

5. Wetland Replication

Replication is not required for this project, there will be no temporary or permanent impacts to wetlands.

DOCUMENT A00831

VERIFICATION ARMY CORPS OF ENGINEERS PERMIT

AND

DEPARTMENT OF THE ARMY GENERAL PERMITS FOR THE COMMONWEALTH OF MASSACHUSETTS

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January 10, 2024

Regulatory Division
File Number: NAE-2023-02232

Courtney Walker
MassDOT – Highway Division
10 Park Plaza, Room 7360
Boston, MA 02116
Sent by email: courtney.l.walker@dot.state.ma.us

Dear Ms. Walker:

The U.S. Army Corps of Engineers (USACE) has reviewed your application to permanently discharge fill material within 31 square feet below the Ordinary High Water (OHW) mark of Oxbow Brook, associated with the replacement of the bridge conveying East Oxbow Road over Oxbow Brook in Charlemont, Massachusetts. The existing single-span bridge will be replaced by a new single-span bridge in the same location. New abutments will be constructed behind the existing abutments, above OHW, and the existing abutments cut down. Rip-rap scour protection will be placed in front of the new abutments. The project will also have temporary impacts within 68 square feet below OHW due to temporary erosion and water controls. The work is shown on the enclosed plans titled “MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION PLAN AND PROFILE OF EAST OXBOW ROAD OVER OXBOW BROOK (BRIDGE NO. C-05-042) IN THE TOWN OF CHARLEMONT FRANKLIN COUNTY,” on seven sheets, and dated “12-01-2023.”

Based on the information that 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). The GPs are available at https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit.

Please review the GPs carefully, in particular the general conditions beginning on page 35, and ensure that you and all personnel performing work authorized by the GPs are fully aware of and comply with its terms and conditions. A copy of the GPs and this verification letter shall be available at the work site as required by General Condition 17. You must perform this work in compliance with the following special conditions:

1. You must complete and return the enclosed Work Start Notification Form to this office at least two weeks before the anticipated start date. You must also complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work.

2. 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 authorization expires on June 1, 2028. You must commence or have 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 and we recommend you contact us *before* the work authorized herein expires. Please contact us immediately if you change the plans or construction methods for work within our jurisdiction as we must approve any changes before you undertake them. Performing work within our jurisdiction that is not specifically authorized by this determination or failing to comply with the special condition(s) provided above or all the terms and conditions of the GPs may subject you to the enforcement provisions of our regulations.

This authorization does not obviate the need to obtain other federal, state, or local authorizations required by law. Applicants are responsible for applying for and obtaining any other approvals.

We continually strive to improve our customer service. To better serve you, we would appreciate your completing our Customer Service Survey located at https://regulatory.ops.usace.army.mil/customer-service-survey.

Please contact Dan Vasconcelos, of my staff, at (978) 318-8653 or daniel.b.vasconcelos@usace.army.mil if you have any questions.

Sincerely,

C. Grace Moses

Grace Moses
Chief, Technical Support Branch
Regulatory Division

Enclosures

cc:
Ed Reiner, U.S. EPA, Region 1, Boston, MA; reiner.ed@epa.gov
Rachel Croy, U.S. EPA, Region 1, Boston, MA; croy.rachel@epa.gov
David Simmons, USFWS, New England Field Office, Concord, NH;
david_simmons@fws.gov
Heidi Davis, MassDEP, Boston, MA; heidi.davis@mass.gov
Tyler Lewis, MassDEP, Boston, MA; Tyler.Lewis@mass.gov
MassDEP-WRP, Boston, MA; dep.waterways@mass.gov
David Robinson, MA Board of Underwater Archaeological Resources (BUAR);
david.s.robinson@mass.gov
Conservation Commission, Charlemont, MA; sectobds@charlemont-ma.us

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	7
PROJECT FILE NO.	608858		

TITLE SHEET
ENVIRONMENTAL PERMIT PLANS
12-01-2023

PLAN AND PROFILE OF

EAST OXBOW ROAD OVER OXBOW BROOK

(BRIDGE NO. C-05-042)

IN THE TOWN OF

CHARLEMONT

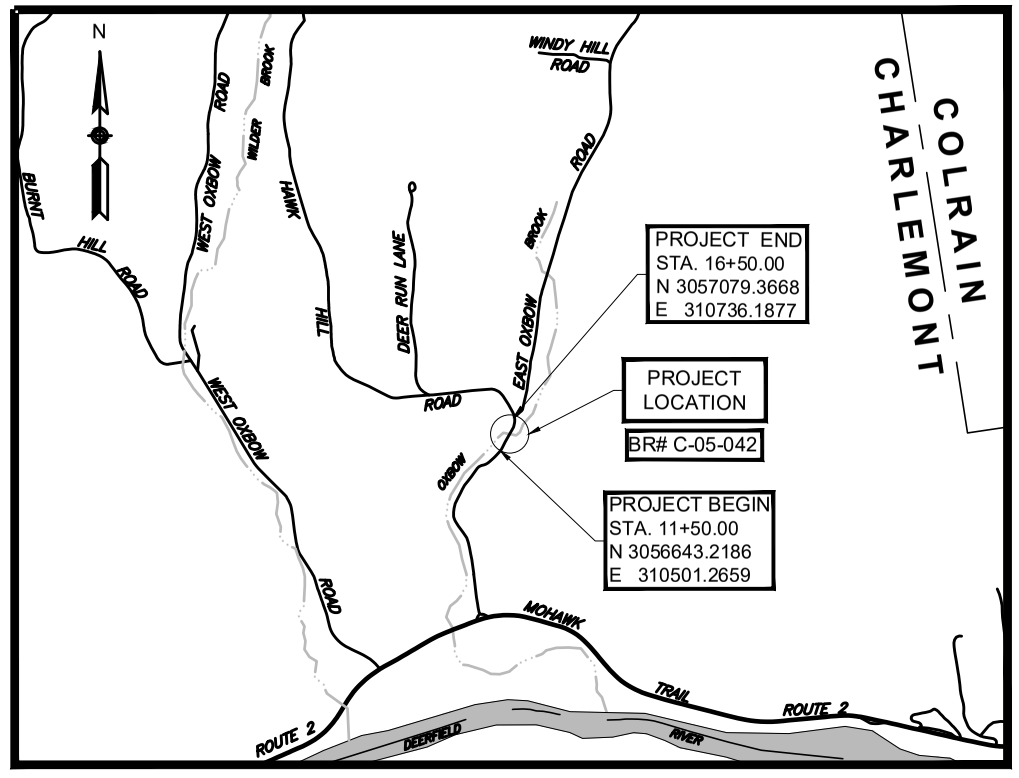
FRANKLIN COUNTY

FEDERAL AID PROJECT NO.

ENVIRONMENTAL PERMIT PLANS

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.

INDEX



0 2000 4000 6000 8000

SCALE: 1" = 2000'

LENGTH OF PROJECT = 500.00 FEET = 0.095 MILE

DATE	DESCRIPTION	REV #
12/01/23	ENVIRONMENTAL PERMIT PLAN EDITS	7
11/16/23	ENVIRONMENTAL PERMIT PLAN EDITS	6
09/29/23	ENVIRONMENTAL PERMIT PLAN EDITS	5
09/12/23	ENVIRONMENTAL PERMIT PLAN EDITS	4
07/11/23	PS&E SUBMISSION	3
03/09/23	100% SUBMISSION (REV 1)	2
02/27/23	100% SUBMISSION	1
10/07/22	ENVIRONMENTAL PERMIT PLANS	0

massDOT Massachusetts Department of Transportation Highway Division

CHA
141 Longwater Drive, Suite 104
Norwell, MA 02061-1620
781-982-7700 . www.chacompanies.com

APPROVED

CHIEF ENGINEER **DATE**

A00831 - 6

Proposal No. 608858-125266

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 (OHW)
		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
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE 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
		ORDINARY HIGH WATER LINE

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)
	2/7	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
	CW	CROSSWALK
	SWL	SOLID WHITE LINE
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE
	BYL	BROKEN YELLOW LINE
	DWL	DOTTED WHITE LINE
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE

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
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
PVMT	PAVEMENT
PWW	PAVED WATER WAY

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	7
PROJECT FILE NO.	608858		

LEGEND & ABBREVIATIONS
ENVIRONMENTAL PERMIT PLANS
12-01-2023

ABBREVIATIONS (cont.)

GENERAL

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
WCR	WHEEL CHAIR RAMP
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

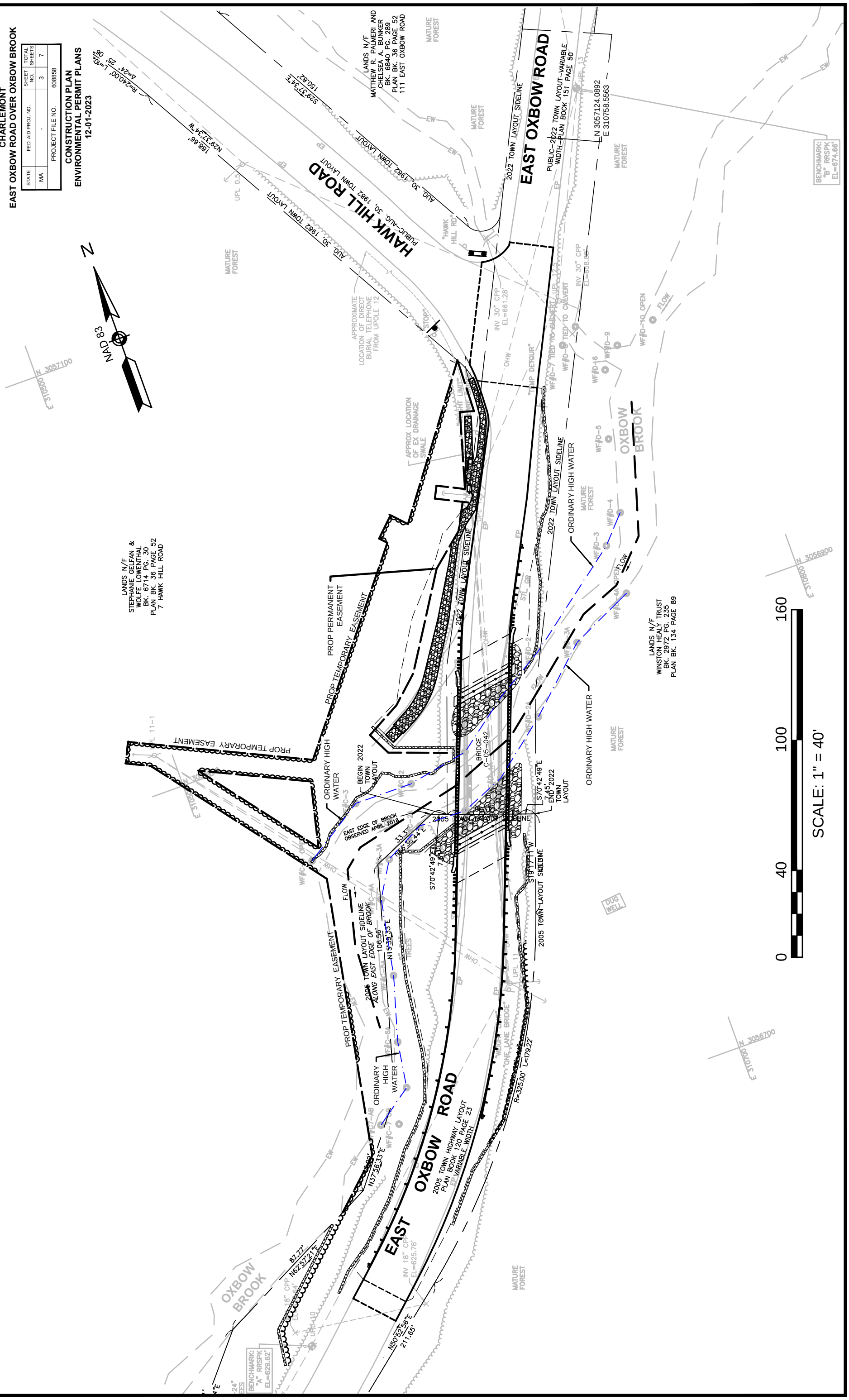
TRAFFIC SIGNAL ABBREVIATIONS

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

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	7
PROJECT FILE NO.	608858		

CONSTRUCTION PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023



CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	7
PROJECT FILE NO.	608858		

IMPACT PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023

NAD 83

ORDINARY HIGH WATER
TEMPORARY LUW IMPACT 16 S.F.
TEMPORARY BRIDGE
2005 TOWN LAYOUT SIDELINE
ALONG EAST EDGE OF BROOK
ORDINARY HIGH WATER
TEMPORARY LUW IMPACT 12 S.F.
EAST EDGE OF BROOK DESCRIBED APRIL 2016
BEGIN 2022 TOWN LAYOUT
RIPRAP (M2.02.0)
2005 TOWN LAYOUT SIDELINE
2022 TOWN LAYOUT SIDELINE
EAST OXBOW ROAD
JERSEY BARRIER
BRIDGE C-05-042
PERMANENT LUW IMPACT 31 S.F.
EAST OXBOW ROAD
UPL 11
WEIGHT LIMIT "ONE LANE BRIDGE"
2005 TOWN LAYOUT SIDELINE
TEMPORARY LUW IMPACT 40 S.F.
2022 TOWN LAYOUT SIDELINE
END 2022 TOWN LAYOUT
PROP TEMPORARY SUPPORT OF EXCAVATION & CONTROL OF WATER (TYP)
PROP SEDIMENT CONTROL BARRIER (TYP)
ORDINARY HIGH WATER
ORDINARY HIGH WATER
MATURE FOREST
MATURE FOREST
DUG WELL
APP OF SWA

LEGEND – ENVIRONMENTAL PLAN:

TEMP. LUW/WOTUS IMPACT AREA (68 SF)
PERM. LUW/WOTUS IMPACT AREA (31 SF)

NOTE: PROPOSED RIPRAP SHALL CONFORM TO THE MATERIAL REQUIREMENTS OF SECTION M.2.02.0 OF STANDARD SPECIFICATIONS. SEE BRIDGE PLANS FOR LIMITS OF PROPOSED RIPRAP.
NO VEGETATED WETLANDS EXIST IN THE PROJECT AREA.

0 20 50 100

SCALE: 1" = 20'

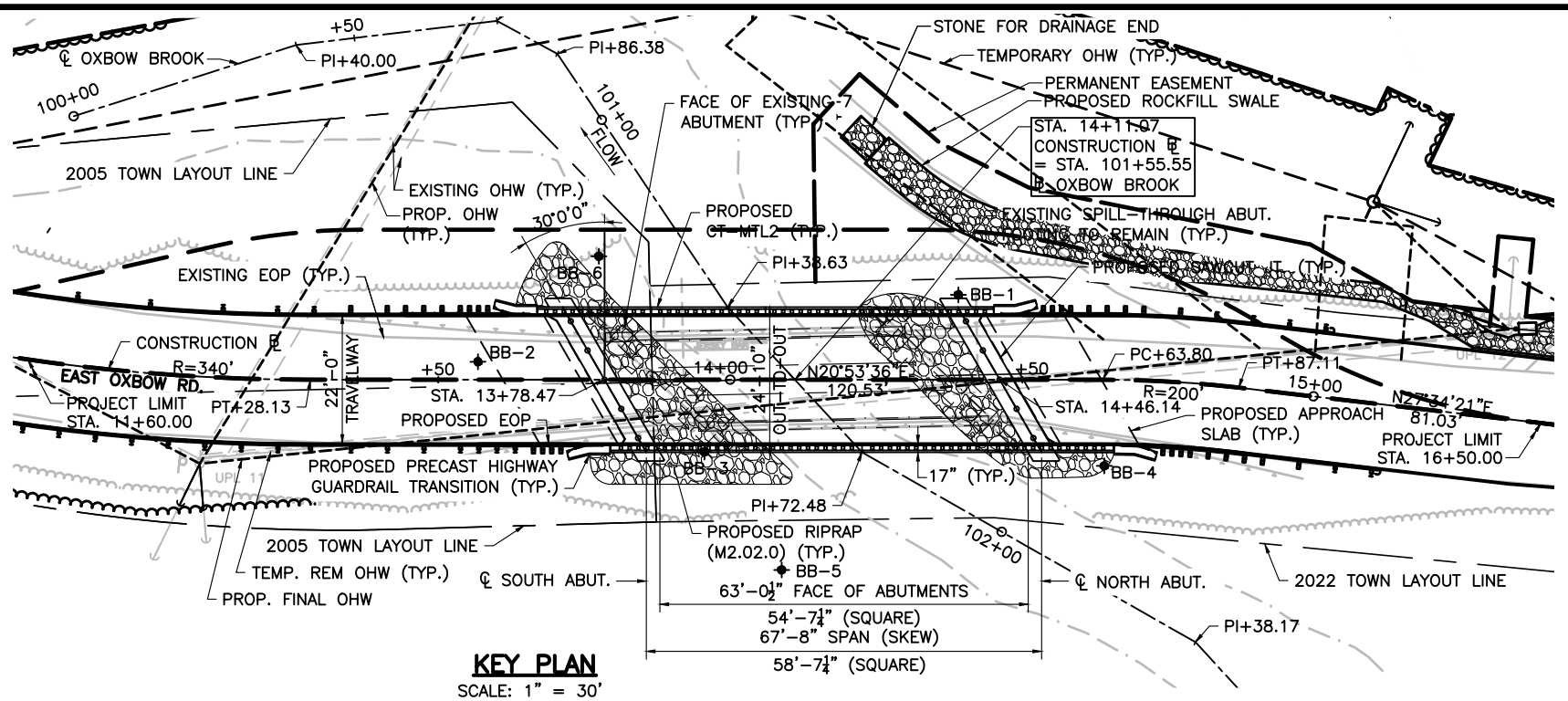
A00831 - 9

Proposal No. 608858-125266

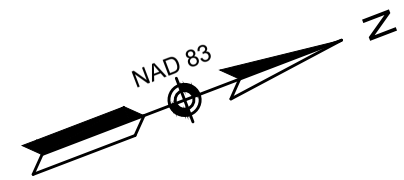
CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

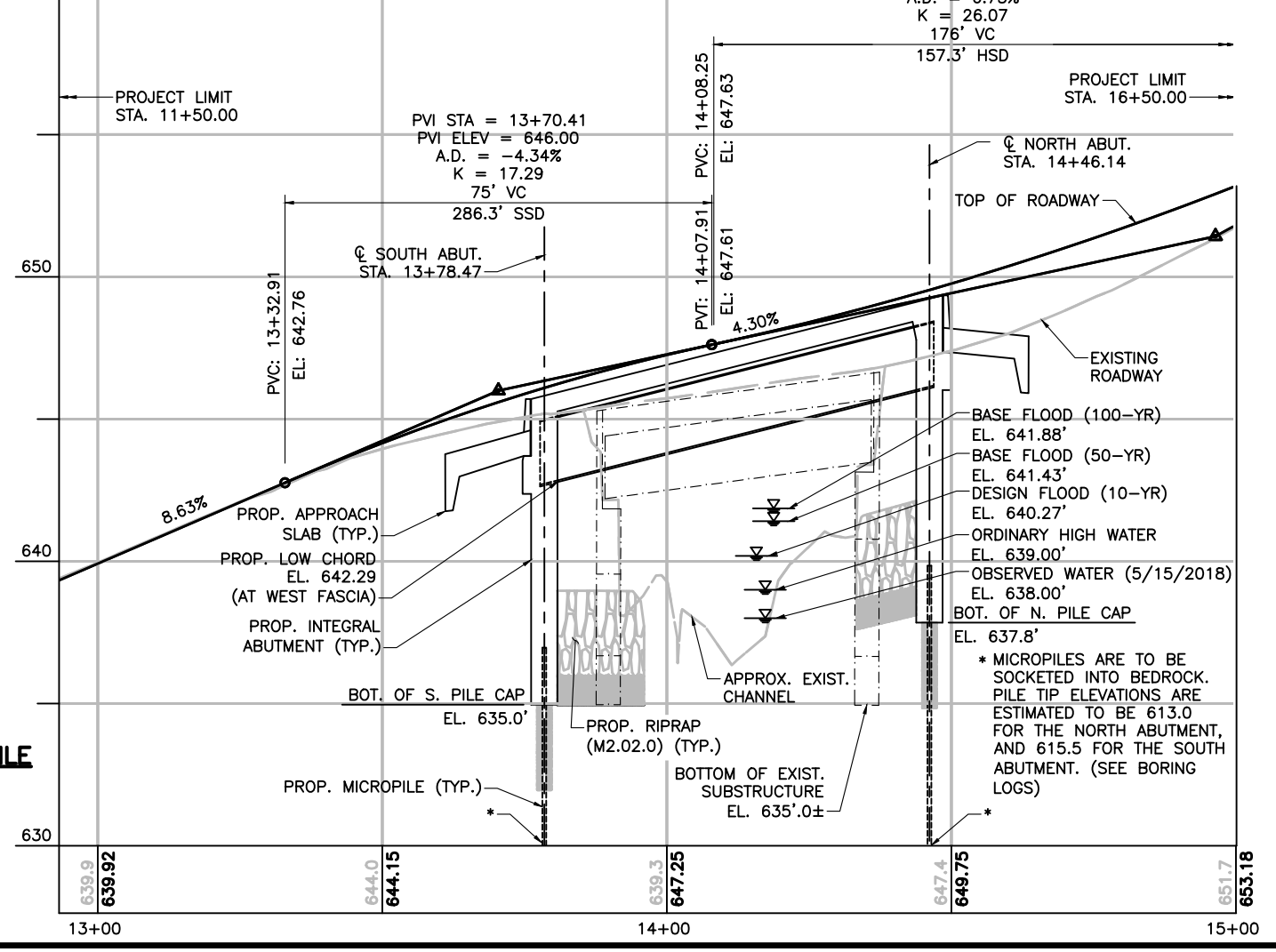
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	7
PROJECT FILE NO.	608858		

KEY PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023

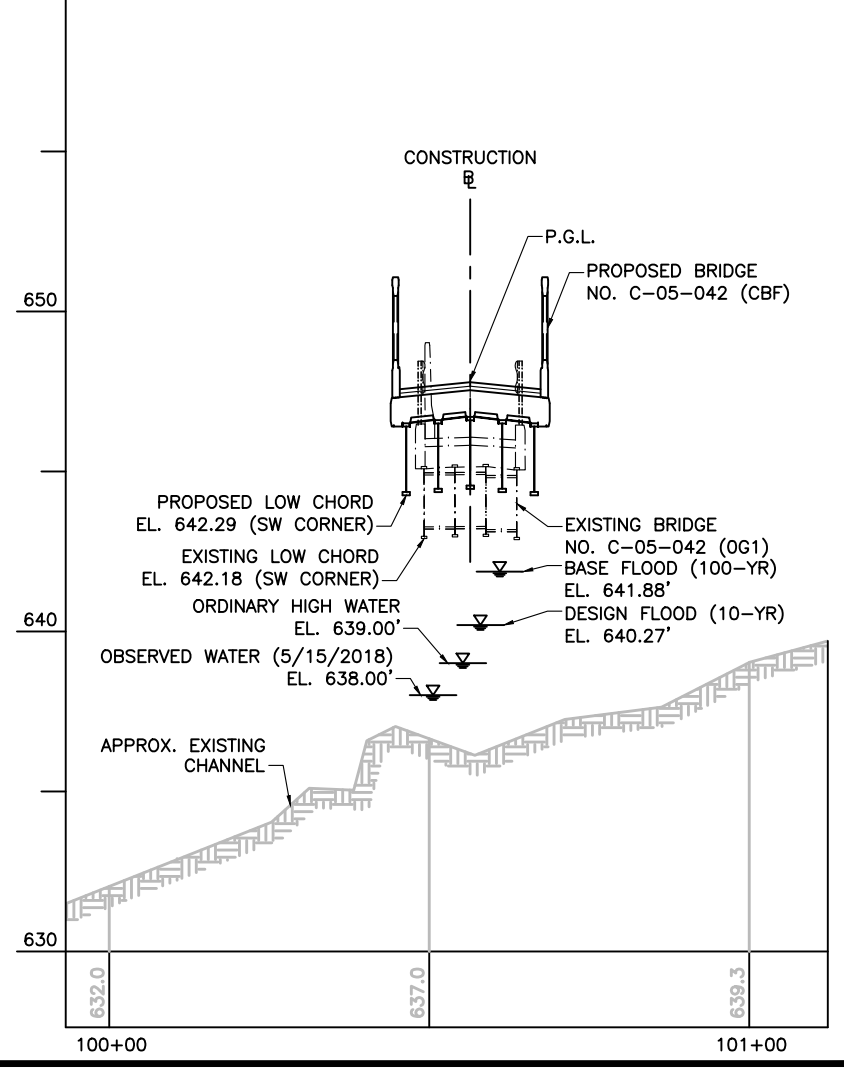


KEY PLAN
SCALE: 1" = 30'





EAST OXBOW ROAD PROFILE
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 6'



OXBOW BROOK PROFILE
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 6'

A00831 - 10

Proposal No. 608858-125266

CHARLEMONT
EAST OXBOW ROAD OVER OXBOW BROOK

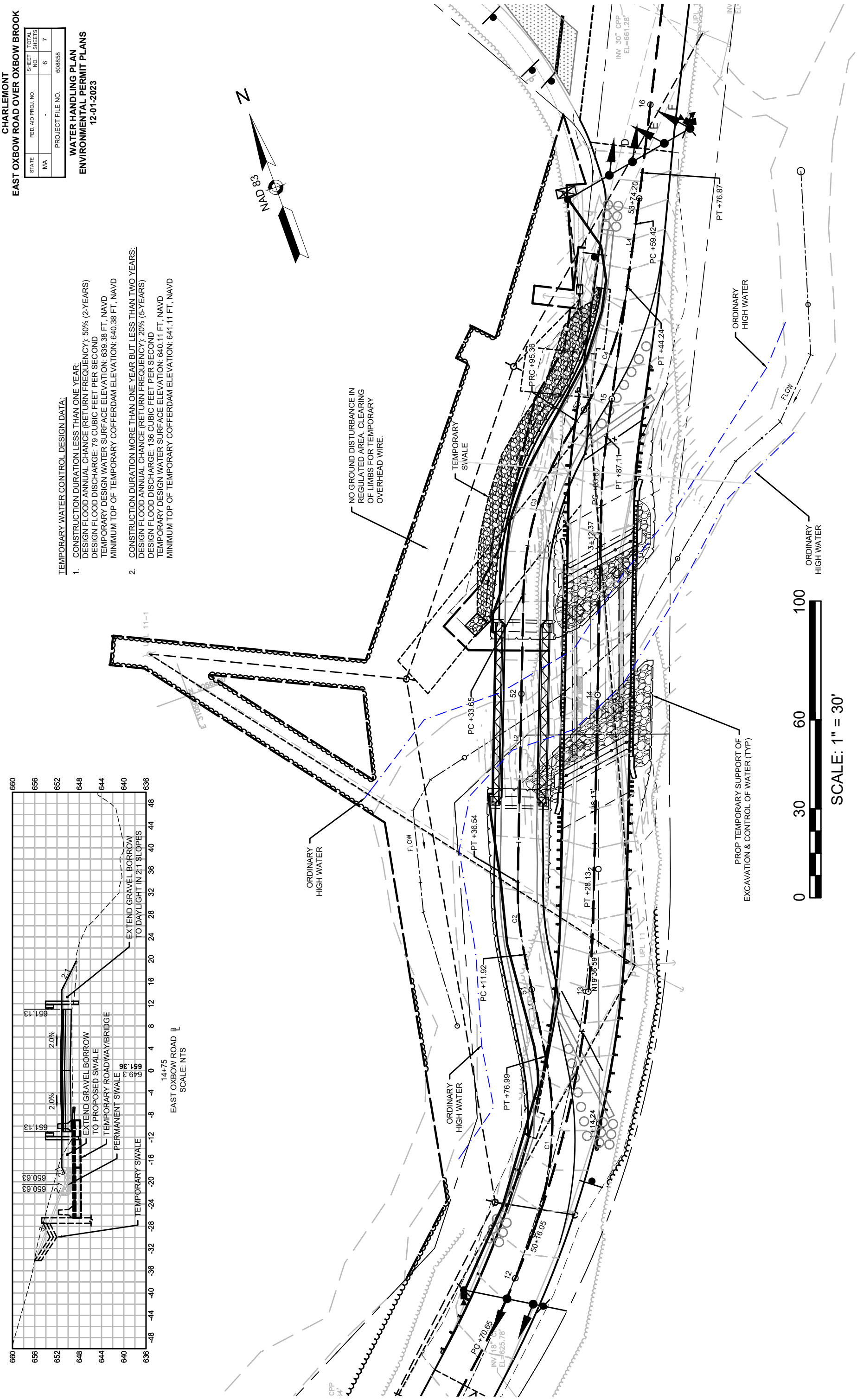
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	7
PROJECT FILE NO.	608858		

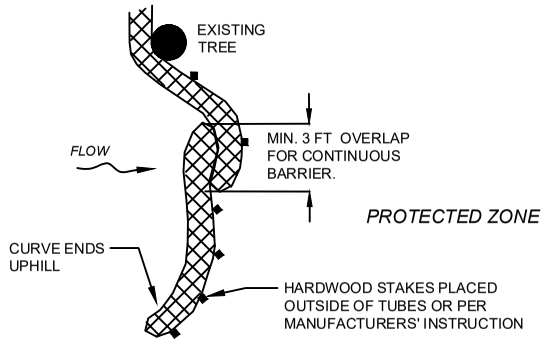
WATER HANDLING PLAN
ENVIRONMENTAL PERMIT PLANS
12-01-2023

TEMPORARY WATER CONTROL DESIGN DATA:

1. CONSTRUCTION DURATION LESS THAN ONE YEAR:
   DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY): 50% (2-YEARS)
   DESIGN FLOOD DISCHARGE: 79 CUBIC FEET PER SECOND
   TEMPORARY DESIGN WATER SURFACE ELEVATION: 639.38 FT, NAVD
   MINIMUM TOP OF TEMPORARY COFFERDAM ELEVATION: 640.38 FT, NAVD

2. CONSTRUCTION DURATION MORE THAN ONE YEAR BUT LESS THAN TWO YEARS:
   DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY): 20% (5-YEARS)
   DESIGN FLOOD DISCHARGE: 136 CUBIC FEET PER SECOND
   TEMPORARY DESIGN WATER SURFACE ELEVATION: 640.11 FT, NAVD
   MINIMUM TOP OF TEMPORARY COFFERDAM ELEVATION: 641.11 FT, NAVD





PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE

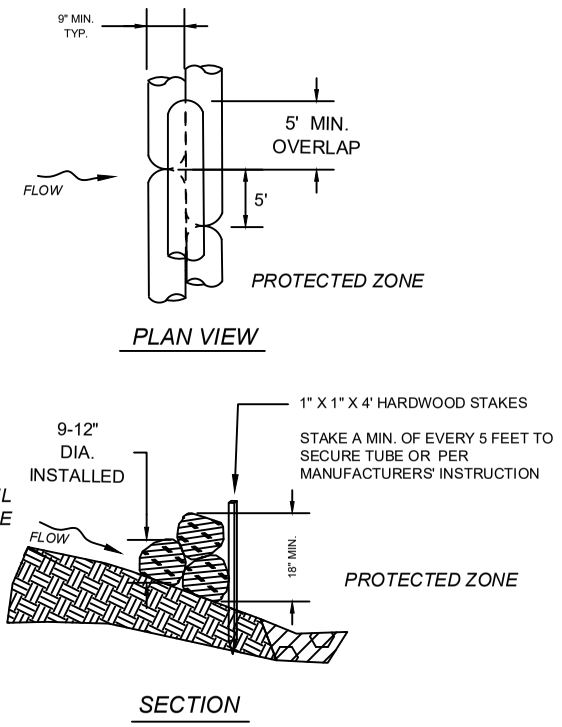
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

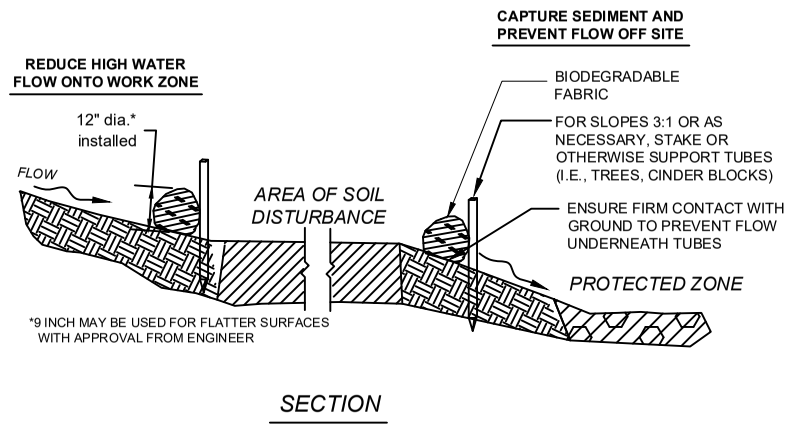
COMPOST FILTER TUBE

NOT TO SCALE



COMPOST FILTER TUBE BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE



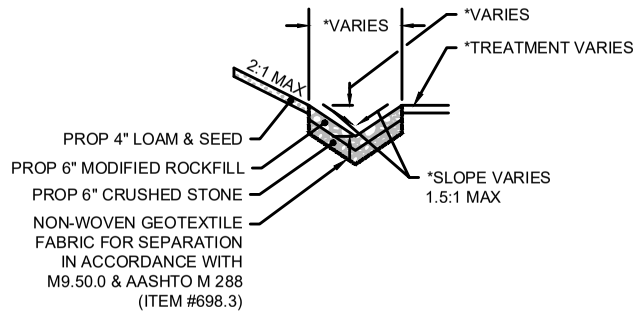
SECTION

SEDIMENT BARRIER - COMPOST FILTER TUBES

NOT TO SCALE

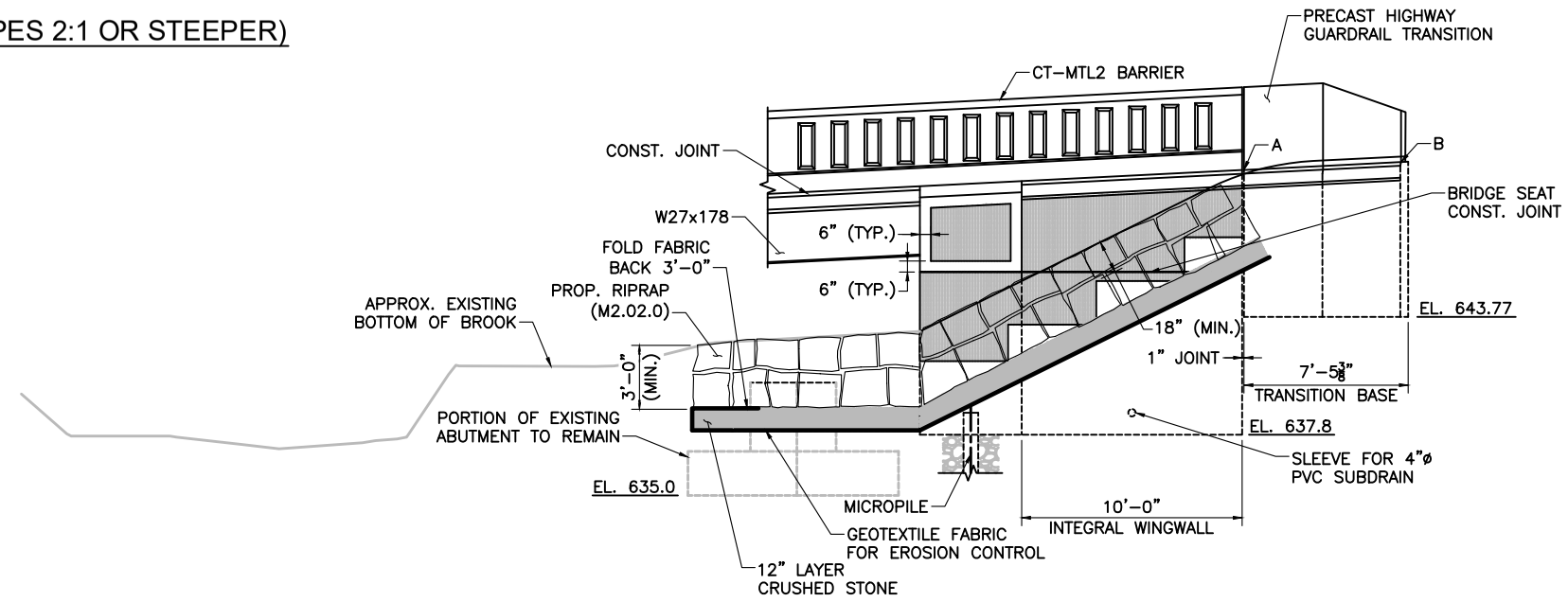
SEEDING NOTES:

STABILIZE SLOPES WITH 4" LOAM, 1" COMPOST BLANKET, PART SHADE ROADSIDE SEED MIX AND JUTE MESH.



TYPICAL ROCKFILL SWALE

NOT TO SCALE



PROPOSED NORTHEAST ELEVATION

NOT TO SCALE

US Army Corps of Engineers ®
New England District

WORK-START NOTIFICATION FORM
(Minimum Notice: Two weeks before work begins)

****

EMAIL TO: daniel.b.vasconcelos@usace.army.mil and cenae-r-ma@usace.army.mil; or

MAIL TO: Daniel Vasconcelos
Regulatory Division
U.S. Army Corps of Engineers, New England District
696 Virginia Road
Concord, Massachusetts 01742-2751

****

A U.S. Army Corps of Engineers authorization, file # 2023-02232, was issued to MassDOT – Highway Division. The permit authorized the permanent discharge of fill material within 31 square feet below the Ordinary High Water (OHW) mark of Oxbow Brook, associated with the replacement of the bridge conveying East Oxbow Road over Oxbow Brook in Charlemont, Massachusetts. The existing single-span bridge with be replaced by a new single-span bridge in the same location. New abutments will be constructed behind the existing abutments, and the existing abutments cut down. Rip-rap scour protection will be placed in front of the new abutments. The project will also have temporary impacts within 68 square feet below OHW due to temporary erosion and water controls.

The people (e.g., contractor) listed below will do the work, and they understand the permit's conditions and limitations.

PLEASE PRINT OR TYPE

Name of Person/Firm: _____

Business Address: _____

_____

_____

Phone: (___) _____ (___) _____

Email: _____

Proposed Work Dates: Start _____ **Finish** _____

Permittee/Agent Signature: _____ **Date:** _____

Printed Name: _____ **Title:** _____

Date Permit Issued: _____ **Date Permit Expires:** _____

****

FOR USE BY THE ARMY CORPS OF ENGINEERS

PM: Vasconcelos **Submittals Required:** _____

Inspection Recommendation: _____

US Army Corps of Engineers ®
New England District

COMPLIANCE CERTIFICATION FORM

(Minimum Notice: Permittee must sign and return notification within one month of the completion of work.)

Permit Number: NAE-2023-02232

Project Manager: Vasconcelos

Name of Permittee: MassDOT – Highway Division

Permit Issuance Date: 1/10/2024

Please sign this certification and return it to our office upon completion of the activity.

****
* E-MAIL TO: cenae-r-ma@usace.army.mil; or *
* *
* MAIL TO: Massachusetts Section *
* Regulatory Division *
* U.S. Army Corps of Engineers, New England District *
* 696 Virginia Road *
* Concord, MA 01742-2751 *
********** *

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit was completed in accordance with the terms and conditions of the above referenced permit, and any required mitigation was completed in accordance with the permit conditions.

Signature of Permittee _____ Date _____

Printed Name _____ Date of Work Completion _____

( ) _____ ( ) _____
Telephone Number Telephone Number

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

January 8, 2024

Massachusetts Department of Transportation
Highway Division
10 Park Plaza, Room 7360
Boston, MA 02116
ATTN: Courtney Walker

RE: Section 401 Water Quality Certification
BRP WW 11, Minor Fill Project
East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)
Charlemont, MA

401 WQC Filing Number: X289412
USACE Application No. NAE-2023-02232

Dear Ms. Walker:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed your application for a Water Quality Certification (WQC), as referenced above. 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. C-05-042) that carries East Oxbow Road over Oxbow Brook in Charlemont, including widening of the approaches and an adjacent temporary bridge to maintain traffic during construction (the Project). The bridge currently serves one-way traffic and will be widened to provide two-way traffic. The bridge is stated as being structurally deficient based on routine inspections in 2019.

Existing Conditions

East Oxbow Road is a rural local road that generally extends in a north/south orientation. The bridge over Oxbow Brook is a 44-foot-long single-span with a curb-to-curb width of 14.2 feet and an out-to-out width of 17.2 feet. The substructure consists of two concrete spill-through abutments with short wingwalls supported by two rectangular concrete columns and footings. There are currently no sidewalks along East Oxbow Road and stormwater management consists solely of country drainage.

Oxbow Brook is a coldwater fishery Critical Area and tributary of the Deerfield River with a bankfull width of approximately 25 feet. There are no Bordering Vegetated Wetlands (BVWs) in the Project area. A vegetated swale is conveyed via a culvert under East Oxbow Road at the northern extent of the Project but is not part of the proposed project. The Project is not located within a one percent annual chance of flooding zone, Priority or Estimated Habitats of Rare Species, or other Critical Areas.

An existing stormwater swale on the west side of East Oxbow Road north of the bridge collects untreated stormwater from Hawk Hill Road and East Oxbow Road and conveys it to Oxbow Brook. Excessive sedimentation is visible within the swale, which is conveyed to the stream during rain events.

Project Description

The existing bridge will be demolished and replaced with a new 67.7-foot-long single span with a curb-to-curb width of 22 feet and an out-to-out width of 24.8 feet. The wider bridge will accommodate two-way traffic and requires widening of the approach roadway on both sides to accommodate the transition. Other roadway improvements along the approaches include superelevation, milling and overlay, full depth roadway reconstruction, and new guardrails. New bridge abutments will be constructed behind the location of the existing abutments outside of wetland resource areas. Riprap will be installed along the new abutments for stabilization and scour protection. No sidewalks or bicycle accommodations are proposed.

A temporary shielding structure will be installed below the superstructure to catch any debris that may fall during demolition. Following removal of the superstructure, a temporary cofferdam will be installed around each abutment and dewatered to allow for partial demolition of the abutments and construction of the new abutments in dry conditions. The existing abutments will be cut down to at least two feet below the channel grade. Following removal of the temporary cofferdam, the new superstructure will be constructed.

Prior to demolition of the existing bridge and construction of the new bridge, a temporary one-lane bridge will be constructed to the west of the existing bridge to maintain traffic. The roadway will be temporarily realigned to accommodate transition to the temporary bridge. The existing stormwater swale will be temporarily relocated west along the side of the realigned roadway and lined with riprap to maintain stormwater conveyance during construction. Overhead utilities will also be temporarily relocated to accommodate the temporary bridge as needed. Following removal of the temporary bridge, the slopes will be restored with loam and a compost blanket, and a native seed mix.

LUW Impacts & Restoration

In total, 99 square feet (sf) of temporary fill impacts to LUW are required; 31 sf for the placement of riprap at the north abutment, and 68 sf for access, grading, and the placement of erosion and sedimentation controls. The 31 sf of riprap constitutes a permanent discharge of fill material, but as the streambed will be restored above the riprap, it constitutes a temporary impact. Temporary LUW impacts will be restored in-situ to match adjacent stream conditions using native streambed material.

Alternatives Analysis

An alternatives analysis was completed in accordance with 314 CMR 9.00. The bridge is required to be replaced as the no-build alternative would result in continued deterioration of the bridge which would pose a safety hazard to the traveling public. Spread prestressed concrete deck beams were considered, which require less long-term maintenance, have low life cycle costs, and have less corrosion and deterioration than steel stringers. However, larger construction equipment would be required to install the spread beams as they are heavier than concrete, which would potentially require additional impacts adjacent to and possibly within Oxbow Brook.

Permanent LUW impacts are required to install the minimum amount of riprap needed to provide scour protection for the new abutments. Temporary LUW impacts are required for erosion and sedimentation controls, access, and to provide room to work, and have been avoided and minimized to the extent practicable. Therefore, the selected alternative is the environmentally preferred alternative.

Stormwater Management Standards

The Project will result in an increase of 1,300 sf of impervious surface. Through a complete evaluation, it was determined that structural stormwater measures (SCMs) are not practicable within the Project limits for various reasons. The entire property to the east of the roadway is subject to an Agricultural Preservation Restriction. Steep slopes, available right-of-way, and the vegetated swale northeast of the bridge also contribute to the entire east side of the roadway being not feasible and/or practicable for an SCM or LID techniques along the length of the Project.

To improve existing conditions, the existing 170-foot-long swale northwest of the bridge which collects stormwater from East Oxbow Road and Hawk Hill Road will be converted to a rock-lined swale. The existing swale currently discharges sediment directly to Oxbow Brook untreated. A stone level pad will be installed at the end of the swale to dissipate flow velocities prior to discharging to an upland buffer and ultimately to Oxbow Brook. The swale cannot be converted to an SCM as it is located on private property and is also subject to Chapter 61 conservation easement restrictions.

As a complete evaluation determined SCMs are not practicable and modifying the existing swale to be a rock-lined swale is an LID technique that improves existing conditions, the Stormwater Standards are met to the maximum extent practicable as a redevelopment project.

Stream Crossing Standards

The Project meets all the Stream Crossing Standards except Standard 7, which has been met to the maximum extent practicable. The new crossing will be an open bottom span that will be 2.7 times the bankfull width with an openness ratio of 9.3 feet. Substrate and water depth and velocity will remain the same. An existing natural shelf will remain undisturbed on the north side under the bridge which will serve as a wildlife passage area.

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. Public notice was provided in the Greenfield Recorder on October 7, 2023, and in the MEPA Monitor on October 23, 2023. 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 CHA Consulting, Inc. on behalf of MassDOT, dated October 4, 2023, with cover letter and attachments. 401 WQC Filing Number: X289412.
    - Plans entitled: “Massachusetts Department of Transportation Highway Division, Plan and Profile of East Oxbow Road over Oxbow Brook (Bridge No. C-05-042) in the Town of Charlemont, Franklin County, Environmental Permit Plans”. Sheets 1 through 7. Prepared by CHA Consulting, Inc. Dated October 7, 2022, last revised December 1, 2023.
    - MassDEP Administrative Completeness and Technical Deficiency Review. 401 Water Quality Certification, Minor Fill Project Certification. East Oxbow Road over Oxbow Brook (Bridge No. C-05-042). Dated October 25, 2023.
    - MassDOT Responses to MassDEP Technical Review, including attachments. Prepared by CHA Consulting, Inc. on behalf of MassDOT. 401 Water Quality Certification, Minor Fill Project Certification. East Oxbow Road over Oxbow Brook (Bridge No. C-05-042). Dated
    - December 6, 2023.

Pre-Construction

2. A minimum of 21 days prior to the start of work, MassDOT shall contact MassDEP to schedule an onsite Pre-Construction Meeting to review the approved plans and terms and conditions of this WQC. The Resident Engineer (RE), the construction contractor, a representative from the MassDOT Environmental Section and/or the District Environmental Engineer shall attend the Pre-Construction Meeting.

3. Prior to the Pre-Construction Meeting, the applicant shall provide MassDEP with the name and contact information of the RE responsible for ensuring that all work complies with the conditions of this WQC. **(Submittal)**

4. MassDEP shall be copied on applicable submittals to the U.S. Army Corps of Engineers (Corps). 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)**

5. A 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. Any subsequent changes to the Final CP/PP (defined herein as including the construction period SWPPP) must be approved by MassDEP. **(Submittal)**

6. 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 Construction General Permit Inspector Training, or other training that meets the CGP requirements, as well as complete a comprehensive review of the Final CP/PP. Verification of proof of completion training of the shall be submitted to MassDEP prior to the start of work.

7. The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to LUW, proposed dewatering 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.

8. A minimum of 21 days prior to the start of work, MassDOT shall submit a Water Management Plan for review and approval. The Plan shall include proposed methods to manage construction-period water including but not limited to dewatering methods and locations, specifications for any water bypass systems, and dredge and debris material dewatering prior to shipment off site, as applicable. The plan shall meet requirements of the CP/PP and be specific to the Project. Dewatering and water bypasses shall be conducted under the supervision of the RE and comply with the applicable conditions identified herein. **(Submittal)**

9. 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.

10. Prior to the Pre-Construction Meeting, the boundaries of LUW shall be re-flagged where they are within 50 feet of the limits of work. In the event 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 RE. All construction personnel shall be made aware of these markers.

11. A minimum of 21 days prior to the start of work, a Demolition Plan shall be submitted for review and approval describing how the existing bridge will be demolished and what measures will be taken to assure that demo material is properly contained and does not enter the waterbody. **(Submittal)**

Construction Period

12. No more than **99 sf** of temporary impacts, including no more than **31 sf** of permanent discharge due to the placement of rip rap shall occur within LUW. All work shall avoid unapproved impacts to LUW.

13. 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. Inspections are required only during the normal working hours of the site.

14. Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

15. Inspection and maintenance of erosion and sediment controls in active work areas shall be the responsibility of both the Contractor and RE. The RE shall be ultimately responsible for inspection and maintenance of site controls. The RE and/or contractor shall immediately notify MassDEP and the Charlemont Conservation Commission if any unauthorized discharges to LUW occur.

16. 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.

17. Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Charlemont Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the RE prior to use, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to LUW. Any discharges shall be visibly free of sediment.

18. 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 RE 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.

19. 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. Stockpiles shall be located no less than 50 feet from LUW, catch basins, or other drainage conveyances that discharge to LUW. The CP/PP shall specify measures to implement this. Filter fabric stretched under storm drain inlet grates are not acceptable for this purpose.

20. 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 LUW, catch basins or other drainage conveyances that discharge directly or indirectly to LUW.

21. Refueling, washing, and cleaning of vehicles and other construction equipment shall not take place within 50 feet of LUW and any wash water shall be contained such that it does not drain toward LUW. MassDEP shall explicitly approve in writing any deviation to this condition for oversized stationary vehicles.

22. The contractor shall have spill containment kits on site. In the event of a release of fuels and/or oils, the local fire department and MassDEP shall be notified.

23. Sheet piles shall be fully removed from wetland resource areas upon stabilization of the area as required. No portion of sheet piles shall remain unless approved by MassDEP in writing prior to installation. A request to leave sheet piles shall include, but not be limited to, demonstration that full removal of the sheet piles is not feasible or practicable, and an alternatives analysis demonstrating alternative methods to isolate the work area(s) are not feasible or practicable. At no time shall sheet piles be allowed to remain in LUW of a waterway that provides aquatic organism passage.

24. A temporary shielding 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 waterbody, 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.

Stream Mitigation

25. The RE shall oversee all LUW restoration. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, roughness, shape, profile, and appearance and will replicate, to the extent possible, the function and appearance of the

natural stream channel. MassDEP shall coordinate with the RE and confirm the success of the streambed restoration prior to the completion of construction.

26. Placement of streambed materials shall take place in no- or low-flow conditions. The Water Management Plan required in Condition 8 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.

27. 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 RE.

28. MassDEP reserves the right to determine the success or failure of the LUW replication and restoration areas and reserves the right to require additional measures deemed necessary to promote success.

Post-Construction

29. All temporary erosion controls shall be removed at the conclusion of work once the surrounding area has achieved final stabilization.

General Conditions

30. 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 ryan.hale@mass.gov. **(Submittal)**

31. This WQC remains in effect for the same duration as the Section 404 permit that requires it.

32. 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.

33. 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; 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

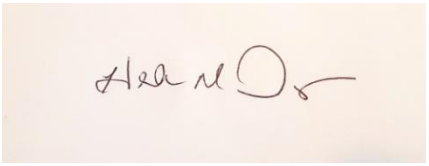
The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

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 Ryan Hale at Heidi.davis@mass.gov and ryan.hale@mass.gov.

Very truly yours,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP WERO – Michael McHugh
USACE – Dan Vasconcelos
MassDOT – Melissa Lenker
MassDOT – Kylie Abouzeid
CHA – Michael Villano
CHA – Chris Wall
Charlemont Conservation Commission – Bill Harker – sectobds@charlemont-ma.us

ATTACHMENT A
East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)
Charlemont, MA

PRE-CONSTRUCTION SUBMITTAL CHECKLIST

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.

Condition	Required Submittal	Due Date	Date Submitted	Date Approved
PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS				
3	Name and contact information of the RE	Prior to Pre-Construction Meeting		
4	Corps Work-Start Notification Form	14 days prior to work start		
5	CP/PP	14 days prior to work start		
8	Water Management Plan	21 days prior to work start		
11	Demolition Plan	21 days prior to work start		

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
ហើយគប្បីត្រូវបានបកប្រែភ្លាមៗ។
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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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.

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. 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. 3. Intake structures that are dry hydrants used exclusively for firefighting activities with no stream impoundments. 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.	1. New outfall and/or intake structures. 2. Unconfined work or silt producing activities in streams with diadromous fish. 3. Submarine cables, conduits, or pipelines that occur in, over or under navigable 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

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.

Pre-Construction Notification Required

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

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/

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930
(978) 281-9300 (phone)
(*Federal endangered species & EFH)*

U.S. Fish & Wildlife Service
70 Commercial Street, Suite 300
Concord, New Hampshire 03301
(603) 223-2541 (phone)
(Federal endangered species)

National Park Service
15 State Street
Boston, Massachusetts 02109
(617) 223-5191 (phone)
(*Wild and Scenic Rivers*)

Bureau of Ocean and Energy Management
1849 C Street, NW
Washington D.C. 20240
202-208-6474 (phone)
(*Offshore Wind Facilities)*

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)

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*)

U.S. Environmental Protection Agency
5 Post Office Square
Suite 100 (OEP06–3)
Boston, Massachusetts 02109-3912
(617) 918-1692 (phone)

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
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

January 8, 2024

Massachusetts Department of Transportation
Highway Division
10 Park Plaza, Room 7360
Boston, MA 02116
ATTN: Courtney Walker

RE: Section 401 Water Quality Certification
BRP WW 11, Minor Fill Project
East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)
Charlemont, MA

401 WQC Filing Number: X289412
USACE Application No. NAE-2023-02232

Dear Ms. Walker:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed your application for a Water Quality Certification (WQC), as referenced above. 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. C-05-042) that carries East Oxbow Road over Oxbow Brook in Charlemont, including widening of the approaches and an adjacent temporary bridge to maintain traffic during construction (the Project). The bridge currently serves one-way traffic and will be widened to provide two-way traffic. The bridge is stated as being structurally deficient based on routine inspections in 2019.

Existing Conditions

East Oxbow Road is a rural local road that generally extends in a north/south orientation. The bridge over Oxbow Brook is a 44-foot-long single-span with a curb-to-curb width of 14.2 feet and an out-to-out width of 17.2 feet. The substructure consists of two concrete spill-through abutments with short wingwalls supported by two rectangular concrete columns and footings. There are currently no sidewalks along East Oxbow Road and stormwater management consists solely of country drainage.

Oxbow Brook is a coldwater fishery Critical Area and tributary of the Deerfield River with a bankfull width of approximately 25 feet. There are no Bordering Vegetated Wetlands (BVWs) in the Project area. A vegetated swale is conveyed via a culvert under East Oxbow Road at the northern extent of the Project but is not part of the proposed project. The Project is not located within a one percent annual chance of flooding zone, Priority or Estimated Habitats of Rare Species, or other Critical Areas.

An existing stormwater swale on the west side of East Oxbow Road north of the bridge collects untreated stormwater from Hawk Hill Road and East Oxbow Road and conveys it to Oxbow Brook. Excessive sedimentation is visible within the swale, which is conveyed to the stream during rain events.

Project Description

The existing bridge will be demolished and replaced with a new 67.7-foot-long single span with a curb-to-curb width of 22 feet and an out-to-out width of 24.8 feet. The wider bridge will accommodate two-way traffic and requires widening of the approach roadway on both sides to accommodate the transition. Other roadway improvements along the approaches include superelevation, milling and overlay, full depth roadway reconstruction, and new guardrails. New bridge abutments will be constructed behind the location of the existing abutments outside of wetland resource areas. Riprap will be installed along the new abutments for stabilization and scour protection. No sidewalks or bicycle accommodations are proposed.

A temporary shielding structure will be installed below the superstructure to catch any debris that may fall during demolition. Following removal of the superstructure, a temporary cofferdam will be installed around each abutment and dewatered to allow for partial demolition of the abutments and construction of the new abutments in dry conditions. The existing abutments will be cut down to at least two feet below the channel grade. Following removal of the temporary cofferdam, the new superstructure will be constructed.

Prior to demolition of the existing bridge and construction of the new bridge, a temporary one-lane bridge will be constructed to the west of the existing bridge to maintain traffic. The roadway will be temporarily realigned to accommodate transition to the temporary bridge. The existing stormwater swale will be temporarily relocated west along the side of the realigned roadway and lined with riprap to maintain stormwater conveyance during construction. Overhead utilities will also be temporarily relocated to accommodate the temporary bridge as needed. Following removal of the temporary bridge, the slopes will be restored with loam and a compost blanket, and a native seed mix.

LUW Impacts & Restoration

In total, 99 square feet (sf) of temporary fill impacts to LUW are required; 31 sf for the placement of riprap at the north abutment, and 68 sf for access, grading, and the placement of erosion and sedimentation controls. The 31 sf of riprap constitutes a permanent discharge of fill material, but as the streambed will be restored above the riprap, it constitutes a temporary impact. Temporary LUW impacts will be restored in-situ to match adjacent stream conditions using native streambed material.

Alternatives Analysis

An alternatives analysis was completed in accordance with 314 CMR 9.00. The bridge is required to be replaced as the no-build alternative would result in continued deterioration of the bridge which would pose a safety hazard to the traveling public. Spread prestressed concrete deck beams were considered, which require less long-term maintenance, have low life cycle costs, and have less corrosion and deterioration than steel stringers. However, larger construction equipment would be required to install the spread beams as they are heavier than concrete, which would potentially require additional impacts adjacent to and possibly within Oxbow Brook.

Permanent LUW impacts are required to install the minimum amount of riprap needed to provide scour protection for the new abutments. Temporary LUW impacts are required for erosion and sedimentation controls, access, and to provide room to work, and have been avoided and minimized to the extent practicable. Therefore, the selected alternative is the environmentally preferred alternative.

Stormwater Management Standards

The Project will result in an increase of 1,300 sf of impervious surface. Through a complete evaluation, it was determined that structural stormwater measures (SCMs) are not practicable within the Project limits for various reasons. The entire property to the east of the roadway is subject to an Agricultural Preservation Restriction. Steep slopes, available right-of-way, and the vegetated swale northeast of the bridge also contribute to the entire east side of the roadway being not feasible and/or practicable for an SCM or LID techniques along the length of the Project.

To improve existing conditions, the existing 170-foot-long swale northwest of the bridge which collects stormwater from East Oxbow Road and Hawk Hill Road will be converted to a rock-lined swale. The existing swale currently discharges sediment directly to Oxbow Brook untreated. A stone level pad will be installed at the end of the swale to dissipate flow velocities prior to discharging to an upland buffer and ultimately to Oxbow Brook. The swale cannot be converted to an SCM as it is located on private property and is also subject to Chapter 61 conservation easement restrictions.

As a complete evaluation determined SCMs are not practicable and modifying the existing swale to be a rock-lined swale is an LID technique that improves existing conditions, the Stormwater Standards are met to the maximum extent practicable as a redevelopment project.

Stream Crossing Standards

The Project meets all the Stream Crossing Standards except Standard 7, which has been met to the maximum extent practicable. The new crossing will be an open bottom span that will be 2.7 times the bankfull width with an openness ratio of 9.3 feet. Substrate and water depth and velocity will remain the same. An existing natural shelf will remain undisturbed on the north side under the bridge which will serve as a wildlife passage area.

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. Public notice was provided in the Greenfield Recorder on October 7, 2023, and in the MEPA Monitor on October 23, 2023. 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 CHA Consulting, Inc. on behalf of MassDOT, dated October 4, 2023, with cover letter and attachments. 401 WQC Filing Number: X289412.
    - Plans entitled: “Massachusetts Department of Transportation Highway Division, Plan and Profile of East Oxbow Road over Oxbow Brook (Bridge No. C-05-042) in the Town of Charlemont, Franklin County, Environmental Permit Plans”. Sheets 1 through 7. Prepared by CHA Consulting, Inc. Dated October 7, 2022, last revised December 1, 2023.
    - MassDEP Administrative Completeness and Technical Deficiency Review. 401 Water Quality Certification, Minor Fill Project Certification. East Oxbow Road over Oxbow Brook (Bridge No. C-05-042). Dated October 25, 2023.
    - MassDOT Responses to MassDEP Technical Review, including attachments. Prepared by CHA Consulting, Inc. on behalf of MassDOT. 401 Water Quality Certification, Minor Fill Project Certification. East Oxbow Road over Oxbow Brook (Bridge No. C-05-042). Dated
    - December 6, 2023.

Pre-Construction

2. A minimum of 21 days prior to the start of work, MassDOT shall contact MassDEP to schedule an onsite Pre-Construction Meeting to review the approved plans and terms and conditions of this WQC. The Resident Engineer (RE), the construction contractor, a representative from the MassDOT Environmental Section and/or the District Environmental Engineer shall attend the Pre-Construction Meeting.

3. Prior to the Pre-Construction Meeting, the applicant shall provide MassDEP with the name and contact information of the RE responsible for ensuring that all work complies with the conditions of this WQC. **(Submittal)**

4. MassDEP shall be copied on applicable submittals to the U.S. Army Corps of Engineers (Corps). 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)**

5. A 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. Any subsequent changes to the Final CP/PP (defined herein as including the construction period SWPPP) must be approved by MassDEP. **(Submittal)**

6. 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 Construction General Permit Inspector Training, or other training that meets the CGP requirements, as well as complete a comprehensive review of the Final CP/PP. Verification of proof of completion training of the shall be submitted to MassDEP prior to the start of work.

7. The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to LUW, proposed dewatering 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.

8. A minimum of 21 days prior to the start of work, MassDOT shall submit a Water Management Plan for review and approval. The Plan shall include proposed methods to manage construction-period water including but not limited to dewatering methods and locations, specifications for any water bypass systems, and dredge and debris material dewatering prior to shipment off site, as applicable. The plan shall meet requirements of the CP/PP and be specific to the Project. Dewatering and water bypasses shall be conducted under the supervision of the RE and comply with the applicable conditions identified herein. **(Submittal)**

9. 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.

10. Prior to the Pre-Construction Meeting, the boundaries of LUW shall be re-flagged where they are within 50 feet of the limits of work. In the event 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 RE. All construction personnel shall be made aware of these markers.

11. A minimum of 21 days prior to the start of work, a Demolition Plan shall be submitted for review and approval describing how the existing bridge will be demolished and what measures will be taken to assure that demo material is properly contained and does not enter the waterbody. **(Submittal)**

Construction Period

12. No more than **99 sf** of temporary impacts, including no more than **31 sf** of permanent discharge due to the placement of rip rap shall occur within LUW. All work shall avoid unapproved impacts to LUW.

13. 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. Inspections are required only during the normal working hours of the site.

14. Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

15. Inspection and maintenance of erosion and sediment controls in active work areas shall be the responsibility of both the Contractor and RE. The RE shall be ultimately responsible for inspection and maintenance of site controls. The RE and/or contractor shall immediately notify MassDEP and the Charlemont Conservation Commission if any unauthorized discharges to LUW occur.

16. 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.

17. Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Charlemont Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the RE prior to use, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to LUW. Any discharges shall be visibly free of sediment.

18. 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 RE 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.

19. 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. Stockpiles shall be located no less than 50 feet from LUW, catch basins, or other drainage conveyances that discharge to LUW. The CP/PP shall specify measures to implement this. Filter fabric stretched under storm drain inlet grates are not acceptable for this purpose.

20. 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 LUW, catch basins or other drainage conveyances that discharge directly or indirectly to LUW.

21. Refueling, washing, and cleaning of vehicles and other construction equipment shall not take place within 50 feet of LUW and any wash water shall be contained such that it does not drain toward LUW. MassDEP shall explicitly approve in writing any deviation to this condition for oversized stationary vehicles.

22. The contractor shall have spill containment kits on site. In the event of a release of fuels and/or oils, the local fire department and MassDEP shall be notified.

23. Sheet piles shall be fully removed from wetland resource areas upon stabilization of the area as required. No portion of sheet piles shall remain unless approved by MassDEP in writing prior to installation. A request to leave sheet piles shall include, but not be limited to, demonstration that full removal of the sheet piles is not feasible or practicable, and an alternatives analysis demonstrating alternative methods to isolate the work area(s) are not feasible or practicable. At no time shall sheet piles be allowed to remain in LUW of a waterway that provides aquatic organism passage.

24. A temporary shielding 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 waterbody, 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.

Stream Mitigation

25. The RE shall oversee all LUW restoration. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, roughness, shape, profile, and appearance and will replicate, to the extent possible, the function and appearance of the

natural stream channel. MassDEP shall coordinate with the RE and confirm the success of the streambed restoration prior to the completion of construction.

26. Placement of streambed materials shall take place in no- or low-flow conditions. The Water Management Plan required in Condition 8 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.

27. 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 RE.

28. MassDEP reserves the right to determine the success or failure of the LUW replication and restoration areas and reserves the right to require additional measures deemed necessary to promote success.

Post-Construction

29. All temporary erosion controls shall be removed at the conclusion of work once the surrounding area has achieved final stabilization.

General Conditions

30. 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 ryan.hale@mass.gov. **(Submittal)**

31. This WQC remains in effect for the same duration as the Section 404 permit that requires it.

32. 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.

33. 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; 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

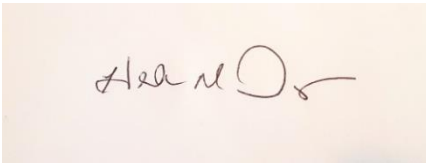
The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

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 Ryan Hale at Heidi.davis@mass.gov and ryan.hale@mass.gov.

Very truly yours,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP WERO – Michael McHugh
USACE – Dan Vasconcelos
MassDOT – Melissa Lenker
MassDOT – Kylie Abouzeid
CHA – Michael Villano
CHA – Chris Wall
Charlemont Conservation Commission – Bill Harker – sectobds@charlemont-ma.us

ATTACHMENT A
East Oxbow Road over Oxbow Brook (Bridge No. C-05-042)
Charlemont, MA

PRE-CONSTRUCTION SUBMITTAL CHECKLIST

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.

Condition	Required Submittal	Due Date	Date Submitted	Date Approved
PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS				
3	Name and contact information of the RE	Prior to Pre-Construction Meeting		
4	Corps Work-Start Notification Form	14 days prior to work start		
5	CP/PP	14 days prior to work start		
8	Water Management Plan	21 days prior to work start		
11	Demolition Plan	21 days prior to work start		

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 A00855

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

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: August 21, 2023
Project code: 2022-0033441
Project Name: 608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK

Subject: Concurrence verification letter for the '608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK' 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 August 21, 2023 to verify that the **608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK** (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, and may affect, but 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

608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK

DESCRIPTION

608858 - CHARLEMONT- BRIDGE REPLACEMENT, C-05-042, EAST OXBOW ROAD OVER OXBOW BROOK

This project proposes full replacement of this existing SD bridge.

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/@42.629089449999995,-72.78386426152227,14z

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

- *AllBridges_Report Submittal_2021-reduced.pdf https://ipac.ecosphere.fws.gov/project/RPARO6NQZJFBHMJT7AJMRAGH6E/projectDocuments/114258160*

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?

    No

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.

    No

27. Is the bridge **within** a known maternity colony's home range[1]?

    [1] Contact your local FWS office for more information if you are uncertain about where the nearest known maternity colony is located.

    No

28. Have presence/probable absence (P/A) summer surveys[1][2] been conducted for this project with at least one survey point **within** suitable habitat and **within** 0.25 miles of the bridge[3][4]?

    [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, P/A summer surveys were conducted within 0.25 miles of the bridge

    SUBMITTED DOCUMENTS

    - *AllBridges_Report Submittal_2021-reduced.pdf https://ipac.ecosphere.fws.gov/project/RPARO6NQZJFBHMJT7AJMRAGH6E/projectDocuments/114258160*

29. 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, Indiana bats and/or NLEBs were not detected during the P/A surveys

30. Did the local Service Field Office verify[1] that this presence/probable absence (P/A) summer survey can be used for determining Indiana bat and/or NLEB absence from the bridge?

    [1] Coordination with local US Fish and Wildlife Service Field Office regarding the applicability of P/A surveys for this use is required.

    Yes, the local FWS office confirmed that this P/A survey can be used to assume Indiana bats and/or NLEBs are absent from the bridge

31. Will the bridge removal, replacement, and/or maintenance activities include installing new or replacing existing **permanent** lighting?

    No

32. 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

33. 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

34. 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

35. Will the project install new or replace existing **permanent** lighting?

    No

36. 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

37. 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

38. 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

39. 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

40. Will the project raise the road profile **above the tree canopy**?

    No

41. 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.

42. 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

43. 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.

44. 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

45. **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.

0.5

4. Please describe the proposed bridge work:

   It will be a one span, two travel lane wide bridge - it consists of steel beams and concrete deck bridge, supported on drilled-mini-piles. There will also be a temporary bridge constructed to allow passage as the existing bridge is only one lane wide and stage construction is not feasible.

5. Please state the timing of all proposed bridge work:

   Spring 2024-Spring 2026

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 July 27, 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: Hana Isihara
Address: 10 Park Plaza
City: Boston
State: MA
Zip: 02116
Email hana.l.isihara@dot.state.ma.us
Phone: 6178964454

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

DOCUMENT A00856

NORTHERN LONG-EARED BAT PRESENCE/ABSENCE SURVEY

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November 11, 2021

Tim Dexter
Fish & Wildlife Program Coordinator
Massachusetts Department of Transportation – Highway Division
Ten Park Plaza, Room 4260
Boston, MA 02116-3973

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	605843
Town	North Adams, Massachusetts
Surveyor Name/Firm	*Emma Duguay / Normandeau Associates, Inc.*
Detector Operation Dates	July 26–29, 2021
Survey Results	**NLEB NOT DETECTED**

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	608830
Town	Westford, Massachusetts
Surveyor Name/Firm	*Emma Duguay / Normandeau Associates, Inc.*
Detector Operation Dates	July 7–12, July 13–15, and August 2–5, 2021
Survey Results	**NLEB NOT DETECTED**

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	608856
Town	Otis, Massachusetts
Surveyor Name/Firm	*Emma Duguay / Normandeau Associates, Inc.*
Detector Operation Dates	July 30–August 2, 2021
Survey Results	**NLEB NOT DETECTED**

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	608858
Town	Charlemont, Massachusetts
Surveyor Name/Firm	*Michael McGowan / Normandeau Associates, Inc.*
Detector Operation Dates	July 29–August 2, 2021
Survey Results	**NLEB NOT DETECTED**

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	609072
Town	Williamstown, Massachusetts
Surveyor Name/Firm	*Emma Duguay / Normandeau Associates, Inc.*
Detector Operation Dates	July 26–August 2, 2021
Survey Results	**NLEB NOT DETECTED**

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	609162
Town	Williamstown, Massachusetts
Surveyor Name/Firm	*Michael McGowan / Normandeau Associates, Inc.*
Detector Operation Dates	July 26–August 2, 2021
Survey Results	**NLEB NOT DETECTED**

Project	Northern Long-eared Bat (NLEB) Presence/Absence Survey
MassDOT Project #	610857
Town	Deerfield-Greenfield-Northfield, Massachusetts
Surveyor Name/Firm	*Emma Duguay, Michael McGowan/ Normandeau Associates, Inc.*
Detector Operation Dates	July 20–29, 2021
Survey Results	**NLEB NOT DETECTED**

Dear Tim,

This report contains the results of the Massachusetts Department of Transportation (MassDOT) northern long-eared bat (*Myotis septentrionalis*, hereafter NLEB) summer presence/absence survey performed for the bridge maintenance, rehabilitation and replacement projects (MassDOT #605843, #608830, #608856, #605858, #609072, #609172, #610857; Projects) in North Adams, Westford, Otis, Charlemont, Williamstown, Williamstown, and Deerfield, Greenfield, and Northfield, Massachusetts, respectively.

Acoustic detectors deployed by *NORMANDEAU ASSOCIATES, INC.* at Route 2 over the Hoosic River in North Adams (MassDOT #605843) did not detect the presence of NLEB. Zero (0) bat passes were initially classified as the federally threatened NLEB by analysis software and no qualitative assessment was performed. Two hundred eleven (211) bat passes were initially classified as the state endangered little brown bat (*Myotis lucifugus*). One (1) bat pass was initially classified as the state endangered eastern small-footed bat (*Myotis leibeii*). Sixteen bat passes were autoclassified as the state endangered tri-colored bat (*Perimyotis subflavus*).

Acoustic detectors deployed by *NORMANDEAU ASSOCIATES, INC.* at Beaver Brook Road over Beaver Brook in Westford (MassDOT #608830) did detect the presence of NLEB. One (1) bat pass was initially classified as the federally threatened NLEB by analysis software. This call was ruled out as such during our qualitative assessment. One hundred and eight (108) bat passes were initially classified as the state endangered little brown bat (*Myotis lucifugus*) and one call was confirmed as such during our qualitative assessment. One (1) bat pass was initially classified as the state endangered eastern small-footed bat (*Myotis leibeii*). Zero bat passes were autoclassified as the state endangered tri-colored bat (*Perimyotis subflavus*).

Acoustic detectors deployed by *NORMANDEAU ASSOCIATES, INC.* at Tannery Road over the West Branch of Farmington River in Otis (MassDOT #608856) did not detect the presence of NLEB. Zero (0) bat passes were initially classified as the federally threatened NLEB by analysis software and no qualitative assessment was performed. Ninety-six (96) bat passes were initially

classified as the state endangered little brown bat (*Myotis lucifugus*). Zero (0) bat passes were initially classified as the state endangered eastern small-footed bat (*Myotis leibeii*). Zero bat passes were autoclassified as the state endangered tri-colored bat (*Perimyotis subflavus*).

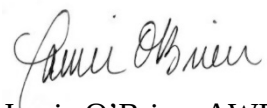
Acoustic detectors deployed by *NORMANDEAU ASSOCIATES, INC.* at East Oxbow Road over Oxbow Brook in Charlemont (MassDOT #608858) did not detect the presence of NLEB. Zero (0) bat passes were initially classified as the federally threatened NLEB by analysis software and no qualitative assessment was performed. Two (2) bat passes were initially classified as the state endangered little brown bat (*Myotis lucifugus*). Zero (0) bat passes were initially classified as the state endangered eastern small-footed bat (*Myotis leibeii*). Zero bat passes were autoclassified as the state endangered tri-colored bat (*Perimyotis subflavus*).

Acoustic detectors deployed by *NORMANDEAU ASSOCIATES, INC.* at Main Street over Hemlock Brook in Williamstown (MassDOT #609072) did detect the presence of NLEB. One (1) bat pass was initially classified as the federally threatened NLEB by analysis software. This call was ruled out as such during our qualitative review. Zero (0) bat passes were initially classified as the state endangered little brown bat (*Myotis lucifugus*). Zero (0) bat passes were initially classified as the state endangered eastern small-footed bat (*Myotis leibeii*). Zero bat passes were autoclassified as the state endangered tri-colored bat (*Perimyotis subflavus*).

Acoustic detectors deployed by *NORMANDEAU ASSOCIATES, INC.* at Route 7 (Moody Bridge) over the Hoosic River and Pan-Am Railroad in Williamstown (MassDOT #609162) did not detect the presence of NLEB. Zero (0) bat passes were initially classified as the federally threatened NLEB by analysis software and no qualitative assessment was performed. Two hundred fifteen (215) bat passes were initially classified as the state endangered little brown bat (*Myotis lucifugus*). Zero (0) bat passes were initially classified as the state endangered eastern small-footed bat (*Myotis leibeii*). Zero bat passes were autoclassified as the state endangered tri-colored bat (*Perimyotis subflavus*).

Acoustic detectors deployed by *NORMANDEAU ASSOCIATES, INC.* at Bridge Preservation of Three Bridges in Deerfield, Greenfield and Northfield (MassDOT #610857) did detect the presence of NLEB. Three (3) bat passes were initially classified as the federally threatened NLEB by analysis software and three calls were ruled out as such during our qualitative assessment. One hundred and seventy (170) bat passes were initially classified as the state endangered little brown bat (*Myotis lucifugus*) and 45 were confirmed as such during our qualitative assessment. Zero (0) bat passes were initially classified as the state endangered eastern small-footed bat (*Myotis leibeii*). Zero bat passes were autoclassified as the state endangered tri-colored bat (*Perimyotis subflavus*).

Sincerely,



Jamie O'Brien, AWB®
Project Manager

Attachments: NLEB Survey Report for North Adams 605843, Westford 608830, Otis 608856, Charlemont 608858, Williamstown 609072, Williamstown 609162, and Deerfield-Greenfield-Northfield 610857

Northern Long-eared Bat Acoustic Survey MassDOT Project Districts 1, 2, 3

#605843, 608830, 608856, 608858, 609072, 609162, 610857 Bridge Replacement, Maintenance, and Preservation Projects

North Adams, Westford, Otis, Charlemont, Williamstown, and Deerfield, Greenfield and Northfield, MA

Prepared For

Tim Dexter
Fish & Wildlife Program Coordinator
Massachusetts Department of Transportation – Highway Division
10 Park Plaza, Room 4260
Boston, MA 02116-3973

Prepared By

Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110-5500
603.472.5191
www.normandeau.com

November 2021

Table of Contents

List of Tables

Summary

Ultrasonic acoustic surveys were conducted to inventory the state-endangered and federally-threatened northern long-eared bat (NLEB; *Myotis septentrionalis*) and other state-listed bat species within the proposed limits of work for seven separate MassDOT bridge replacement projects, located in North Adams, Westford, Otis, Charlemont, Williamstown (2 projects), and Deerfield, Greenfield and Northfield, MA (MassDOT Projects #605843, #608830, #608856, 608858, 609072, 609162, 610857, respectively). Surveys were designed specifically to sample for NLEB, and were conducted in District 1 (Projects #605843, 608856, 608858, 609072, and 609162) from July 26 to August 2, District 2 (Project #610857) from July 20 through July 29, 2021 and in District 3 (Project #608830) from July 7 to August 5, 2021. Two detectors were placed on either side of the bridge where conditions allowed.

No bat calls were identified as NLEB by the Kaleidoscope Pro software package at Route 2 over the Hoosic River in North Adams (#605843).

One bat call was identified as NLEB by KPro at the Bridge Rehabilitation of Beaver Brook Road over Beaver Brook project area in Westford (#608830), but manual review ruled out this finding.

No bat calls were identified as NLEB by KPro at Tannery Road over the west branch of Farmington River in Otis (#608856).

No bat calls were identified by the Kaleidoscope Pro software package as belonging or potentially belonging to the NLEB at East Oxbow Road over Oxbow Brook in Charlemont (#608858).

One bat call was identified as NLEB by KPro at Main Street over Hemlock Brook in Williamstown (#609072), but manual review ruled out this finding.

No bat calls were identified as NLEB by KPro at Route 7 (Moody Bridge) over the Hoosic River and Pan Am Railroad in Williamstown (#609162).

Three bat calls were identified as NLEB by KPro in Northfield (#610857), but manual review ruled out this finding.

Big brown bat (*Eptesicus fuscus*) and little brown bat (*Myotis lucificugus*) were the most commonly identlfied species by Kaleidoscope Pro across all bridge locations. Eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), eastern small-footed bat (*Myotis leibii*), NLEB, and tri-colored bat (*Perimyotis subflavus*) were also identified in at least one bridge location by Kaleidoscope Pro software. Manual review of NLEB calls confirmed the presence of little brown bat (Projects #607432, 608830, 609072, and #610857). This species is listed as endangered by the State of Massachusetts, but currently has no federal status.

1 Project Overview

Projects #605843, Route 2 bridge replacement on Route 2 over the Hoosic River; #608830 bridge rehabilitation on Beaver Brook Road over Beaver Brook; #608856, bridge replacement on Tannery Road over the west branch of Farmington River; #608858, bridge replacement on East Oxbow Road over Oxbow Brook; #609072, bridge replacement on Main Street over Hemlock Brook; #609162, systematic bridge maintenance on Route 7 (Moody Bridge) over the Hoosic River; and #610857, bridge preservation of three bridges in Deerfield, Greenfield and Northfield; located in North Adams, Westford, Otis, Charlemont, Williamstown, Williamstown and Deerfield, Greenfield and Northfield, MA respectively, involve work activities including existing bridge demolition, new bridge construction, guardrail installation, grading, paving, and/or tree clearing and trimming within the proposed limits of work. The total length of each Project is less than 1.0 km.

All Projects are within the range of the federally-threatened NLEB, which encompasses all of Massachusetts. This tree-roosting bat uses forested habitats and human-made structures such as bridges and buildings during its active season, from April 15 through October 31. Because bridge structures can mimic cave-like environments, they can potentially provide suitable roosting habitat for bats. The Projects have the potential to affect this species through bridge demolition and associated tree clearing during the active roosting season. Bridge demolition and tree clearing in the NLEB's range may reduce roosting habitat or potentially cause direct mortality if an occupied bridge structure or roost tree is felled. If NLEBs are determined to be present at a particular location, direct impacts can be avoided by performing the work outside of the active season.

Normandeau identified the portion(s) of the Project areas that required a presence/absence survey and then conducted acoustic surveys in these locations as described below. All habitat assessments and presence/absence surveys conducted were consistent with the USFWS' 2020 Range-wide Indiana Bat Survey Guidelines[1] (Guidelines). Bridge assessments were also conducted using the Bridge/Structure Assessment Form found with Appendix D of the FHWA/FRA/FTA – U.S. Fish & Wildlife Service Range-wide Programmatic Consultation for Indian Bat and Northern Long-eared Bat. The bridge assessment forms are presented in Appendix A. The protocol for NLEB summer surveys are described in the Guidelines, which explicitly include the NLEB and provide NLEB-specific guidance. Results of the surveys are summarized below, and these results include all of the elements requested in Appendix C of the Guidelines. These projects do not occur within the known summer range of the Indiana bat (*Myotis sodalis*), the only other federally-listed (endangered) species in the northeast region.

[1] https://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/FINAL%20Range-wide%20IBat%20Survey%20Guidelines%203.23.20.pdf

2 Methods

The surveys were conducted in conformance with the methods and approach outlined in the Guidelines. The field survey and the data analysis were conducted by personnel trained and qualified to conduct their respective tasks. Staff resumes are in Appendix F.

Habitat Assessment

The general suitability of the habitat on this site was assessed by examining recent aerial photography (Google Earth™) prior to deploying the detectors. In the field, habitat characteristics were examined to confirm suitability in all locations where acoustic detectors were placed. The desktop assessment and on-site observations of the vegetation within the Project area were conducted by Emma Duguay and Michael McGowan, Environmental Scientists. Characteristics of the overall habitat within the Project areas are presented in Section 3.1.

Detector Deployment

Normandeau conducted surveys using equipment from Binary Acoustic Technology. This included 1) IFR-V Field Recorders, full-spectrum ultrasonic acoustic detectors; and 2) AR125-EXT Ultrasonic receivers, microphones designed specifically for ultrasonic monitoring and analysis. The microphones were attached to the inside of a PVC elbow to protect them from precipitation.

As defined by the Guidelines, the Projects were categorized as linear projects, and required two detector nights (one detector deployed for two nights) of survey effort per kilometer of project length. Where conditions allowed, each project area was surveyed using two detectors placed in suitable roosting habitat along the proposed limits of work. Detectors were often placed either facing the underside of the existing bridge abutments or perpendicular to the underside of the bridge to capture bats entering or exiting potential roosting sites. All acoustic detectors were left in place to collect data on at least two nights with suitable weather conditions as described in the Guidelines. Project 609162 in Williamstown was surveyed from one location due to riverbank access and was left in place to collect data on four nights with suitable weather conditions. Upon completion of the bridge acoustic surveys, each project had a minimum of four total detector nights with suitable weather conditions that met USFWS Guideline criteria.

The sampling locations were selected based on a combination of factors including access, proximity/opportunity for minimal human disturbance, an open cone of detection for the microphones to sample, and apparent bat habitat quality (e.g., mature trees, snags, hollows and crevices, and wetland habitat). The detector set-ups adhered to specifications detailed in the 2020 Guidelines.

To ensure that the detectors were functioning correctly during every survey period, settings were checked upon retrieval of the detector in a similar fashion as to when they were deployed: 1) the microphones were checked for proper recording of sounds and archiving of

data onto the internal drive/USB; and 2) the program recording times and acoustic range were verified.

Call Analysis

Each acoustic file was processed as required by the 2020 Guidelines using Kaleidoscope Pro version 5.4.2 (KPro), which is one of the USFWS-approved automated bat call classification software packages. The software analyzes bat calls and determines the probability (or "likelihood of presence p (probability) value") that they were made by a certain bat species. Any probability less than 0.05 is statistically interpreted to mean that the call belongs to that species. Bat call files identified by the software package as belonging or potentially belonging to NLEB were manually examined by Jeffrey Clerc, a trained bat acoustic expert and call analyst, for final determination. Mr. Clerc reviewed all calls for the location and survey night that KPro identified NLEB to determine if the species designations were correct as is required by the Guidelines.

Particular call characteristics are used to make a determination regarding species identification. Specifically, the myotid call characteristics reviewed are as follows:

a) MYLU calls were identified using an Fc of 38-42 kHz, longer duration and a curved look (Sc 60-110), a maximum frequency usually below 80 kHz and the presence of a Myotis tail;

b) MYLE calls were identified using an Fc of 40-45 kHz, shorter duration and near vertical in slope, a maximum frequency of 95 kHz and a slightly different look near Fc than other Myotis species and the presence of a Myotis tail;

c) MYSE calls were identified using an Fc of 38-42 kHz (though MYSE sometimes average slightly higher Fc than MYLU and MYSO), shortest duration with the most vertical pulse, slight or no slope to pulse (Sc 210+), a maximum frequency above 105 kHz, the presence of a Myotis tail and usually quieter than other Myotis;

Mr. Clerc's resume is in Appendix F.

3 Results

3.1 Overall Habitat Assessment

The locations of Projects #605843, 608830, 608856, 608858, 609072, 609162, and 610857 are depicted in Figures B-1 through B-9, Appendix B. The dominant habitat feature of most project locations are riparian corridors. All projects are bordered by or in close proximity to forests or areas of woodland. The on-site trees consisted primarily of red oak (*Quercus rubra*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), white pine (Pinus strobus), and eastern hemlock (*Tsuga canadensis*). Maximum diameter at breast height (DBH) was typically between 12 and 20 inches with larger trees scattered throughout. Details of the habitat at each project location are described in Section 3.2.

3.2 Deployment Details

The surveys in North Adams, Otis, Charlemont, and Williamstown, were conducted July 26 – August 2, 2021, Deerfield, Greenfield and Northfield was conducted July 20 – July 29, 2021, and Westford wase conducted July 7 – August 5, 2021. The detectors were programed to run from 19:32 UTC until 6:01 UTC the following morning. The detectors were placed on opposite sides of the bridge to capture bats entering or exiting potential roosting sites (Figures B-1 to B-9 and Table B-1, Appendix B). Details of the survey for each of the Projects and recording nights are summarized in Table 1 and specifications of the detectors and microphones used are summarized in Table 2.

The hourly weather conditions from North Adams Harriman-and-West Airport (KAQW), Laurence G Hanscom Field Airport (KBED), Pittsfield Municipal Airport (KPSF), and Orange Municipal Airport (KORE), the NOAA weather reporting stations nearest to the bridge projects are presented in Appendix C for each of the survey nights.

Table 1. Deployment Details, Bridge Replacement Projects #605843, 608830, 608856, 608858, 609072, 609162, and 610857 (North Adams, Westford, Otis, Charlemont, Williamsown, Williamstown, and Deerfield, Greenfield and Northfield)

Project	Detector	Deploy-ment Date	Latitude	Longitude	Begin	End	Sunset	Hi Temp (°F)*	Low Temp (°F)*	Max wind (mph) **	Weather*
605843 North Adams	Location A	7/26/2021	42.698431	-73.147834	19:32	6:01	20:18	75	63	3	Fair
		7/27/2021	42.698431	-73.147834	19:32	6:01	20:17	68	66	Calm	Overcast
		7/28/2021	42.698431	-73.147834	19:32	6:01	20:16	70	61	3	Overcast
	Location B	7/26/2021	42.697933	-73.147606	19:32	6:01	20:18	75	63	3	Fair
		7/27/2021	42.697933	-73.147606	19:32	6:01	20:17	68	66	Calm	Overcast
		7/28/2021	42.697933	-73.147606	19:32	6:01	20:16	70	61	3	Overcast
608830 Westford	Location A	7/7/2021	42.572643	-71.478378	19:32	6:01	20:25	75	68	7	Fair
		7/8/2021	42.572643	-71.478378	19:32	6:01	20:25	62	62	6	Light Rain
		7/9/2021	42.572643	-71.478378	19:32	6:01	20:24	74	70	6	Light Rain
		7/10/2021	42.572643	-71.478378	19:32	6:01	20:24	70	60	3	Fair
		7/11/2021	42.572643	-71.478378	19:32	6:01	20:23	71	69	5	Light Rain
		7/13/2021	42.572643	-71.478378	19:32	6:01	20:22	66	65	8	Fog/ Mist
		7/14/2021	42.572643	-71.478378	19:32	6:01	20:21	78	72	6	Mostly Cloudy
	Location B	7/7/2021	42.572281	-71.479087	19:32	6:01	20:25	75	68	7	Fair
		7/8/2021	42.572281	-71.479087	19:32	6:01	20:25	62	62	6	Light Rain
		7/9/2021	42.572281	-71.479087	19:32	6:01	20:24	74	70	6	Light Rain
		7/10/2021	42.572281	-71.479087	19:32	6:01	20:24	70	60	3	Fair
		7/11/2021	42.572281	-71.479087	19:32	6:01	20:23	71	69	5	Light Rain
		7/13/2021	42.572281	-71.479087	19:32	6:01	20:22	66	65	8	Fog/ Mist
		7/14/2021	42.572281	-71.479087	19:32	6:01	20:21	78	72	6	Mostly Cloudy
		8/2/2021	42.572281	-71.479087	19:32	6:01	20:04	70	59	3	Fair
		8/3/2021	42.572281	-71.479087	19:32	6:01	20:03	70	62	5	Fair
		8/4/2021	42.572281	-71.479087	19:32	6:01	20:01	N/A	N/A	N/A	N/A
608856 Otis	Location A	7/30/2021	42.210037	-73.094925	19:32	6:01	20:13	63	53	7	Fair
		7/31/2021	42.210037	-73.094925	19:32	6:01	20:12	58	52	Calm	Fair
		8/1/2021	42.210037	-73.094925	19:32	6:01	20:11	66	62	12	Light Rain

	Location B	7/30/2021	42.209942	-73.095222	19:32	6:01	20:13	63	53	7	Fair
		7/31/2021	42.209942	-73.095222	19:32	6:01	20:12	58	52	Calm	Fair
		8/1/2021	42.209942	-73.095222	19:32	6:01	20:11	66	62	12	Light Rain
608858 Charle-mont	Location A	7/29/2021	42.6289318	-72.7840359	19:32	6:01	20:14	73	66	30	Light Rain
		7/30/2021	42.6289318	-72.7840359	19:32	6:01	20:13	66	62	13	Fair
		7/31/2021	42.6289318	-72.7840359	19:32	6:01	20:12	64	55	Calm	A Few Clouds
		8/1/2021	42.6289318	-72.7840359	19:32	6:01	20:11	71	63	8	Light Rain
	Location B	7/29/2021	42.6290628	-72.7838133	19:32	6:01	20:14	73	66	30	Light Rain
		7/30/2021	42.6290628	-72.7838133	19:32	6:01	20:13	66	62	13	Fair
		7/31/2021	42.6290628	-72.7838133	19:32	6:01	20:12	64	55	Calm	A Few Clouds
		8/1/2021	42.6290628	-72.7838133	19:32	6:01	20:11	71	63	8	Light Rain
609072 Williams-town	Location A	7/26/2021	42.714588	-73.21418	19:32	6:01	20:19	75	63	3	Fair
		7/27/2021	42.714588	-73.21418	19:32	6:01	20:18	68	66	Calm	Overcast
		7/28/2021	42.714588	-73.21418	19:32	6:01	20:17	70	61	3	Overcast
	Location B	7/26/2021	42.714339	-73.21416	19:32	6:01	20:19	75	63	3	Fair
		7/27/2021	42.714339	-73.21416	19:32	6:01	20:18	68	66	Calm	Overcast
		7/28/2021	42.714339	-73.21416	19:32	6:01	20:17	70	61	3	Overcast
		7/29/2021	42.714339	-73.21416	19:32	6:01	20:16	73	66	30	Light Rain
		7/30/2021	42.714339	-73.21416	19:32	6:01	20:15	66	62	13	Fair
		7/31/2021	42.714339	-73.21416	19:32	6:01	20:14	64	55	Calm	A Few Clouds
		8/1/2021	42.714339	-73.21416	19:32	6:01	20:12	71	63	8	Light Rain
609162 Williams-town	Location A	7/26/2021	42.7276322	-73.2043528	19:32	6:01	20:19	75	63	3	Fair
		7/27/2021	42.7276322	-73.2043528	19:32	6:01	20:18	68	66	Calm	Overcast
		7/28/2021	42.7276322	-73.2043528	19:32	6:01	20:17	70	61	3	Overcast
		7/29/2021	42.7276322	-73.2043528	19:32	6:01	20:16	73	66	30	Light Rain
		7/30/2021	42.7276322	-73.2043528	19:32	6:01	20:15	66	62	13	Fair
		7/31/2021	42.7276322	-73.2043528	19:32	6:01	20:14	64	55	Calm	A Few Clouds
		8/1/2021	42.7276322	-73.2043528	19:32	6:01	20:12	71	63	8	Light Rain
610857 Deerfield, Green-field, North-field	Location A	7/20/2021	42.610542	-72.584801	19:32	6:01	20:22	73	64	29	Light Rain
		7/21/2021	42.610542	-72.584801	19:32	6:01	20:21	71	60	8	Fair
		7/22/2021	42.610542	-72.584801	19:32	6:01	20:20	72	64	5	Overcast
		7/23/2021	42.610542	-72.584801	19:32	6:01	20:19	65	59	3	Fog/ Mist
		7/24/2021	42.610542	-72.584801	19:32	6:01	20:18	72	68	8	Fair
		7/25/2021	42.610542	-72.584801	19:32	6:01	20:17	72	68	5	Fog/ Mist
		7/26/2021	42.610542	-72.584801	19:32	6:01	20:16	77	64	3	Fog/ Mist
		7/27/2021	42.610542	-72.584801	19:32	6:01	20:15	66	65	3	Overcast
		7/28/2021	42.610542	-72.584801	19:32	6:01	20:14	68	60	Calm	Fair
	Location B	7/20/2021	42.610455	-72.585442	19:32	6:01	20:22	73	64	29	Light Rain
		7/21/2021	42.610455	-72.585442	19:32	6:01	20:21	71	60	8	Fair
		7/22/2021	42.610455	-72.585442	19:32	6:01	20:20	72	64	5	Overcast
	Location C	7/20/2021	42.68322	-72.4727763	19:32	6:01	20:22	73	64	29	Light Rain
		7/21/2021	42.68322	-72.4727763	19:32	6:01	20:21	71	60	8	Fair
		7/22/2021	42.68322	-72.4727763	19:32	6:01	20:20	72	64	5	Overcast
		7/23/2021	42.68322	-72.4727763	19:32	6:01	20:19	65	59	3	Fog/ Mist
		7/24/2021	42.68322	-72.4727763	19:32	6:01	20:18	72	68	8	Fair
		7/25/2021	42.68322	-72.4727763	19:32	6:01	20:17	72	68	5	Fog/ Mist
		7/26/2021	42.68322	-72.4727763	19:32	6:01	20:16	77	64	3	Fog/ Mist
		7/27/2021	42.68322	-72.4727763	19:32	6:01	20:15	66	65	3	Overcast
		7/28/2021	42.68322	-72.4727763	19:32	6:01	20:14	68	60	Calm	Fair
		7/20/2021	42.682865	-72.472601	19:32	6:01	20:22	73	64	29	Light Rain

	Location D	7/21/2021	42.682865	-72.472601	19:32	6:01	20:21	71	60	8	Fair
		7/22/2021	42.682865	-72.472601	19:32	6:01	20:20	72	64	5	Overcast
	Location E	7/20/2021	42.484196	-72.61661	19:32	6:01	20:22	73	64	29	Light Rain
		7/21/2021	42.484196	-72.61661	19:32	6:01	20:21	71	60	8	Fair
		7/22/2021	42.484196	-72.61661	19:32	6:01	20:20	72	64	5	Overcast
	Location F	7/20/2021	42.483746	-72.615967	19:32	6:01	20:22	73	64	29	Light Rain
		7/21/2021	42.483746	-72.615967	19:32	6:01	20:21	71	60	8	Fair
		7/22/2021	42.483746	-72.615967	19:32	6:01	20:20	72	64	5	Overcast
		7/23/2021	42.483746	-72.615967	19:32	6:01	20:19	65	59	3	Fog/ Mist
		7/24/2021	42.483746	-72.615967	19:32	6:01	20:18	72	68	8	Fair
		7/25/2021	42.483746	-72.615967	19:32	6:01	20:17	72	68	5	Fog/ Mist
		7/26/2021	42.483746	-72.615967	19:32	6:01	20:16	77	64	3	Fog/ Mist
		7/27/2021	42.483746	-72.615967	19:32	6:01	20:15	66	65	3	Overcast
		7/28/2021	42.483746	-72.615967	19:32	6:01	20:14	68	60	Calm	Fair

**High temp, low temp, max wind speed, and weather within the first five hours of survey. NOAA records values hourly, and this table summarizes conditions across those five values.*

***NOAA reports wind speeds hourly; "Max Wind" is the highest speed reported over the first 5 hours of the survey period. The Guidelines specify no wind speeds of >9mph for ≥30 minutes during this period. If a maximum wind speed >9 mph was reported during the first or last hour of the survey, but all other hours meet the standard, it was assumed the duration of that wind speed was <30 minutes.*

Table 2. Acoustic Monitoring Equipment Settings

Detector Setting	Specification	Microphone Setting	Specification
Threshold	21	Frequency range	1 to 125 KHz
TE	1	Dynamic range	> 90 dB (Full BW); > 96 dB (Audio BW)
Dur	1.7	Range limits	(SPL +/- 3 dB); Max: 90 dB
Idle	1.7	Min	0 dB (Full) / -6 dB (audio) Interface: USB 2.0
Delay	0	Output format	16-bit offset binary, 250Ksps
Low F	15		
High F	125		
PopFilt	On		
PwrSave	On		

Detailed habitat descriptions follow below and include survey locations as well as habitat assessments. Photos of the detector set-ups and habitat are presented in Appendix D.

- **Project #605843** – The detector at Location A was deployed facing northwest along the Hoosic River beneath the existing Route 2 bridge to the north. The detector at Location B was deployed facing west over the river, south of the bridge. Both detectors were positioned along the riverbank to capture bats entering or exiting potential roost sites. Commercial and residential development were present surrounding the bridge, and woodland habitat was present bordering the Hoosic River. Tree species observed included sugar maple and white pine, and shrubs and saplings were more prevelant in

the detector areas. Larger DBH trees were adjacent to these areas on residential properties. Some snags were identified along the river corridor.

- **Project #608830** – The detector at Location A was deployed facing southwest across Beaver Brook and the adjoining wetland on the south side of Beaver Brook Road and the detector at Location B was deployed facing northeast across Forge Pond/Beaver Brook on the north side of the bridge. This area had forested habitat interspersed with pond and woodland, with light residential development. Dominant tree species included red oak, and white pine. Red maple and white oak were also observed. Maximum DBH recorded was 28 inches, and snags were present surrounding the bridge.

- **Project #608856** – The detector at Location A was deployed facing northwest along Farmington Brook to the north of Tannery Road and the detector at Locaiton B was deployed facing southeast along the river corridor downstream of the bridge. Both detectors were positioned near the underside of the bridge to capture bats entering or exiting potential roosting sites. The surrounding habitat consisted of deciduous and conifer trees, such as ash, sugar maple red maple, quaking aspen, eastern hemlock and white pine. Large snags were present within the wetland surrounding the river, and average DBH across all tree species observed was 13 inches.

- **Project #608858** – The detector at Location A was deployed facing north parallel to the Oxbow River bridge over Oxbow Brook and the detector at Location B was deployed facing southeast, to the east of the bridge. Both detectors were positioned close to the underside of the bridge to capture bats entering or exiting potential roosting sites. The surrounding habitat consisted primarily of woodland, with light residential development. Tree species observed include American beech, red maple, yellow birch, and eastern hemlock. Over 12 snags were identified along the project corridor.

- **Project #609072** – The detector at Location A was deployed facing northeast along Hemlock Brook, north of Main Street. Detector B was deployed facing northwest south of the bridge. Both detectors were positioned near the bridge to capture bats entering or exiting potential roosting sites. The surrounding habitat consisted of deciduous and conifer trees located within an area with moderate residential development. Norway maple was the dominant tree species observed, followed by green ash, white pine eastern hemlock, and black locust. Maximum DBH across all species was 20 inches.

- **Project #609162** – The detector was deployed facing east over the Hoosic River to the east of Route 7. Heavy shrubbery bording the riverbank restricted placement of a second detector. The detector was positioned to capture bats entering or exiting potential roosting sites under the bridge. Residential, commercial and agricultural development was present near the bridge, with woodland interspersed throughout and dominant in the riparian area surrounding the river. Tree species observed include easter cottonwood, red maple, and American beech. Maximum DBH for these species was 36, 12, and 6 inches, respectively.

- **Project #610857 (Greenfield)** – The detectors at Location A and B were deployed in Greenfield. Location A detector was facing west and Location B detector was facing southeast. Both detectors were positioned on between bridge overpasses to capture bats entering or exiting potential roosting sites. The surrounding land cover consisted of commericial and residential development, with mowed lawn and shrubs present near the detector locations. Tree species were interspersed throughout and comprised of red maple, red oak and white pine, with an average DBH across all tree species of 22 inches.

- **Project #610857 (Northfield)** – The detectors at Location C and D were deployed in Northfield. Location C was deployed to the north of the bridge facing east across the Connecticut River and Detector D was deployed south of the bridge in line with a potential flight corridor where a trail provided a canopy opening. Tree and understory cover was dense closer to the bridge at this location. Surrounding land cover in the area was agriculture, with woodland along the riparian corridor and extending in dense cover to the north. Tree species observed include American elm, black locust, hickory, red oak, and American beech. Maximum DBH across all species was between 4 and 36 inches.

- **Project #610857 (Deerfield)** – The detectors at Location E was placed to the north of the bridge parallel to the overpass facing east and the detector at Location F was placed south of the bridge facing northwest. Both detectors were placed to capture bats entering or existing potential roosts under the bridge. The surrounding area was comprised mainly of agricultural use, with forest interspersed and dominant through light residential development. White pine, red oak, red maple, and gray birch were observed, with maximum DBH of 18, 18, 12, and 5 inches, respectively.

3.3 Survey Results

The number of calls recorded by species and location are presented in Table 3 by project. Blue cells are those with likelihood of presence values <0.05 and correspond to species considered by Kaleidoscope Pro (KPro) to be present. Calls from eight species, consisting of big brown bat, eastern red bat, hoary bat, silver-haired bat, eastern small-footed, little brown bat, northern long-eared bat, and tri-colored bat were recorded with p-values of less than 0.05. **The KPro software identified NLEB calls at Beaver Brook Road over Beaver Brook in Westford (608830), Main Street over Hemlock Brook in Williamstown (609072), and Bridge Preservation of three bridges in Northfield (610857) but manual review of these calls ruled out this finding**. Manual review confirmed the presence of little brown bat at all three of these projects. A summary of the call analyst's findings is presented in Appendix E.

Table 3. **Acoustic Survey Results by Date, Site, and Species for Bridge Replacement Projects #605843, 608830, 608856, 608858, 609072, 609162, and 610857 (North Adams, Westford, Otis, Charlemont, Williamstown, Williamstown, and Deerfield, Greenfield, Northfield)**

Project	Location	Detector Night	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	PESU
Number of calls recorded										
605843 North Adams	Location A	7/27/2021	280	10	4	659		130		3
		7/28/2021	63	18	2	98		43		5
		7/29/2021	75	7	4	136		24		3
	Location B	7/27/2021	502	4	89	907		3		12
		7/28/2021	294	9	139	329	1	10		3
		7/29/2021	241	2	80	507		4		4
608830 Westford	Location A	7/8/2021	120	1	18	11	1	12		
		7/9/2021	55	2		1		5		
		7/10/2021	76	3	3	8		1		
		7/11/2021	19					10		
		7/12/2021	80		2	7		5		
		7/14/2021	5		3			23		
		7/15/2021	82	2	10	4		10		
	Location B	7/8/2021	59		3	3				
		7/9/2021								
		7/10/2021	38		1	9				
		7/11/2021							1	
		7/12/2021	49		1	6		1		
		7/14/2021	16		7	5		4	1	
		7/15/2021	102		10	10		2	1	
		8/3/2021	41		6	6		11		
		8/4/2021	76		1	5		5		
		8/5/2021	50		2	12		21		
608856 Otis	Location A	7/31/2021	15					27	1	
		8/1/2021	2					11		
		8/2/2021	13					8		

Project	Location	Detector Night	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	PESU
	Location B	7/31/2021	9					19		
		8/1/2021	1					10		
		8/2/2021	5					21		
608858 Charlemont	Location A	7/31/2021						2		
		8/1/2021	1							
		8/2/2021								
	Location B	7/30/2021								
		7/31/2021								
		8/1/2021								
609072 Williamstown	Location A	7/27/2021						1	1	
		7/28/2021								
		7/29/2021								
	Location B	7/31/2021								
		8/1/2021							1	
609162 Williamstown	Location A	7/27/2021	33	2		5		22		1
		7/28/2021	15	4		6		21		1
		7/29/2021	73	1		6		37		
		7/30/2021	51	5		5		47		1
		7/31/2021	100	2		9		47		
		8/1/2021	303	6	3	4		41		
610857 Deerfield Greenfield, Northfield	Location A	7/21/2021	8	1	9	4				
		7/22/2021	1		7	1		2		
		7/23/2021								
		7/24/2021	2	1	5					
		7/25/2021	6	1	10	3				
		7/26/2021	5	1	2	2		3		
		7/27/2021	16		5	4		1		
		7/28/2021	37	1	3	7		5		
		7/29/2021	3		1			2		

Project	Location	Detector Night	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	PESU
	Location B	7/21/2021	5	3	1	4		4		
		7/22/2021	6	9	9	3		1		
		7/23/2021		4	16	4		1		
	Location C	7/21/2021	264	553	5	1		28		31
		7/22/2021	76	72				9		3
		7/23/2021		24						1
		7/24/2021	200	834	4	3		29	1	59
		7/25/2021	98	1379	12	5		62	1	83
		7/26/2021	49	1164	5	3		49		93
		7/27/2021	102	1373	3	5		65	1	115
		7/28/2021	23	868	5	1		72		90
		7/29/2021	59	901	2	3		151	2	66
	Location D	7/21/2021	145	143		1		4	1	1
		7/22/2021	245	5		1		1		1
		7/23/2021	318	14		2		6		2
	Location E	7/21/2021	120	3	15	43				
		7/22/2021	58	1	8	28				
		7/23/2021	64	5	15	31				
	Location F	7/21/2021	131	1	14	35		1		
		7/22/2021								
		7/23/2021								
		7/24/2021	54	5	6	16				
		7/25/2021	123	2	8	27		3		
		7/26/2021	85	3	3	31				
		7/27/2021	79	2	5	22				
		7/28/2021	110	4	8	26				
		7/29/2021	44	3	3	3				
Presence P-Value										
		7/27/2021	0	0.026179	1	0	1	0	1	0.671406

Project	Location	Detector Night	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	PESU
605843 North Adams	Location A	7/28/2021	0	0	1	0	1	0	1	0.37845
		7/29/2021	0	0.000144	1	0	1	0	1	0.298383
	Location B	7/27/2021	0	0.000126	7.37E-05	0	1	0.151472	1	0
		7/28/2021	0	0	0	0	0.014129	4.78E-05	1	0.400538
		7/29/2021	0	0.045473	0	0	1	0.007248	1	0.0056
608830 Westford	Location A	7/8/2021	0	0.736846	0.000385	1	0.01858	0	1	1
		7/9/2021	0	0.057531	1	1	1	0.000611	1	1
		7/10/2021	0	0.000302	1	1	1	0.704353	1	1
		7/11/2021	0	1	1	1	1	0	1	1
		7/12/2021	0	1	1	1	1	1.36E-05	1	1
		7/14/2021	0.000215	1	0.015693	1	1	0	1	1
		7/15/2021	0	0.165383	0.046939	1	1	0	1	1
	Location B	7/8/2021	0	1	0.994805	1	1	1	1	1
		7/9/2021								
		7/10/2021	0	1	1	0.485121	1	1	1	1
		7/11/2021	1	1	1	1	1	1	0.027584	1
		7/12/2021	0	1	1	1	1	0.106299	1	1
		7/14/2021	0	1	0.000361	0.8238	1	0.000114	0.301079	1
		7/15/2021	0	1	0.134366	1	1	0.010685	0.176064	1
		8/3/2021	0	1	0.074465	1	1	0	1	1
		8/4/2021	0	1	1	1	1	1.36E-05	1	1
		8/5/2021	0	1	1	0.364231	1	0	1	1
608856 Otis	Location A	7/31/2021	0	1	1	1	1	0	0.968878	1
		8/1/2021	0.016348	1	1	1	1	0	1	1
		8/2/2021	0	1	1	1	1	0	1	1
	Location B	7/31/2021	0	1	1	1	1	0	1	1
		8/1/2021	0.12786	1	1	1	1	0	1	1
		8/2/2021	3.42E-05	1	1	1	1	0	1	1
		7/31/2021	1	1	1	1	1	0.0113	1	1

Project	Location	Detector Night	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	PESU
608858 Charlemont	Location A	8/1/2021	0.12786	1	1	1	1	1	1	1
		8/2/2021	1	1	1	1	1	1	1	1
	Location B	7/30/2021	1	1	1	1	1	1	1	1
		7/31/2021	1	1	1	1	1	1	1	1
		8/1/2021	1	1	1	1	1	1	1	1
609072 Williamstown	Location A	7/27/2021	1	1	1	1	1	0.103363	0.107294	1
		7/28/2021								
		7/29/2021	1	1	1	1	1	1	1	1
	Location B	7/31/2021	1	1	1	1	1	1	1	1
		8/1/2021	1	1	1	1	1	1	0.027584	1
609162 Williamstown	Location A	7/27/2021	0	0.429461	1	0.998738	1	0	1	0.664585
		7/28/2021	0	0.022562	1	0.16523	1	0	1	0.882707
		7/29/2021	0	1	1	1	1	0	1	1
		7/30/2021	0	0.070797	1	1	1	0	1	0.969454
		7/31/2021	0	0.945676	1	1	1	0	1	1
		8/1/2021	0	0.017825	1	1	1	0	1	1
610857 Deerfield, Greenfield, Northfield	Location A	7/21/2021	0.000238	0.035735	2E-07	0.861985	1	1	1	1
		7/22/2021	0.834812	1	0	1	1	0.0113	1	1
		7/23/2021								
		7/24/2021	0.194388	0.035735	1.29E-05	1	1	1	1	1
		7/25/2021	0.003732	0.035735	0	0.996501	1	1	1	1
		7/26/2021	0.001452	0.275655	0.129499	0.780892	1	0.009265	1	1
		7/27/2021	0	1	0.010305	0.930332	1	0.106299	1	1
		7/28/2021	0	0.406673	0.711178	0.896983	1	0.000155	1	1
		7/29/2021	0.00373	1	0.381723	1	1	0.0113	1	1
	Location B	7/21/2021	0.00587	0.003446	0.683933	0.105529	1	0.009641	1	1
		7/22/2021	0.003067	0	0	0.980873	1	1	1	1
		7/23/2021	1	1.25E-05	0	0.98472	1	0.813522	1	1
		7/21/2021	0	0	1	1	1	1	1	1

Project	Location	Detector Night	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	PESU
	Location C	7/22/2021	0	0	1	1	1	0.99149	1	1
		7/23/2021	1	0	1	1	1	1	1	1
		7/24/2021	0	0	1	1	1	1	0.03949	1
		7/25/2021	0	0	0.01531	1	1	1	0.009015	1
		7/26/2021	0	0	0.342864	1	1	1	1	1
		7/27/2021	0	0	1	1	1	1	0.070839	1
		7/28/2021	0	0	0.03504	1	1	1	1	1
		7/29/2021	0	0	1	1	1	0.000293	1	1
	Location D	7/21/2021	0	0	1	1	1	1	0.03826	1
		7/22/2021	0	4E-07	1	1	1	0.930431	1	0.918135
		7/23/2021	0	0	1	1	1	0.080408	1	0.984552
	Location E	7/21/2021	0	4.56E-05	0.020397	0.000196	1	1	1	1
		7/22/2021	0	0.035735	0.115953	0.00009	1	1	1	1
		7/23/2021	0	1E-07	0.000127	0.000181	1	1	1	1
	Location F	7/21/2021	0	0.124123	0.051985	0.038291	1	0.369219	1	1
		7/22/2021								
		7/23/2021								
		7/24/2021	0	1E-07	0.266546	0.128919	1	1	1	1
		7/25/2021	0	0.026969	0.748639	0.252976	1	0.025366	1	1
		7/26/2021	0	4.56E-05	1	0.000384	1	1	1	1
		7/27/2021	0	0.001277	0.899328	0.059545	1	1	1	1
		7/28/2021	0	1.6E-06	0.602597	0.16799	1	1	1	1
		7/29/2021	0	4.56E-05	0.848652	1	1	1	1	1

EPFU= Eptesicus fuscus, LABO= Lasiurus borealis, LACI= Lasiurus cinereus, LANO= Lasionycteris noctivagans, MYLE= Myotis leibii, MYLU= Myotis lucifugus, MYSE= Myotis septentrionalis, PESU= Perimyotis subflavus

Detector nights are one day after deployment dates due to software processing of data. (I.e. a deployment date of 5/30/2019 will have a result/detector night of 5/31/2019.)
Nights from Table 1 that are not represented in Table 3 had no recorded bat calls.

Cells highlighted in gray indicate detector nights for which data was unacceptable due to weather conditions. Cells highlighted in yellow indicate detector nights in excess of the required two successful nights due to transportation logistics. Cells highlighted in blue are calls/p-values considered by Kpro to be present.

4 Appendices

Appendix A. Bridge Assessment Forms

Bridge/Structure Bat Assessment Form

Date & Time of Assessment 07.26.2021 1300	DOT Project Number 605843	Route/Facility Carried SR2 State Rd	County Berkshire
Federal Structure ID N-14-016	Structure Coordinates (latitude and longitude) 42.69817597 -73.14811797	Structure Height (approximate)	Structure Length 55.2

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Flat Slab/Box
- ○ Truss (Side View)
- ○ Parallel Box Beam
- ○ Pre-stressed Girder
- ⊗ Steel I-beam
- ○ Covered
- ○ Other:

Culvert Type

- ○ Box
- ○ Pipe/Round
- ○ Other:

Other Structure

- ○

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☒ Metal	☐ None	☒ Concrete
☐ Concrete	☐ Concrete	☐ Timber
☐ Timber	☒ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Culvert Material N/A

- ☐ Metal
- ☐ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Creosote Evidence

- ○ Yes ⊗ No
- ○ Unknown

Notes: only viewed from top.

Crossings Traversed (check all that apply)

- ☐ Bare ground
- ☐ Rip-rap
- ☒ Flowing water
- ☐ Standing water
- ☐ Seasonal water
- ☐ Open vegetation
- ☐ Closed vegetation
- ☐ Railroad
- ☐ Road/trail - Type:
- ☐ Other:

Surrounding Habitat (check all that apply)

- ☐ Agricultural
- ☒ Commercial
- ☐ Residential-urban
- ☒ Residential-rural
- ☒ Woodland/forested
- ☐ Grassland
- ☐ Ranching
- ☐ Riparian/wetland
- ☐ Mixed use
- ☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☒ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Concrete surfaces (open roosting on concrete)	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Spaces between concrete end walls and the bridge deck	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Vertical surfaces on concrete I-beams	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Weep holes, scupper drains, and inlets/pipes	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ All guiderails	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Emma Duguay

Signature: Emma Duguay

Last revised April 2020

Assessment Form

Bridge/Structure Bat Assessment Form

Date & Time of Assessment: 7/7/2021 1300	DOT Project Number: 608830	Route/Facility Carried: HWY Beaver Blk Rd	County: Middlesex
Federal Structure ID: W-26-014	Structure Coordinates (latitude and longitude): 42.52248583 -71.478739	Structure Height (approximate):	Structure Length: 7.6

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Flat Slab/Box
- ○ Truss (Side View)
- ○ Parallel Box Beam
- ○ Pre-stressed Girder
- ○ Steel I-beam
- ○ Covered
- ⊗ Other: culvert, pipe (and-2

Culvert Type

- ○ Box
- ○ Pipe/Round
- ○ Other:

Other Structure

- ○

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	☐ Concrete
☐ Concrete	☐ Concrete	☐ Timber
☐ Timber	☒ Steel	☒ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other: Pavement	☐ Other:	

Culvert Material: N/A

- ☐ Metal
- ☐ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Creosote Evidence

- ○ Yes ⊗ No
- ○ Unknown

Notes:

Crossings Traversed (check all that apply)

- ☐ Bare ground
- ☐ Rip-rap
- ☒ Flowing water
- ☐ Standing water
- ☐ Seasonal water
- ☐ Open vegetation
- ☐ Closed vegetation
- ☐ Railroad
- ☐ Road/trail - Type:
- ☐ Other:

Surrounding Habitat (check all that apply)

- ☐ Agricultural
- ☐ Commercial
- ☐ Residential-urban
- ☒ Residential-rural
- ☒ Woodland/forested
- ☐ Grassland
- ☐ Ranching
- ☒ Riparian/wetland
- ☐ Mixed use
- ☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☐ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☐ Not present: viewed all accessible areas and no evidence	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Concrete surfaces (open roosting on concrete)	☐ Not present: same as above	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between concrete end walls and the bridge deck	☐ Not present: same above	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Crack between concrete railings on top of the bridge deck (Gap, Railing)	☐ Not present: same above	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Vertical surfaces on concrete I-beams	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	☐ Not present: same as first	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Weep holes, scupper drains, and inlets/pipes	☐ Not present: same above	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails	☐ Not present: same above	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Emma Duggan

Signature: Emma Duggan

Last revised April 2020

Assessment Form

Bridge/Structure Bat Assessment Form

Date & Time of Assessment 7/30/2021 1300	DOT Project Number 608856	Route/Facility Carried Hwy Tannery Rd	County Berkshire
Federal Structure ID 0-05-007	Structure Coordinates (latitude and longitude) 42.21 -73.095	Structure Height (approximate)	Structure Length 8.8

Structure Type (check one)

Bridge Construction Style

○ Cast-in-place		○ Pre-stressed Girder	
○ Flat Slab/Box		⊘ Steel I-beam	
○ Truss	Side View	○ Covered	
○ Parallel Box Beam		○ Other:	

Culvert Type

○ Box	
○ Pipe/Round	
○ Other:	

Other Structure

○	

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☒ Metal	☐ None	☒ Concrete
☐ Concrete	☐ Concrete	☐ Timber
☐ Timber	☒ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Creosote Evidence

○ Yes	⊗ No
○ Unknown	

Culvert Material NA

☐ Metal	
☐ Concrete	
☐ Plastic	
☐ Stone/Masonry	
☐ Other:	

Notes: Bridge appears Brand new

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation
☐ Rip-rap	☐ Closed vegetation
☒ Flowing water	☐ Railroad
☐ Standing water	☐ Road/trail - Type:
☐ Seasonal water	☐ Other:

Surrounding Habitat (check all that apply)

☐ Agricultural	☐ Grassland
☐ Commercial	☐ Ranching
☐ Residential-urban	☐ Riparian/wetland
☐ Residential-rural	☐ Mixed use
☒ Woodland/forested	☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	**Assessment Notes**	**Evidence of Bats** (include photos if present)
☒ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Concrete surfaces (open roosting on concrete)	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Spaces between concrete end walls and the bridge deck	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Vertical surfaces on concrete I-beams	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Spaces between walls, ceiling joists	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Weep holes, scupper drains, and inlets/pipes	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ All guiderails	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ All expansion joints	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Emma Degway

Signature: Emma Degway

Last revised April 2020

Assessment Form

Bridge/Structure Bat Assessment Form

Date & Time of Assessment: 7/29/2021 11:16 am	DOT Project Number: 608858	Route/Facility Carried: Hwy E Oxbow Rd	County: Franklin
Federal Structure ID: C-05-042	Structure Coordinates (latitude and longitude): 42.624066647 -72.783895	Structure Height (approximate)	Structure Length: 15.2

Structure Type (check one)

Bridge Construction Style

○ Cast-in-place		○ Pre-stressed Girder	
○ Flat Slab/Box		● Steel I-beam	
○ Truss	Side View	○ Covered	
○ Parallel Box Beam		○ Other:	

Culvert Type X

○ Box	
○ Pipe/Round	
○ Other:	

Other Structure

○	X

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	■ Concrete
■ Concrete	☐ Concrete	☐ Timber
☐ Timber	■ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Culvert Material X

☐ Metal	
☐ Concrete	
☐ Plastic	
☐ Stone/Masonry	
☐ Other:	

Creosote Evidence

○ Yes	● No
○ Unknown	

Notes: No evident standalone culvert visible.

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation
☐ Rip-rap	☐ Closed vegetation
■ Flowing water	☐ Railroad
☐ Standing water	☐ Road/trail - Type:
☐ Seasonal water	☐ Other:

Surrounding Habitat (check all that apply)

☐ Agricultural	☐ Grassland
☐ Commercial	☐ Ranching
☐ Residential-urban	☐ Riparian/wetland
■ Residential-rural	☐ Mixed use
■ Woodland/forested	☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	**Assessment Notes**	**Evidence of Bats** (include photos if present)
☐ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Concrete surfaces (open roosting on concrete)	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Spaces between concrete end walls and the bridge deck	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☑ Not present N/A	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Vertical surfaces on concrete I-beams	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	☐ Not present No spaces evident X	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Weep holes, scupper drains, and inlets/pipes	☐ Not present None present in this structure X	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ All guiderails	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ All expansion joints	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Michael McGowan

Signature: Michael McGowan

Bridge/Structure Bat Assessment Form

Date & Time of Assessment 7/26/2021 1400	DOT Project Number 609072	Route/Facility Carried Hwy W Main St	County Berkshire
Federal Structure ID W-37-010	Structure Coordinates (latitude and longitude) 42.71998397 -73.214264	Structure Height (approximate)	Structure Length 10.1

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Pre-stressed Girder
- ⊘ Flat Slab/Box
- ○ Steel I-beam
- ○ Truss (Side View)
- ○ Covered
- ○ Parallel Box Beam
- ○ Other:

Culvert Type

- ○ Box
- ○ Pipe/Round
- ○ Other:

Other Structure

- ○

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	☒ Concrete
☒ Concrete	☒ Concrete	☐ Timber
☐ Timber	☐ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Culvert Material NA

- ☐ Metal
- ☐ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Creosote Evidence

- ○ Yes ⊗ No
- ○ Unknown

Notes:

Crossings Traversed (check all that apply)

- ☐ Bare ground
- ☐ Rip-rap
- ☒ Flowing water
- ☐ Standing water
- ☐ Seasonal water
- ☐ Open vegetation
- ☐ Closed vegetation
- ☐ Railroad
- ☐ Road/trail - Type:
- ☐ Other:

Surrounding Habitat (check all that apply)

- ☐ Agricultural
- ☐ Commercial
- ☐ Residential-urban
- ☒ Residential-rural
- ☒ Woodland/forested
- ☐ Grassland
- ☐ Ranching
- ☐ Riparian/wetland
- ☐ Mixed use
- ☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	**Assessment Notes**	**Evidence of Bats** (include photos if present)
☒ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Concrete surfaces (open roosting on concrete)	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Spaces between concrete end walls and the bridge deck	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Vertical surfaces on concrete I-beams	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Spaces between walls, ceiling joists	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ Weep holes, scupper drains, and inlets/pipes	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ All guiderails	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☒ All expansion joints	☒ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Emma Duguay

Signature: Emma Duguay

Bridge/Structure Bat Assessment Form

Date & Time of Assessment: 7/26/2021 4:06 pm	DOT Project Number: 609162	Route/Facility Carried: US 7 Simonds Rd	County: Berkshire
Federal Structure ID: W-37-013	Structure Coordinates (latitude and longitude): 42.28831647 -73.209547	Structure Height (approximate):	Structure Length: 139

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Flat Slab/Box
- ○ Truss (Side View)
- ○ Parallel Box Beam
- ○ Pre-stressed Girder
- ● Steel I-beam
- ○ Covered
- ○ Other:

Culvert Type

- ○ Box
- ○ Pipe/Round
- ○ Other:

Other Structure

- ○ Very difficult to see underside of bridge. Impassable vegetation.

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	■ Concrete
■ Concrete	☐ Concrete	☐ Timber
☐ Timber	■ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Culvert Material: N/A

- ☐ Metal
- ☐ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Creosote Evidence

- ○ Yes ● No
- ○ Unknown

Notes: Ongoing construction already started

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation
☐ Rip-rap	☐ Closed vegetation
■ Flowing water	☐ Railroad
☐ Standing water	☐ Road/trail - Type:
☐ Seasonal water	☐ Other:

Surrounding Habitat (check all that apply)

☐ Agricultural	☐ Grassland
☐ Commercial	■ Ranching
☐ Residential-urban	☐ Riparian/wetland
■ Residential-rural	■ Mixed use
☐ Woodland/forested	☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☐ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☐ Not present: Height of bridge and distance from base made detection and observation difficult.	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Concrete surfaces (open roosting on concrete)	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between concrete end walls and the bridge deck	☐ Not present: Impossible to see from observation point.	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Vertical surfaces on concrete I-beams	☐ Not present: Observation point distant.	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	☐ Not present: Too tall to be able to see in	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Weep holes, scupper drains, and inlets/pipes	☐ Not present: Could not make it to base of bridge for observation due to plant cover	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ All guiderails	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	☐ Not present: X	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Michael McGowan

Signature: Michael McGowan

Bridge/Structure Bat Assessment Form

Date & Time of Assessment: 7/20/2021 11:21 am	DOT Project Number: 610957	Route/Facility Carried: ST 2 EB+WB	County: Franklin
Federal Structure ID: 612-047	Structure Coordinates (latitude and longitude): 42.610447 97 72.585241	Structure Height (approximate):	Structure Length: 33.9

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Flat Slab/Box
- ○ Truss (Side View)
- ○ Parallel Box Beam
- ○ Pre-stressed Girder
- ● Steel I-beam
- ○ Covered
- ○ Other:

Culvert Type

- ○ Box
- ○ Pipe/Round
- ○ Other:

Other Structure

- ○ Could not see

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	■ Concrete
■ Concrete	☐ Concrete	☐ Timber
☐ Timber	■ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Culvert Material

- ☐ Metal
- ■ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Creosote Evidence

- ○ Yes ● No
- ○ Unknown

Notes: Unknown culvert material could not visually confirm

Crossings Traversed (check all that apply)

- ☐ Bare ground
- ☐ Rip-rap
- ☐ Flowing water
- ☐ Standing water
- ☐ Seasonal water
- ☐ Open vegetation
- ☐ Closed vegetation
- ☐ Railroad
- ■ Road/trail - Type: Road/pedestrian walkway
- ☐ Other:

Surrounding Habitat (check all that apply)

- ☐ Agricultural
- ■ Commercial
- ☐ Residential-urban
- ☐ Residential-rural
- ■ Woodland/forested
- ☐ Grassland
- ☐ Ranching
- ☐ Riparian/wetland
- ■ Mixed use (commercial/rural)
- ☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Concrete surfaces (open roosting on concrete)	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Spaces between concrete end walls and the bridge deck	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Vertical surfaces on concrete I-beams	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Spaces between walls, ceiling joists	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Weep holes, scupper drains, and inlets/pipes	☑ Not present Some covered by wood that were not checked	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails X	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints X	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Michael McGowan

Signature: Michael McGowan

Last revised April 2020

Assessment Form

Bridge/Structure Bat Assessment Form

Date & Time of Assessment: 7/20/21 9:05 am	DOT Project Number: 610857	Route/Facility Carried: ST ID Bernardston	County: Franklin
Federal Structure ID: N-22-004	Structure Coordinates (latitude and longitude): 42.63302597 -72.471614	Structure Height (approximate):	Structure Length: 215.1

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Flat Slab/Box
- ○ Truss (Side View)
- ○ Parallel Box Beam
- ○ Pre-stressed Girder
- ● Steel I-beam
- ○ Covered
- ○ Other:

Culvert Type

- ○ Box
- ● Pipe/Round
- ○ Other:

Other Structure

- ○

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	■ Concrete
■ Concrete	☐ Concrete	☐ Timber
☐ Timber	■ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Creosote Evidence

- ○ Yes ● No
- ○ Unknown

Culvert Material

- ■ Metal
- ☐ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Notes:

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation	
☐ Rip-rap	☐ Closed vegetation	
■ Flowing water	☐ Railroad	
☐ Standing water	☐ Road/trail - Type:	
☐ Seasonal water	☐ Other:	

Surrounding Habitat (check all that apply)

■ Agricultural	☐ Grassland	
☐ Commercial	☐ Ranching	
☐ Residential-urban	☐ Riparian/wetland	
☐ Residential-rural	☐ Mixed use	
☐ Woodland/forested	■ Other: Recreation	

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Concrete surfaces (open roosting on concrete)	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Spaces between concrete end walls and the bridge deck	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☑ Not present Could not access	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Vertical surfaces on concrete I-beams	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Spaces between walls, ceiling joists	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Weep holes, scupper drains, and inlets/pipes	☑ Not present Outfalls	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails	☐ Not present Could not access	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	☐ Not present Could not access	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Michael McGowan

Signature: Michael McGowan

Last revised April 2020

Only checked North end underside of bridge

Assessment Form

Bridge/Structure Bat Assessment Form

Date & Time of Assessment: 7/20/2021 ~3pm	DOT Project Number: 610857	Route/Facility Carried: ST 116 County Rd	County: Franklin
Federal Structure ID: D-06-048	Structure Coordinates (latitude and longitude): 42.487107 -72.616294917	Structure Height (approximate):	Structure Length: 72.6

Structure Type (check one)

Bridge Construction Style

○ Cast-in-place		○ Pre-stressed Girder	
○ Flat Slab/Box		● Steel I-beam	
○ Truss	Side View	○ Covered	
○ Parallel Box Beam		○ Other:	

Culvert Type

○ Box	
● Pipe/Round	
○ Other:	

Other Structure

○	

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	■ Concrete
■ Concrete	☐ Concrete	☐ Timber
☐ Timber	■ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Culvert Material

☐ Metal
■ Concrete
☐ Plastic
☐ Stone/Masonry
☐ Other:

Creosote Evidence

○ Yes ● No ○ Unknown

Notes: Cannot easily identify no clear visual

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation
☐ Rip-rap	☐ Closed vegetation
☐ Flowing water	☐ Railroad
☐ Standing water	■ Road/trail - Type: I-91 highway
☐ Seasonal water	☐ Other:

Surrounding Habitat (check all that apply)

■ Agricultural	☐ Grassland
☐ Commercial	☐ Ranching
☐ Residential-urban	☐ Riparian/wetland
■ Residential-rural	☐ Mixed use
■ Woodland/forested	☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	**Assessment Notes**	**Evidence of Bats** (include photos if present)
■ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Concrete surfaces (open roosting on concrete)	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Spaces between concrete end walls and the bridge deck	☐ Not present Too tall to clearly see through entire structure	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Vertical surfaces on concrete I-beams	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Spaces between walls, ceiling joists	☐ Not present Too tall to clearly see through entire structure	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ Weep holes, scupper drains, and inlets/pipes	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ All guiderails	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
■ All expansion joints	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Michael McGowan

Signature: Michael McGowan

Appendix B. Figures

Figure B- 1. **Overview of Project area showing 1-km survey segments for Project #605843, Bridge Replacement on Route 2 Over the Hoosic River (North Adams)**

Figure B-2. **Overview of Project area showing 1-km survey segments for Project #608830, Bridge Rehabilitation on Beaver Brook Road Over Beaver Brook (Westford)**

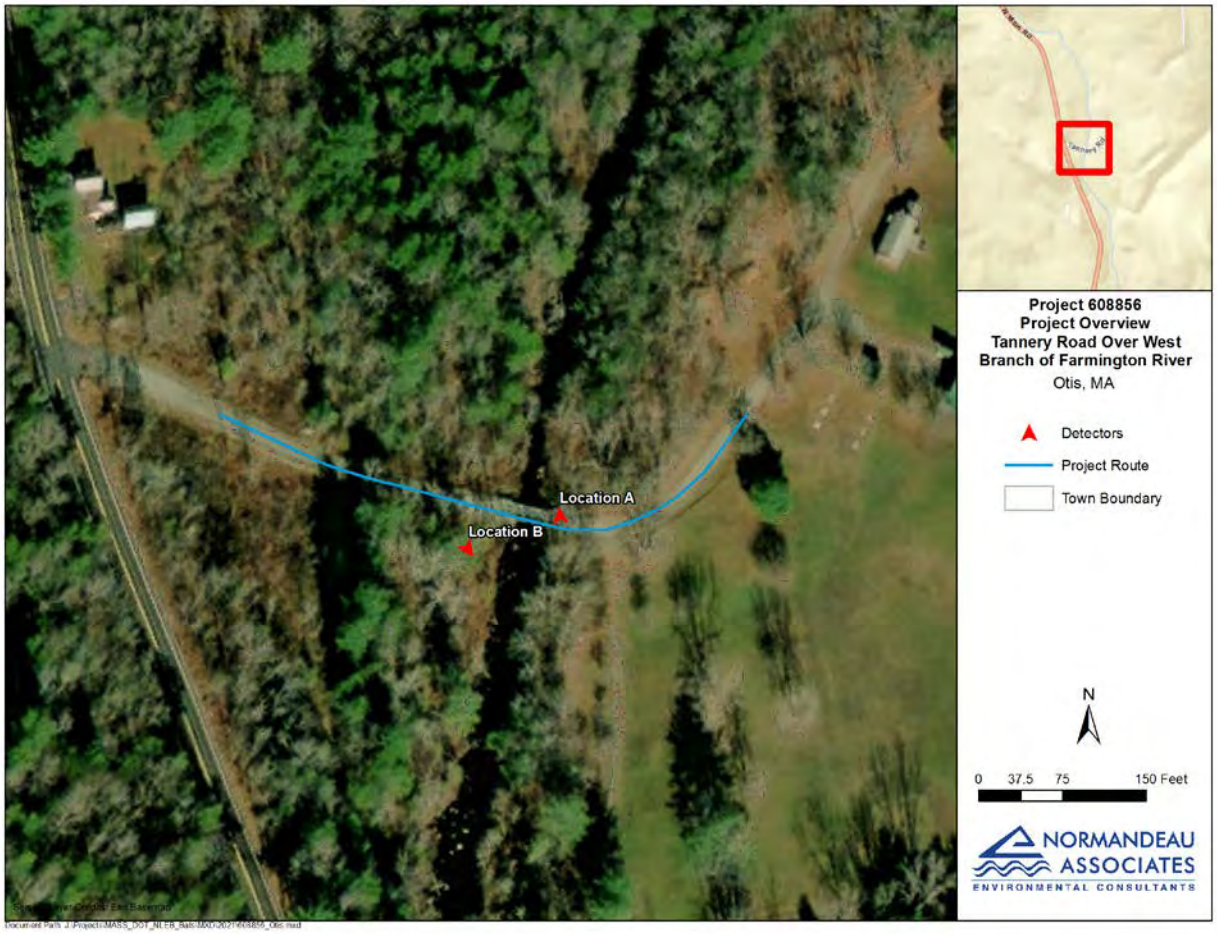


Figure B-3. **Overview of Project area showing 1-km survey segments for Project #608856, Bridge Replacement on Tannery Road Over the West Branch of Farmington River (Otis)**

Figure B-4. **Overview of Project area showing 1-km survey segments for Project #608858, Bridge Replacement on East Oxbow Road Over Oxbow Brook (Charlemont)**

Figure B-5. **Overview of Project area showing 1-km survey segments for Project #609072, Bridge Replacement on Main Street Over Hemlock Brook (Williamstown)**

Figure B-6. **Overview of Project area showing 1-km survey segments for Project #609162, Systematic Bridge Maintenance on Route 7 (Moody Bridge) Over Hoosic River & Pan-Am Railroad (Williamstown)**

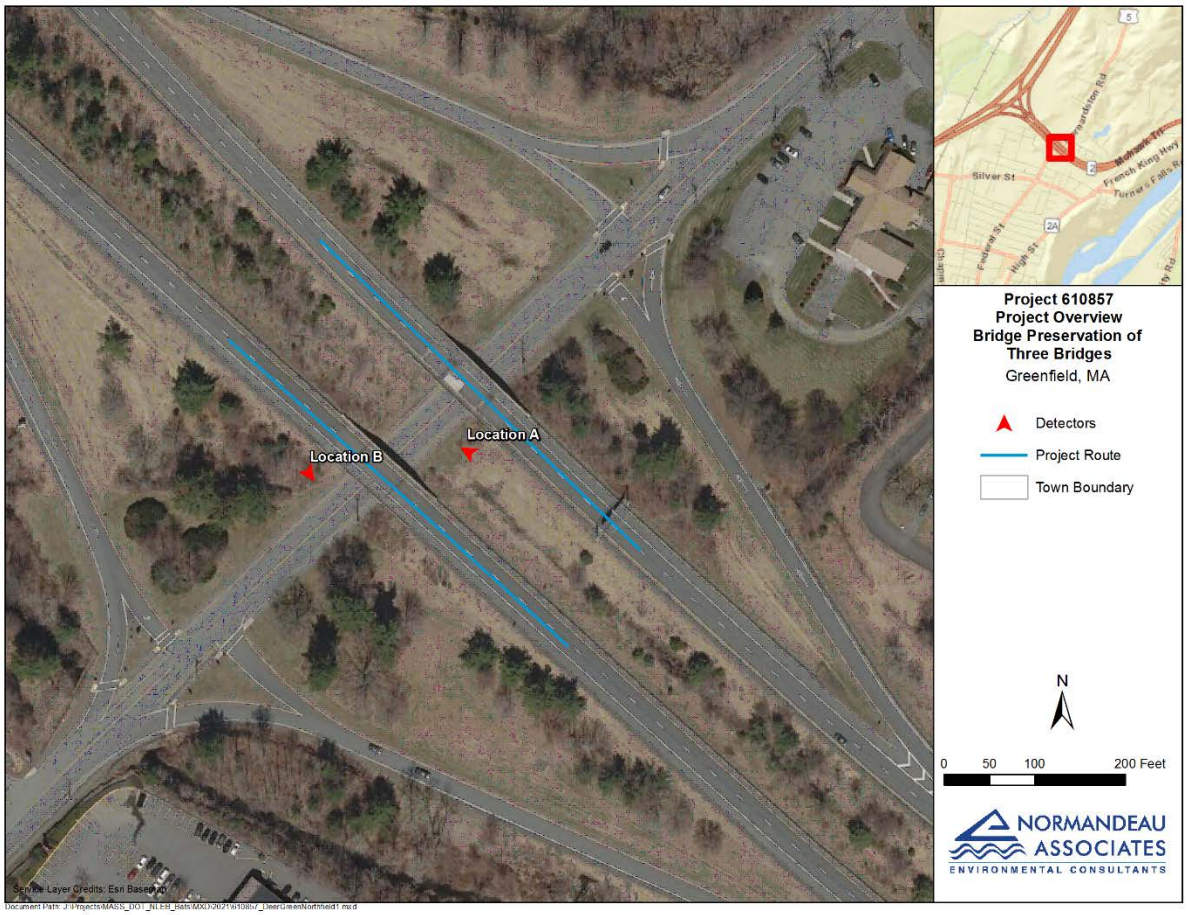


Figure B-7. **Overview of Project area showing 1-km survey segments for Project #610857, Bridge Preservation of Three Bridges (Greenfield)**

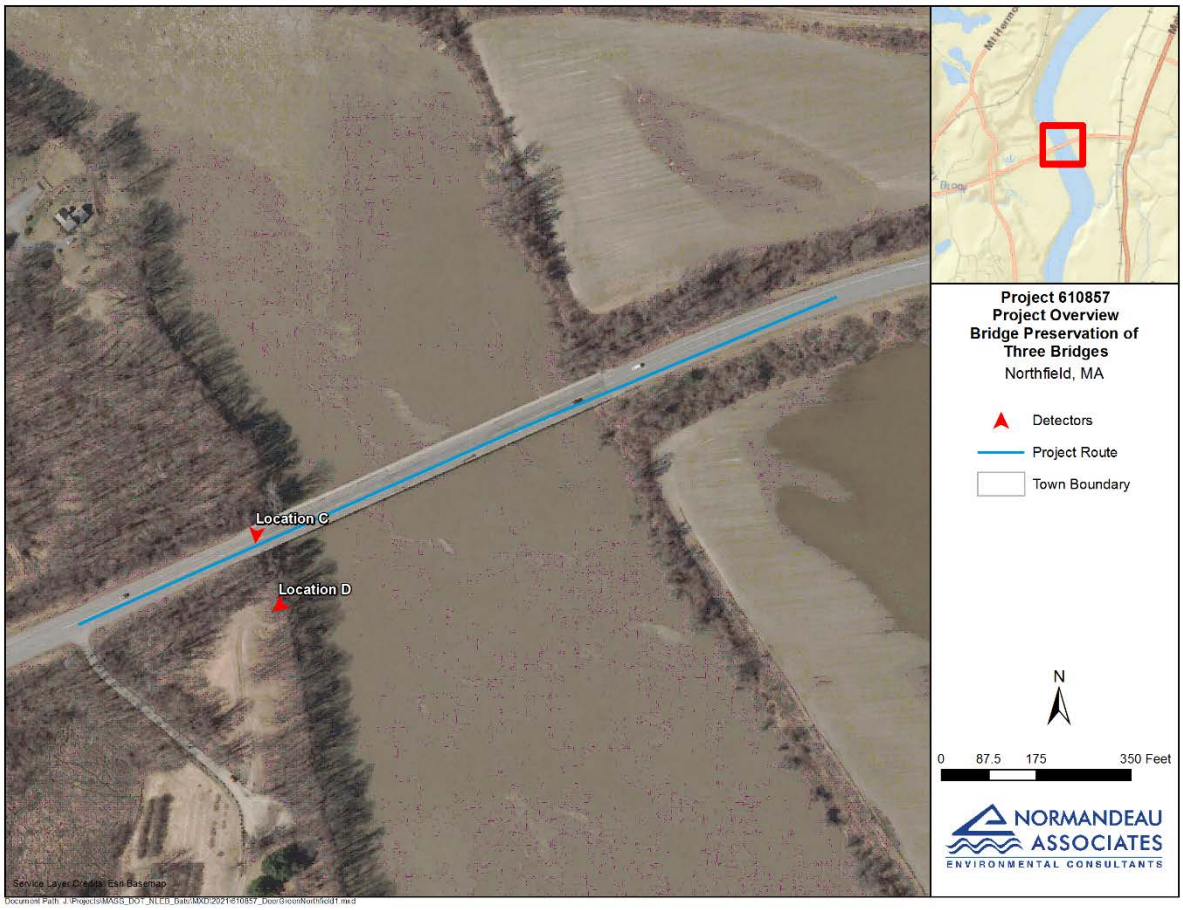


Figure B-8. **Overview of Project area showing 1-km survey segments for Project #610857, Bridge Preservation of Three Bridges (Northfield)**

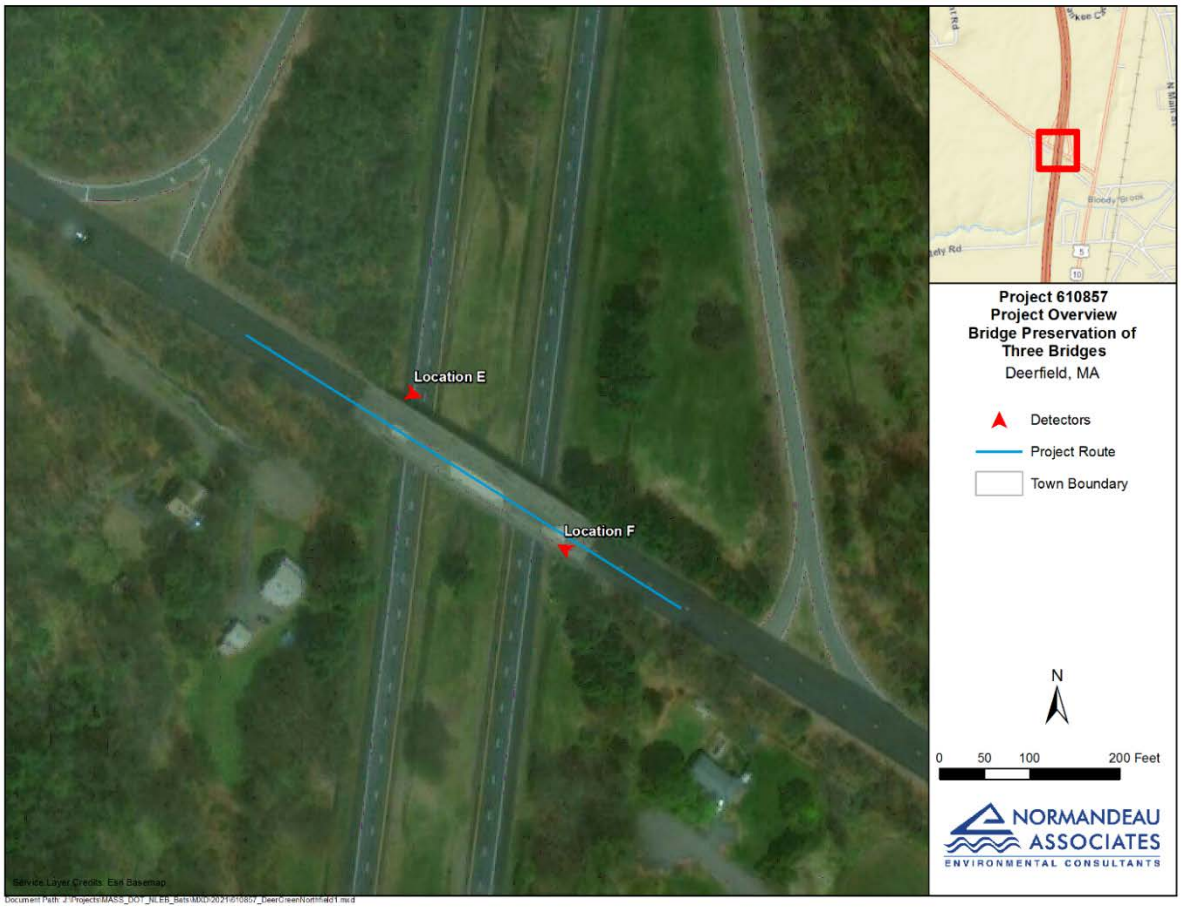


Figure B-9. **Overview of Project area showing 1-km survey segments for Project #610857, Bridge Preservation of Three Bridges (Deerfield)**

Table B-1. Geographical coordinates of bat detector survey locations

Project	Location	Coordinates	
		Latitude	*Longitude*
605843	A	42.698431	-73.147834
	B	42.697933	-73.147606
608830	A	42.572643	-71.478378
	B	42.572281	-71.479087
608856	A	42.210037	-73.094925
	B	42.209942	-73.095222
608858	A	42.6289318	-72.7840359
	B	42.6290628	-72.7838133
609072	A	42.714588	-73.21418
	B	42.714339	-73.21416
609162	A	42.7276322	-73.2043528
610857	A	42.610542	-72.584801
	B	42.610455	-72.585442
	C	42.68322	-72.4727763
	D	42.682865	-72.472601
	E	42.484196	-72.61661
	F	42.483746	-72.615967

Appendix C. Weather Data

#605843, North Adams; #608858, Charlemont; #609072, Williamstown; #609162, Williamstown, MA (KAQW)

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour Max.	6 hour Min.				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
20-Jul																	
20	18:52	Calm	1.75	Rain Fog/Mist	SCT048 BKN070 OVC100	74	70			88%	NA	NA	29.85	1010.6	0.07		
20	19:52	Calm	2.5	Fog/Mist	CLR	73	70	84	73	90%	NA	NA	29.85	1010.6	0.09		0.16
20	20:52	Calm	2.5	Fog/Mist	SCT003	71	69			94%	NA	NA	29.84	1010.4			
20	21:52	Vrbl 7 G 29	2	Thunderstorm Heavy Rain Fog/Mist	FEW003 SCT023 BKN032	67	63			87%	NA	NA	29.93	1013.2	0.09		
20	22:52	Calm	10	Overcast	SCT015 SCT060 OVC075	64	62			93%	NA	NA	29.94	1013.6	0.52	0.61	
20	23:52	N 6	8	Light Rain	BKN085 OVC100	65	62			90%	NA	NA	29.94	1013.6	0.01		
21	0:52	W 7	10	Mostly Cloudy	FEW045 SCT070 BKN120	64	62			93%	NA	NA	29.92	1012.9	0.03		
21	1:52	E 3	10	Light Rain	OVC100	64	62	73	64	93%	NA	NA	29.88	1011.5	0.02		0.67
21	2:52	W 3	9	Fair	CLR	64	62			93%	NA	NA	29.88	1011.4			
21	3:52	E 3	8	Mostly Cloudy	BKN004	64	62			93%	NA	NA	29.86	1011			
21	4:52	SW 5	7	Overcast	FEW004 OVC026	64	61			90%	NA	NA	29.85	1010.5			
21	5:52	Calm	3	Fog/Mist	FEW005	63	61			93%	NA	NA	29.86	1011			
26-Jul																	
26	18:52	Calm	9	Fair	CLR	81	64			57%	NA	83	29.87	1011.3			
26	19:52	Calm	8	Fair	CLR	75	67	84	75	76%	NA	NA	29.89	1012			
26	20:52	Calm	7	Fair	CLR	69	63			81%	NA	NA	29.92	1012.9			
26	21:52	Calm	9	Fair	CLR	67	62			84%	NA	NA	29.94	1013.6			
26	22:52	Calm	8	Fair	CLR	65	61			87%	NA	NA	29.94	1013.4			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour Max.	6 hour Min.				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
27	0:52	E 3	7	A Few Clouds	FEW120	63	60			90%	NA	NA	29.95	1013.8			
27	1:52	Calm	6	Fog/Mist	CLR	62	59	81	62	90%	NA	NA	29.95	1013.7			
27	2:52	Calm	7	Fair	CLR	61	59			93%	NA	NA	29.95	1013.8			
27	3:52	Calm	6	Fog/Mist	CLR	60	58			93%	NA	NA	29.95	1013.9			
27	4:52	Calm	4	Fog/Mist	CLR	59	57			93%	NA	NA	29.96	1014.2			
27	5:52	Calm	6	Fog/Mist	CLR	59	57			93%	NA	NA	29.98	1014.9			
27	6:52	Calm	6	Fog/Mist	FEW003	61	58			90%	NA	NA	29.98	1014.9			
27-Jul																	
27	18:52	Calm	10	Mostly Cloudy	BKN075	69	65			87%	NA	NA	29.95	1014.2			
27	19:52	Calm	10	Mostly Cloudy	FEW080 BKN110	68	65	86	67	90%	NA	NA	29.94	1013.8			0.59
27	20:52	Calm	8	Overcast	BKN070 BKN090 OVC110	67	65			93%	NA	NA	29.94	1013.7			
27	21:52	Calm	9	Overcast	FEW003 OVC060	67	65			93%	NA	NA	29.97	1014.5			
27	22:52	Calm	7	Light Rain	SCT065 OVC080	67	65			93%	NA	NA	29.96	1014.1	0.02	0.02	
27	23:52	Calm	10	Overcast	OVC006	67	64			91%	NA	NA	29.95	1013.9			
28	0:52	Calm	8	Overcast	BKN023 BKN027 OVC036	66	63			90%	NA	NA	29.95	1013.8			
28	1:52	W 6	8	Overcast	BKN005 OVC014	66	64	68	66	93%	NA	NA	29.95	1013.9			0.02
28	2:52	W 6	10	Overcast	OVC019	65	61			87%	NA	NA	29.97	1014.5			
28	3:52	S 3	10	Overcast	OVC014	64	61			90%	NA	NA	29.97	1014.6			
28	4:52	Calm	10	Overcast	OVC018	64	61			90%	NA	NA	29.98	1015			
28	5:52	W 3	10	Overcast	OVC013	63	60			90%	NA	NA	30	1015.7			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour Max.	6 hour Min.				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
28	6:52	W 5	10	Overcast	FEW007 BKN024 OVC055	63	60			90%	NA	NA	30.01	1016.2			
28-Jul																	
28	18:52	N 3	10	Fair	CLR	76	55			48%	NA	78	30.01	1016.1			
28	19:52	SW 3	10	Partly Cloudy	SCT080	70	57	78	70	64%	NA	NA	30.01	1016.2			
28	20:52	Calm	10	Mostly Cloudy	BKN080	64	59			84%	NA	NA	30.02	1016.5			
28	21:52	Calm	10	Overcast	SCT065 OVC080	63	58			84%	NA	NA	30.04	1017			
28	22:52	Calm	10	Overcast	OVC060	63	59			87%	NA	NA	30.05	1017.3			
28	23:52	Calm	10	Overcast	OVC060	63	59			87%	NA	NA	30.05	1017.4			
29	0:52	Calm	10	Mostly Cloudy	BKN075	61	57			87%	NA	NA	30.04	1017.1			
29	1:52	Calm	10	Mostly Cloudy	BKN070	59	56	70	59	90%	NA	NA	30.04	1017.1			
29	2:52	Calm	10	Mostly Cloudy	FEW055 BKN070	58	56			93%	NA	NA	30.03	1016.8			
29	3:52	Calm	10	Fair	CLR	57	55			93%	NA	NA	30.02	1016.3			
29	4:52	Calm	10	Mostly Cloudy	FEW047 BKN060	56	54			93%	NA	NA	30.01	1016.2			
29	5:52	Calm	10	Mostly Cloudy	FEW046 BKN060	56	54			93%	NA	NA	30.03	1016.9			
29	6:52	Vrbl 3	10	Partly Cloudy	SCT046	59	56			90%	NA	NA	30.03	1016.8			
29-Jul																	
29	18:52	Vrbl 7 G 26	10	Overcast	FEW036 FEW050 OVC070	71	64			79%	NA	NA	29.73	1006.6	0.03		
29	19:52	S 12 G 21	10	Overcast	SCT034 SCT041 OVC050	72	63	73	68	73%	NA	NA	29.7	1005.4	0.02		0.35

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour Max.	6 hour Min.				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
29	20:52	SW 16 G 30	10	Overcast	BKN026 BKN036 OVC049	73	63			71%	NA	NA	29.66	1004.3			
29	21:52	S 9 G 20	10	Light Rain	SCT024 BKN049 OVC080	68	62			81%	NA	NA	29.71	1005.8	0.27		
29	22:52	W 9	10	Overcast	BKN018 BKN055 OVC080	67	63			87%	NA	NA	29.72	1006.1		0.27	
29	23:52	W 5	10	Overcast	BKN018 OVC023	66	63			90%	NA	NA	29.72	1006.2			
30	0:52	SW 6	10	Overcast	FEW012 OVC021	66	63			90%	NA	NA	29.71	1006			
30	1:52	Calm	10	Overcast	BKN012 OVC017	65	63	73	65	93%	NA	NA	29.7	1005.6			0.27
30	2:52	W 7	10	Overcast	BKN008 OVC013	65	62			90%	NA	NA	29.7	1005.4			
30	3:52	W 5	10	Overcast	BKN009 OVC014	65	62			90%	NA	NA	29.7	1005.6			
30	4:52	Calm	10	Overcast	BKN018 OVC026	65	62			90%	NA	NA	29.71	1005.9			
30	5:52	W 6	10	Overcast	FEW013 BKN021 OVC027	65	61			87%	NA	NA	29.73	1006.4			
30	6:52	W 8	10	Overcast	BKN021 OVC028	64	61			90%	NA	NA	29.75	1007.3			
30-Jul																	
30	18:52	W 7 G 17	10	Fair	CLR	69	47			45%	NA	NA	29.85	1010.5			
30	19:52	W 13	10	Fair	CLR	66	46	76	66	49%	NA	NA	29.88	1011.5			
30	20:52	SW 9	10	Fair	CLR	63	45			52%	NA	NA	29.9	1012.4			
30	21:52	W 6	10	Fair	CLR	60	46			60%	NA	NA	29.93	1013.3			
30	22:52	W 5	10	Mostly Cloudy	BKN050	60	46			60%	NA	NA	29.95	1014.2			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour Max.	6 hour Min.				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
30	23:52	W 6	10	Fair	CLR	55	47			74%	NA	NA	29.94	1013.9			
31	0:52	N 3	10	Fair	CLR	52	48			86%	NA	NA	29.95	1014.2			
31	1:52	N 3	10	Fair	CLR	50	47	66	50	89%	NA	NA	29.95	1014.3			
31	2:52	NW 6	10	Fair	CLR	51	47			86%	NA	NA	29.96	1014.4			
31	3:52	Calm	10	Fair	CLR	50	47			89%	NA	NA	29.95	1014.3			
31	4:52	Calm	10	Fair	CLR	48	45			89%	NA	NA	29.97	1014.9			
31	5:52	Calm	10	Fair	CLR	47	44			90%	NA	NA	29.98	1015.2			
31	6:52	Calm	10	Fair	CLR	48	46			93%	NA	NA	29.99	1015.5			
31-Jul																	
31	18:52	W 6	10	Fair	CLR	68	49			51%	NA	NA	29.94	1013.8			
31	19:52	Calm	10	Fair	CLR	64	53	72	64	68%	NA	NA	29.94	1014			
31	20:52	Calm	5	Fair with Haze	CLR	58	53			84%	NA	NA	29.97	1014.8			
31	21:52	Calm	10	A Few Clouds	FEW120	57	52			83%	NA	NA	29.97	1015			
31	22:52	Calm	10	A Few Clouds	FEW110	55	52			90%	NA	NA	29.97	1015			
31	23:52	Calm	10	Mostly Cloudy	BKN100	56	52			87%	NA	NA	29.97	1014.7			
1	0:52	Calm	10	Fair	CLR	55	52			90%	NA	NA	29.97	1014.9			
1	1:52	Calm	10	A Few Clouds	FEW090	55	52	64	55	90%	NA	NA	29.96	1014.5			
1	2:52	Calm	10	Overcast	OVC090	55	52			90%	NA	NA	29.95	1014.2			
1	3:52	Calm	10	Partly Cloudy	SCT100	55	52			90%	NA	NA	29.95	1014.2			
1	4:52	Calm	10	Overcast	OVC090	57	52			83%	NA	NA	29.94	1013.9			
1	5:52	SE 3	10	Overcast	OVC090	57	52			83%	NA	NA	29.96	1014.3			
1	6:52	Calm	10	Partly Cloudy	SCT085	57	53			87%	NA	NA	29.95	1014.2			
1-Aug																	

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour Max.	6 hour Min.				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
1	18:52	Vrbl 5	10	Mostly Cloudy	FEW032 SCT049 BKN070	72	60			66%	NA	NA	29.83	1009.9			
1	19:52	W 7	10	Overcast	BKN032 BKN042 OVC120	71	60	79	71	68%	NA	NA	29.84	1010.3			
1	20:52	W 8	10	Overcast	BKN032 BKN041 OVC050	69	58			68%	NA	NA	29.86	1010.9			
1	21:52	Vrbl 5	9	Light Rain	FEW025 BKN065 OVC085	65	60			84%	NA	NA	29.85	1010.7	0.01		
1	22:52	W 7	10	Overcast	BKN020 BKN034 OVC110	65	60			84%	NA	NA	29.86	1010.9		0.01	
1	23:52	Calm	10	Overcast	OVC025	65	59			81%	NA	NA	29.86	1010.8			
2	0:52	SW 3	10	Overcast	FEW032 SCT045 OVC095	63	59			87%	NA	NA	29.84	1010.4			
2	1:52	Calm	10	Mostly Cloudy	SCT041 BKN050 BKN090	62	59	71	62	90%	NA	NA	29.84	1010.4			0.01
2	2:52	W 7	10	Overcast	BKN042 OVC100	62	59			90%	NA	NA	29.85	1010.6			
2	3:52	Calm	10	Mostly Cloudy	FEW022 BKN026 BKN031	61	58			90%	NA	NA	29.85	1010.5			
2	4:52	W 3	10	Overcast	OVC020	62	58			86%	NA	NA	29.85	1010.6			
2	5:52	W 3	10	Overcast	OVC018	62	58			86%	NA	NA	29.87	1011.1			
2	6:52	W 8	10	Overcast	SCT018 BKN026 OVC032	64	58			81%	NA	NA	29.88	1011.5			

NA is a National Weather Service designation and is believed to refer to values that are negligible and/or below the detection limit for the given parameter

#608830, Westford, MA (KBED)

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour Max.	6 hour Min.				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
7-Jul																	
7	18:51	N 5	10	Thunderstorm in Vicinity Light Rain	SCT060 BKN075 BKN090	80	70			71%	NA	83	29.89	1013.3			
7	19:51	Calm	10	Fair	CLR	75	73	89	75	94%	NA	NA	29.9	1013.5	0.05		0.05
7	20:51	NW 7	8	Fair	CLR	74	73			97%	NA	NA	29.92	1014.2			
7	21:51	Calm	9	Fair	CLR	73	72			96%	NA	NA	29.96	1015.5			
7	22:51	Calm	9	Fair	CLR	73	72			96%	NA	NA	29.96	1015.7			
7	23:51	NE 7	10	Overcast	OVC011	69	65			87%	NA	NA	29.97	1016			
8	0:51	NE 7	10	Overcast	OVC018	68	64			87%	NA	NA	29.97	1015.7			
8	1:51	Calm	10	Overcast	OVC024	68	62	75	67	81%	NA	NA	29.99	1016.5			
8	2:51	NE 6	10	Mostly Cloudy	BKN025 BKN070	67	62			84%	NA	NA	29.99	1016.7			
8	3:51	SW 5	10	Partly Cloudy	SCT029 SCT080	66	60			81%	NA	NA	30.03	1017.9			
8	4:51	NE 15	8	Thunderstorm in Vicinity Rain	FEW042 BKN100 BKN120	63	62			97%	NA	NA	30.01	1017.1	0.29	0.29	
8	5:51	NE 5	10	Partly Cloudy	SCT090	63	61			93%	NA	NA	30.01	1017.2	0.01		
8	6:51	NE 3	10	A Few Clouds	FEW090	63	61			93%	NA	NA	30.04	1018.2			
8-Jul																	
8	18:51	NE 7	2	Rain Fog/Mist	OVC009	61	60			97%	NA	NA	30.07	1019.3	0.1		
8	19:51	NE 5	8	Light Rain	OVC007	61	60	70	61	97%	NA	NA	30.05	1018.9	0.02		0.13
8	20:51	NE 5	10	Light Rain	OVC006	62	61			96%	NA	NA	30.03	1018.2	0.02		

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure			Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)		sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.									
8	21:51	NE 6	10	Light Rain	OVC006	62	61				96%	NA	NA	30.03	1018	0.01		
8	22:51	N 3	10	Overcast	OVC004	62	61				96%	NA	NA	30.03	1018.1		0.03	
8	23:51	NW 3	2	Light Rain Fog/Mist	OVC003	61	61				100%	NA	NA	30.05	1018.7			
9	0:51	Calm	10	Overcast	OVC003	61	61				100%	NA	NA	30.01	1017.3	0.05		
9	1:51	NE 3	9	Overcast	OVC003	62	61	63		61	96%	NA	NA	29.99	1016.7			0.08
9	2:51	NE 3	4	Fog/Mist	OVC002	62	61				96%	NA	NA	29.98	1016.4			
9	3:51	Calm	0.75	Fog/Mist	VV002	62	62				100%	NA	NA	29.97	1016.1			
9	4:51	Calm	1.75	Light Rain Fog/Mist	OVC003	62	62				100%	NA	NA	29.96	1015.7	0.02	0.02	
9	5:51	E 6	5	Light Rain Fog/Mist	OVC002	63	63				100%	NA	NA	29.95	1015.2	0.02		
9	6:51	NE 6	1	Light Rain Fog/Mist	OVC002	63	63				100%	NA	NA	29.93	1014.8	0.01		
9-Jul																		
9	18:51	W 8	10	A Few Clouds	FEW029	76	68				77%	NA	77	29.76	1008.9			
9	19:51	SW 6	10	Fair	CLR	74	69	76		66	85%	NA	NA	29.79	1009.7			0.2
9	20:51	SW 5	10	Fair	CLR	71	68				90%	NA	NA	29.82	1011			
9	21:51	SW 5	10	Partly Cloudy	SCT046	70	68				93%	NA	NA	29.86	1012.3			
9	22:51	Calm	10	Mostly Cloudy	FEW042 BKN075	70	68				93%	NA	NA	29.86	1012.4			
9	23:51	Calm	10	Light Rain	FEW044 SCT060 BKN090	70	68				93%	NA	NA	29.89	1013.1	0.01		
10	0:51	SW 6	4	Rain Fog/Mist	FEW035 SCT055 OVC110	71	70				96%	NA	NA	29.89	1013.1	0.15		
10	1:51	W 3	3	Light Rain Fog/Mist	SCT021 OVC030	71	70	74		69	96%	NA	NA	29.89	1013.3	0.26		0.42
10	2:51	N 8	10	Overcast	OVC027	70	68				93%	NA	NA	29.89	1013.3	0.01		

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure			Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)		sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.									
10	3:51	Calm	10	Mostly Cloudy	BKN045 BKN050 BKN120	68	66				93%	NA	NA	29.9	1013.6			
10	4:51	Calm	10	Overcast	OVC100	67	65				93%	NA	NA	29.91	1014		0.01	
10	5:51	Calm	10	Overcast	SCT047 OVC090	66	64				93%	NA	NA	29.93	1014.5			
10	6:51	NW 5	10	Mostly Cloudy	SCT032 BKN090	67	64				91%	NA	NA	29.94	1015			
10-Jul																		
10	18:51	SE 5	10	A Few Clouds	FEW100	71	62				73%	NA	NA	30	1017			
10	19:51	S 3	10	Partly Cloudy	SCT100	70	61	72	69		73%	NA	NA	30.01	1017.4			
10	20:51	S 3	10	Fair	CLR	65	62				90%	NA	NA	30.03	1018			
10	21:51	Calm	10	Fair	CLR	64	61				90%	NA	NA	30.05	1018.6			
10	22:51	Calm	10	Fair	CLR	62	61				96%	NA	NA	30.04	1018.3			
10	23:51	Calm	10	Partly Cloudy	SCT090	60	60				100%	NA	NA	30.04	1018.5			
11	0:51	Calm	9	Fair	CLR	60	59				96%	NA	NA	30.06	1018.9			
11	1:51	Calm	10	Fair	CLR	59	59	70	59		100%	NA	NA	30.06	1019.2			
11	2:51	Calm	9	Fair	CLR	59	58				96%	NA	NA	30.06	1019.2			
11	3:51	Calm	1	Fog/Mist	VV003	58	57				97%	NA	NA	30.06	1019.1			
11	4:51	Calm	5	Fog/Mist	CLR	57	57				100%	NA	NA	30.08	1019.6			
11	5:51	Calm	8	Fair	CLR	57	57				100%	NA	NA	30.08	1019.9			
11	6:51	Calm	10	Fair	CLR	62	62				100%	NA	NA	30.1	1020.4			
11-Jul																		
11	18:51	SW 7	3	Light Rain Fog/Mist	OVC050	71	69				94%	NA	NA	30.11	1020.9	0.01		
11	19:51	W 5	10	Overcast	OVC060	70	68	80	70		93%	NA	NA	30.11	1020.7			0.05
11	20:51	Calm	10	Overcast	OVC050	71	69				94%	NA	NA	30.1	1020.3			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure			Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)		1 hr	3 hr	6 hr
								Max.	Min.									
11	21:51	Calm	6	Light Rain Fog/Mist	OVC044	70	68				93%	NA	NA	30.12	1020.9	0.03		
11	22:51	Calm	10	Light Rain	BKN021 OVC029	69	68				96%	NA	NA	30.11	1020.8	0.01	0.04	
11	23:51	Calm	10	Overcast	OVC008	69	68				96%	NA	NA	30.12	1020.8			
12	0:51	Calm	9	Overcast	SCT006 OVC026	69	69				100%	NA	NA	30.12	1021			
12	1:51	Calm	6	Fog/Mist	BKN007 OVC027	69	69	71	69		100%	NA	NA	30.12	1020.8			0.04
12	2:51	N 3	10	Overcast	OVC007	69	68				96%	NA	NA	30.12	1020.9			
12	3:51	NE 7	10	Light Rain	OVC011	67	66				97%	NA	NA	30.11	1020.7			
12	4:51	E 7	6	Light Rain Fog/Mist	OVC010	66	65				96%	NA	NA	30.1	1020.4	0.02	0.02	
12	5:51	NE 9	9	Light Rain	FEW007 OVC010	66	65				96%	NA	NA	30.09	1020	0.02		
12	6:51	E 9	4	Light Rain Fog/Mist	OVC007	66	65				96%	NA	NA	30.08	1019.9	0.02		
13-Jul																		
13	18:51	E 6	10	Overcast	OVC007	67	64				91%	NA	NA	30.26	1025.9			
13	19:51	E 8	9	Overcast	OVC005	66	64	69	66		93%	NA	NA	30.26	1025.7			
13	20:51	E 7	1.25	Fog/Mist	OVC005	65	65				100%	NA	NA	30.25	1025.6			
13	21:51	E 6	1.5	Fog/Mist	OVC005	65	64				97%	NA	NA	30.26	1025.7			
13	22:51	E 6	10	Overcast	OVC004	65	64				97%	NA	NA	30.25	1025.4			
13	23:51	E 5	9	Overcast	OVC004	65	65				100%	NA	NA	30.25	1025.4			
14	0:51	Calm	6	Fog/Mist	OVC003	65	65				100%	NA	NA	30.24	1025			
14	1:51	Calm	6	Fog/Mist	OVC003	65	65	66	65		100%	NA	NA	30.23	1024.8			
14	2:51	E 3	1.5	Fog/Mist	OVC002	65	65				100%	NA	NA	30.21	1024.3			
14	3:49	Calm	3	Light Rain Fog/Mist	OVC003	65	65				100%	NA	NA	30.2	1024			
14	4:51	Calm	4	Fog/Mist	OVC003	65	65				100%	NA	NA	30.19	1023.6			
14	5:51	Calm	2.5	Fog/Mist	OVC003	66	65				96%	NA	NA	30.19	1023.5			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.								
14	6:51	Calm	0.25	Fog	OVC002	66	66				100%	NA	NA	30.19 1023.4			
14-Jul																	
14	18:51	S 7	10	Partly Cloudy	SCT032	80	74				82%	NA	85	30.07 1019.3			
14	19:51	SE 6	10	A Few Clouds	FEW060	78	73	84	77		85%	NA	80	30.06 1018.9			
14	20:51	E 3	10	Light Rain	SCT018 BKN027 BKN055	76	73				91%	NA	76	30.06 1018.9			
14	21:51	SW 5	10	A Few Clouds	FEW065	74	73				97%	NA	NA	30.07 1019.4			
14	22:51	SW 5	10	Mostly Cloudy	SCT018 BKN065	73	70				90%	NA	NA	30.07 1019.3			
14	23:51	W 5	10	Mostly Cloudy	BKN048	73	70				90%	NA	NA	30.09 1020			
15	0:51	W 3	10	A Few Clouds	FEW070	72	69				91%	NA	NA	30.09 1019.9			
15	1:51	W 3	10	Fair	CLR	69	68	78	69		96%	NA	NA	30.07 1019.4			
15	2:51	Calm	10	Fair	CLR	68	67				96%	NA	NA	30.07 1019.4			
15	3:51	Calm	10	Fair	CLR	68	67				96%	NA	NA	30.07 1019.4			
15	4:51	Calm	7	Fair	CLR	67	66				97%	NA	NA	30.08 1019.6			
15	5:51	Calm	1	Fog/Mist	VV003	65	65				100%	NA	NA	30.09 1019.9			
15	6:51	Calm	10	Mostly Cloudy	BKN005	69	68				96%	NA	NA	30.1 1020.2			
2-Aug																	
2	18:51	NW 6	10	Partly Cloudy	SCT055	75	57				54%	NA	NA	29.95 1015.2			
2	19:51	W 3	10	Partly Cloudy	SCT070	70	58	80	70		66%	NA	NA	29.97 1015.9			
2	20:51	Calm	10	A Few Clouds	FEW055	66	60				81%	NA	NA	29.99 1016.7			
2	21:51	Calm	10	Fair	CLR	64	59				84%	NA	NA	30.01 1017.4			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.								
2	22:51	Calm	10	Fair	CLR	62	59			90%	NA	NA	30.03	1017.9			
2	23:51	Calm	10	Fair	CLR	60	58			93%	NA	NA	30.03	1018.2			
3	0:51	S 3	10	A Few Clouds	FEW065	59	58			96%	NA	NA	30.06	1019			
3	1:51	Calm	10	Fair	CLR	59	58	71	57	96%	NA	NA	30.07	1019.4			
3	2:51	Calm	10	Fair	CLR	56	55			97%	NA	NA	30.07	1019.5			
3	3:51	Calm	5	Fog/Mist	CLR	56	56			100%	NA	NA	30.08	1019.7			
3	4:51	Calm	10	Fair	CLR	55	54			96%	NA	NA	30.09	1020			
3	5:51	Calm	10	Fair	CLR	54	54			100%	NA	NA	30.1	1020.4			
3	6:51	Calm	10	Fair	CLR	58	56			93%	NA	NA	30.11	1020.6			
3-Aug																	
3	18:51	S 5	10	Fair	CLR	74	60			62%	NA	NA	30.07	1019.4			
3	19:51	SW 5	10	Partly Cloudy	SCT055	70	62	77	70	76%	NA	NA	30.07	1019.5			
3	20:51	Calm	10	Fair	CLR	67	62			84%	NA	NA	30.08	1019.9			
3	21:51	Calm	10	Fair	CLR	65	62			90%	NA	NA	30.08	1019.9			
3	22:51	Calm	10	Fair	CLR	64	62			93%	NA	NA	30.09	1020.1			
3	23:51	Calm	10	Fair	CLR	62	61			96%	NA	NA	30.09	1020			
4	0:51	Calm	10	Fair	CLR	62	61			96%	NA	NA	30.08	1019.8			
4	1:51	Calm	10	Fair	CLR	62	61	70	60	96%	NA	NA	30.08	1019.7			
4	2:51	Calm	10	Fair	CLR	60	60			100%	NA	NA	30.08	1019.7			
4	3:51	Calm	10	Fair	CLR	59	59			100%	NA	NA	30.08	1019.8			
4	4:51	Calm	10	Fair	CLR	59	58			96%	NA	NA	30.09	1019.9			
4	5:51	Calm	10	Fair	CLR	58	58			100%	NA	NA	30.1	1020.3			
4	6:51	Calm	10	Fair	CLR	59	59			100%	NA	NA	30.12	1021			
4-Aug																	
4	18:51	SE 13		Cloudy		68	64			87 %	NA	NA	30.02				
4	19:51	E 10		Cloudy		65	62			90 %	NA	NA	30.04				

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.								
4	20:51	E 6		Light Rain		65	62			90 %	NA	NA	30.03				
4	21:51	NE 6		Light Rain		65	63			93 %	NA	NA	30.02				
4	22:51	N 6		Light Rain		64	63			96 %	NA	NA	30.02				
4	23:51	N 7		Rain		64	63			96 %	NA	NA	30		0.1		
5	0:51	N 6		Rain		64	63			96 %	NA	NA	29.99		0.1		
5	1:51	N 7		Light Rain		64	63			96 %	NA	NA	29.97		0.1		
5	2:51	N 8		Light Rain		64	63			96 %	NA	NA	29.95				
5	3:51	N 7		Cloudy		64	63			96 %	NA	NA	29.95				
5	4:51	N 7		Cloudy		64	63			96 %	NA	NA	29.95				
5	5:51	N 7		Fog		64	63			96 %	NA	NA	29.96				
5	6:51	NE 10		Fog		64	63			96 %	NA	NA	29.96				

NA is a National Weather Service designation and is believed to refer to values that are negligible and/or below the detection limit for the given parameter

#608856, Otis, MA (KPSF)

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.								
30-Jul																	
30	18:54	NW 10 G 21	10	A Few Clouds	FEW060	67	46			47%	NA	NA	29.86	1009			
30	19:54	NW 7	10	Fair	CLR	63	44	74	63	50%	NA	NA	29.88	1010			
30	20:54	NW 7	10	Partly Cloudy	SCT055	61	44			54%	NA	NA	29.91	1010.9			
30	21:54	W 7	10	Fair	CLR	58	49			72%	NA	NA	29.94	1012			
30	22:54	W 6	10	Fair	CLR	57	48			72%	NA	NA	29.96	1012.5			
30	23:54	W 6	10	Fair	CLR	55	47			74%	NA	NA	29.96	1012.4			
31	0:54	SW 3	10	Fair	CLR	53	47			80%	NA	NA	29.96	1012.5			
31	1:54	Calm	10	Fair	CLR	51	47	63	51	86%	NA	NA	29.95	1012.4			
31	2:54	W 6	10	Fair	CLR	50	47			89%	48	NA	29.95	1012.7			
31	3:54	W 5	10	Partly Cloudy	SCT050	49	47			93%	47	NA	29.95	1012.7			
31	4:54	SW 7	10	Overcast	OVC050	53	49			86%	NA	NA	29.96	1012.7			
31	5:54	NW 5	10	Fair	CLR	50	47			89%	48	NA	29.96	1013.1			
31	6:54	W 9	10	Fair	CLR	51	47			86%	NA	NA	29.97	1013.3			
31-Jul																	
31	18:54	NW 7	10	Fair	CLR	66	46			49%	NA	NA	29.95	1012.5			
31	20:54	Calm	10	Fair	CLR	58	50			75%	NA	NA	29.96	1013.1			
31	21:54	Calm	10	Fair	CLR	54	51			90%	NA	NA	29.97	1013.3			
31	22:54	Calm	9	Partly Cloudy	SCT120	54	50			87%	NA	NA	29.97	1013.2			
31	23:54	Calm	10	A Few Clouds	FEW120	52	50			93%	NA	NA	29.96	1013.1			
1	0:54	Calm	10	A Few Clouds	FEW110	53	51			93%	NA	NA	29.97	1013.1			
1	1:54	Calm	10	Fair	CLR	51	50	62	51	96%	NA	NA	29.96	1012.9			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.								
1	2:54	Calm	10	Fair	CLR	50	49			96%	NA	NA	29.95	1012.5			
1	3:54	Calm	10	Fair	CLR	50	48			93%	NA	NA	29.95	1012.4			
1	4:54	Calm	10	Mostly Cloudy	BKN095	51	49			92%	NA	NA	29.94	1012.3			
1	5:54	Calm	10	Overcast	OVC090	51	50			96%	NA	NA	29.95	1012.5			
1	6:54	Calm	10	Fair	CLR	53	51			93%	NA	NA	29.95	1012.7			
1-Aug																	
1	18:54	SW 9	10	Overcast	BKN019 BKN043 OVC070	68	61			78%	NA	NA	29.84	1008.9			
1	19:54	SW 12	10	Light Rain	FEW020 BKN043 OVC110	66	60	76	66	81%	NA	NA	29.86	1009.5			0.01
1	20:54	SW 5	10	Light Rain	FEW011 BKN017 OVC034	63	60			90%	NA	NA	29.87	1009.7	0.01		
1	21:54	SE 6	10	Overcast	SCT027 OVC095	62	59			90%	NA	NA	29.86	1008.9	0.01		
1	22:54	W 9	10	Light Rain	SCT010 BKN017 OVC022	62	60			93%	NA	NA	29.86	1009.1		0.02	
1	23:54	Calm	10	Light Rain	BKN013 OVC022	62	60			93%	NA	NA	29.85	1008.7			
2	0:54	Calm	10	Overcast	SCT010 OVC014	62	60			93%	NA	NA	29.85	1008.4			
2	1:54	W 3	7	Light Rain	BKN010 OVC019	62	60	65	62	93%	NA	NA	29.85	1008.3	0.01		0.03
2	2:54	W 6	10	Overcast	BKN025 OVC044	61	58			90%	NA	NA	29.85	1008.2	0.06		
2	3:54	NW 5	10	Fair	CLR	57	55			93%	NA	NA	29.84	1008.4			
2	4:54	W 6	10	Mostly Cloudy	BKN011	59	57			93%	NA	NA	29.86	1009		0.06	
2	5:54	W 7	10	Overcast	OVC008	60	57			90%	NA	NA	29.87	1009.5			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)				Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
								Max.	Min.								
2	6:54	W 7	10	Overcast	OVC008	60	57			90%	NA	NA	29.88	1009.9			

NA is a National Weather Service designation and is believed to refer to values that are negligible and/or below the detection limit for the given parameter

#610857, Deerfield, Greenfield, Northfield, MA (KORE)

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)			Relative Humidity		Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
20-Jul																	
not available- see KAQW																	
21-Jul																	
21	18:52	NW 16 G 21	10	Fair	CLR	75	59				58%	NA	NA	29.89	1012.2		
21	19:52	N 8	10	Partly Cloudy	SCT070	71	59	80	71		66%	NA	NA	29.92	1013		
21	20:52	NW 5	10	A Few Clouds	FEW030	67	60				79%	NA	NA	29.94	1013.8		
21	21:52	W 5	10	Fair	CLR	64	60				87%	NA	NA	29.97	1014.7		
21	22:52	NW 5	10	Fair	CLR	63	59				87%	NA	NA	29.97	1014.7		
21	23:52	NW 5	10	Fair	CLR	61	58				90%	NA	NA	29.98	1015		
22	0:52	NW 6	10	Fair	CLR	60	57				90%	NA	NA	29.97	1014.9		
22	1:52	NW 3	10	Fair	CLR	59	56	71	59		90%	NA	NA	29.97	1014.7		
22	2:52	NW 5	10	Fair	CLR	58	55				90%	NA	NA	29.98	1014.9		
22	3:52	Calm	10	Fair	CLR	57	55				93%	NA	NA	29.99	1015.3		
22	4:52	Calm	9	Fair	CLR	55	54				96%	NA	NA	29.99	1015.4		
22	5:52	Calm	7	Fair	CLR	54	53				97%	NA	NA	30.02	1016.3		
22	6:52	Calm	10	Fair	CLR	59	56				90%	NA	NA	30.03	1016.9		
22-Jul																	
22	18:52	W 9	10	Partly Cloudy	SCT110	75	56				52%	NA	NA	30.05	1017.5		
22	19:52	W 5	10	Light Rain	BKN060 OVC075	72	58	81	72		61%	NA	NA	30.06	1017.9		
22	20:52	SW 5	10	Mostly Cloudy	FEW060 BKN080 BKN095	66	63				90%	NA	NA	30.08	1018.4	0.09	
22	21:52	Calm	10	Overcast	BKN060 BKN080 OVC095	65	64				97%	NA	NA	30.1	1019.2		

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)			Relative Humidity		Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
22	22:52	Calm	10	Overcast	OVC070	65	64			97%	NA	NA	30.11	1019.4		0.09	
22	23:52	Calm	10	Mostly Cloudy	BKN090	65	64			97%	NA	NA	30.11	1019.2			
23	0:52	Calm	10	Fair	CLR	64	63			96%	NA	NA	30.11	1019.3			
23	1:52	Calm	10	Fair	CLR	63	62	72	63	97%	NA	NA	30.1	1019.1			0.09
23	2:52	Calm	10	Fair	CLR	62	61			96%	NA	NA	30.1	1019			
23	3:52	NW 3	10	Fair	CLR	61	60			97%	NA	NA	30.09	1018.8			
23	4:52	NW 5	10	Fair	CLR	60	58			93%	NA	NA	30.1	1019.1			
23	5:52	NW 3	10	A Few Clouds	FEW120	59	57			93%	NA	NA	30.11	1019.5			
23	6:52	Calm	10	Partly Cloudy	SCT110	61	58			90%	NA	NA	30.13	1020			
23-Jul																	
23	18:52	Vrbl 7	6	Rain	FEW044 SCT065 BKN080	67	60			79%	NA	NA	30.11	1019.4	0.02		
23	19:52	Calm	10	Partly Cloudy	SCT100	65	63	82	65	93%	NA	NA	30.11	1019.5			0.02
23	20:52	NE 3	10	Fair	CLR	63	62			97%	NA	NA	30.12	1019.8			
23	21:52	Calm	10	Overcast	OVC100	63	61			93%	NA	NA	30.14	1020.4			
23	22:52	Calm	10	Fair	CLR	62	60			93%	NA	NA	30.13	1020.3			
23	23:52	N 3	5	Fog/Mist	FEW008	61	59			93%	NA	NA	30.14	1020.6			
24	0:52	Calm	10	Fair	CLR	59	58			96%	NA	NA	30.14	1020.5			
24	1:52	Calm	10	Fair	CLR	58	57	65	58	97%	NA	NA	30.13	1020			
24	2:52	Calm	5	Fog/Mist	FEW002	57	57			100%	NA	NA	30.13	1020			
24	3:52	Calm	10	A Few Clouds	FEW002	56	56			100%	NA	NA	30.12	1020			
24	4:52	Calm	0.25	Fog	VV002	55	55			100%	NA	NA	30.13	1020.1			
24	5:52	Calm	0.75	Fog/Mist	VV002	54	53			97%	NA	NA	30.14	1020.4			
24	6:52	Calm	0.25	Fog	VV002	55	55			100%	NA	NA	30.14	1020.8			
24-Jul																	

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)			Relative Humidity		Wind Chill (°F)	Heat Index (°F)	Pressure			Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)		sea level (mb)	1 hr	3 hr	6 hr
24	18:52	S 5	10	Fair	CLR	78	52				40%	NA	79	30.05	1017.4			
24	19:52	Calm	10	Fair	CLR	72	60	82	72		66%	NA	NA	30.05	1017.4			
24	20:52	Calm	10	Mostly Cloudy	BKN070	69	59				70%	NA	NA	30.05	1017.4			
24	21:52	Calm	10	Fair	CLR	67	60				79%	NA	NA	30.06	1017.7			
24	22:52	S 7	10	Fair	CLR	70	60				71%	NA	NA	30.04	1017.1			
24	23:52	S 8	10	Fair	CLR	69	61				76%	NA	NA	30.03	1016.7			
25	0:52	S 5	10	Fair	CLR	68	61				78%	NA	NA	30.03	1016.6			
25	1:52	S 5	10	Fair	CLR	67	60	72	66		79%	NA	NA	30.02	1016.2			
25	2:52	S 6	10	Fair	CLR	67	60				79%	NA	NA	30	1015.6			
25	3:52	S 3	10	Partly Cloudy	SCT100	67	59				76%	NA	NA	29.98	1015			
25	4:52	Calm	10	Light Rain	SCT040 BKN050 BKN075	65	62				90%	NA	NA	29.98	1014.8			
25	5:52	SE 3	7	Light Rain	FEW015 OVC060	66	63				90%	NA	NA	29.98	1014.8	0.01		
25	6:52	S 9	9	Light Rain	FEW041 BKN095 OVC110	67	63				87%	NA	NA	29.95	1013.9	0.03		
25-Jul																		
25	18:52	S 10	10	Fair	CLR	74	68				82%	NA	NA	29.85	1010.4			
25	19:52	S 5	8	Fair	CLR	72	69	75	70		91%	NA	NA	29.86	1010.9			
25	20:52	SE 3	8	Overcast	FEW015 OVC110	72	69				91%	NA	NA	29.87	1011.4			
25	21:52	Calm	8	Mostly Cloudy	FEW015 BKN110	72	69				91%	NA	NA	29.88	1011.8			
25	22:52	Calm	4	Fog/Mist	SCT013 BKN080 BKN095	69	68				96%	NA	NA	29.88	1011.8			
25	23:52	Calm	4	Fog/Mist	FEW010	68	68				100%	NA	NA	29.88	1011.7			
26	0:52	S 5	4	Fog/Mist	FEW009	68	67				96%	NA	NA	29.89	1011.9			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)			Relative Humidity		Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
26	1:52	Calm	6	Fog/Mist	CLR	69	68	72	67	96%	NA	NA	29.89	1012			
26	2:52	Calm	4	Fog/Mist	BKN008 OVC013	66	65			96%	NA	NA	29.88	1011.8			
26	3:52	Calm	0.25	Fog	BKN005 BKN009	64	64			100%	NA	NA	29.88	1011.8			
26	4:52	Calm	0.15	Fog	VV001	64	64			100%	NA	NA	29.88	1011.8			
26	5:52	Calm	0.15	Fog	VV001	66	65			96%	NA	NA	29.89	1011.9			
26	6:52	Calm	0.25	Fog	VV002	66	66			100%	NA	NA	29.89	1012.1			
26-Jul																	
26	18:52	W 6	5	Fair with Haze	CLR	82	62			51%	NA	83	29.87	1011.3			
26	19:52	Calm	4	Fair with Haze	CLR	77	66	88	77	69%	NA	79	29.88	1011.6			
26	20:52	Calm	5	Fair with Haze	CLR	72	66			82%	NA	NA	29.91	1012.5			
26	21:52	SW 3	5	Fog/Mist	CLR	69	66			90%	NA	NA	29.92	1013			
26	22:52	Calm	5	Fog/Mist	CLR	67	64			91%	NA	NA	29.93	1013.2			
26	23:52	Calm	4	Fog/Mist	CLR	66	64			93%	NA	NA	29.93	1013.3			
27	0:52	Calm	3	Fog/Mist	FEW120	64	62			93%	NA	NA	29.94	1013.7			
27	1:52	Calm	3	Fog/Mist	CLR	63	61	77	63	93%	NA	NA	29.94	1013.4			
27	2:52	Calm	3	Fog/Mist	CLR	62	61			96%	NA	NA	29.93	1013.4			
27	3:52	Calm	3	Fog/Mist	BKN002	61	60			97%	NA	NA	29.93	1013.3			
27	4:52	Calm	0.5	Fog	VV002	61	60			97%	NA	NA	29.94	1013.6			
27	5:52	Calm	0.25	Fog	VV003	59	59			100%	NA	NA	29.96	1014.4			
27	6:52	Calm	0.15	Fog	VV002	60	60			100%	NA	NA	29.96	1014.3			
27-Jul																	
27	18:52	NE 5	4	Thunderstorm in Vicinity Rain Fog/Mist	BKN075 BKN090 OVC100	66	64			93%	NA	NA	29.97	1014.9	0.25		

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)			Relative Humidity		Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour					altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
27	19:52	Calm	8	Light Rain	FEW033 FEW095 BKN110	66	64	89	66	93%	NA	NA	29.95	1014.1	0.1		0.49
27	20:52	Calm	10	Mostly Cloudy	FEW004 BKN110	65	64			97%	NA	NA	29.96	1014.5			
27	21:52	Calm	10	Overcast	OVC009	66	64			93%	NA	NA	29.98	1014.9			
27	22:52	W 3	10	Overcast	OVC008	66	64			93%	NA	NA	29.96	1014.4			
27	23:52	Calm	10	Overcast	OVC007	65	63			93%	NA	NA	29.96	1014.3			
28	0:52	Calm	10	Overcast	OVC007	65	63			93%	NA	NA	29.95	1014			
28	1:52	N 3	10	Overcast	OVC005	65	63	66	65	93%	NA	NA	29.95	1013.9			
28	2:52	N 5	10	Overcast	BKN006 OVC013	65	63			93%	NA	NA	29.96	1014.3			
28	3:52	N 7	10	Overcast	OVC009	64	62			93%	NA	NA	29.97	1014.6			
28	4:52	NW 6	10	Overcast	BKN011 OVC018	63	61			93%	NA	NA	29.97	1014.6			
28	5:52	NW 6	10	Overcast	OVC015	63	61			93%	NA	NA	29.99	1015.4			
28	6:52	N 6	10	Overcast	FEW014 BKN034 OVC060	63	61			93%	NA	NA	30.01	1016.1			
28-Jul																	
28	18:52	N 7	10	Mostly Cloudy	BKN080	76	53			45%	NA	78	30.02	1016.4			
28	19:52	Calm	10	Fair	CLR	68	60	79	68	76%	NA	NA	30.02	1016.5			
28	20:52	Calm	10	Fair	CLR	64	60			87%	NA	NA	30.03	1016.6			
28	21:52	Calm	10	Fair	CLR	62	59			90%	NA	NA	30.04	1017.3			
28	22:52	Calm	10	Mostly Cloudy	BKN065	61	58			90%	NA	NA	30.05	1017.7			
28	23:52	Calm	10	Mostly Cloudy	BKN070	60	58			93%	NA	NA	30.06	1017.7			
29	0:52	Calm	10	Overcast	OVC080	60	58			93%	NA	NA	30.05	1017.5			
29	1:52	Calm	10	Overcast	BKN013 BKN055 OVC080	60	59	68	59	96%	NA	NA	30.05	1017.5			

Date	Time (edt)	Wind (mph)	Vis. (mi)	Weather	Sky Cond.	Temperature (ºF)			Relative Humidity	Wind Chill (°F)	Heat Index (°F)	Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour				altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
29	2:52	Calm	10	Overcast	OVC009	61	58		90%	NA	NA	30.04	1017.1			
29	3:52	Calm	10	Overcast	BKN009 OVC015	61	59		93%	NA	NA	30.04	1016.9			
29	4:52	Calm	10	Overcast	BKN012 OVC020	61	59		93%	NA	NA	30.03	1016.7			
29	5:52	Calm	10	Overcast	OVC012	62	59		90%	NA	NA	30.03	1016.7			
29	6:52	Calm	10	Mostly Cloudy	BKN014 BKN018	63	60		90%	NA	NA	30.04	1017.2			

NA is a National Weather Service designation and is believed to refer to values that are negligible and/or below the detection limit for the given parameter

Appendix D. Photos of Detector Set-up & Habitat

Figure D-1. Project 605843; Segment A – overview of set-up.

Figure D-2. Project 605843; Segment A – cone of detection.

Figure D-3. Project 605843; Segment A – facing north.

Figure D-4. Project 605843; Segment A – facing east.

Figure D-6. Project 605843; Segment A – facing west.

Figure D-8. Project 605843; Segment A – bridge.

Figure D-5. Project 605843; Segment A – facing south.

Figure D-7. Project 605843; Segment A – habitat area of detection.

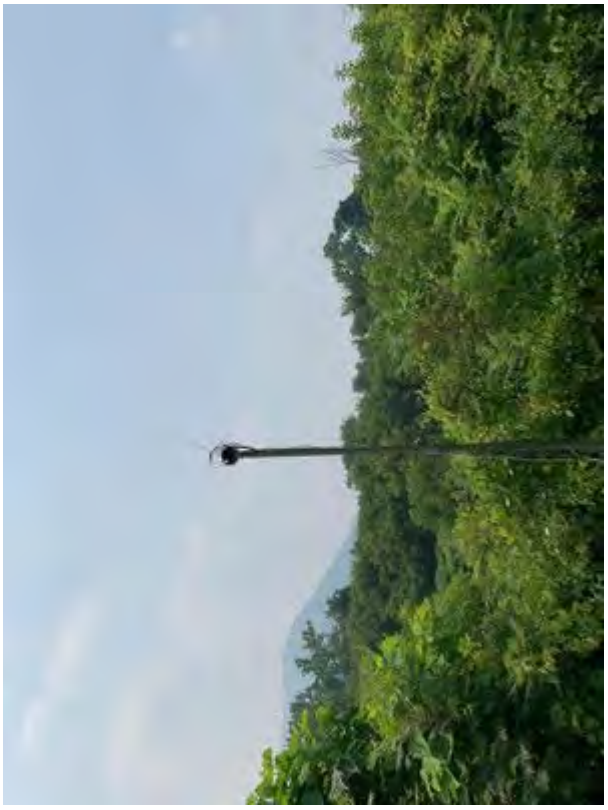


Figure D-10. Project 605843; Segment B – cone of detection.

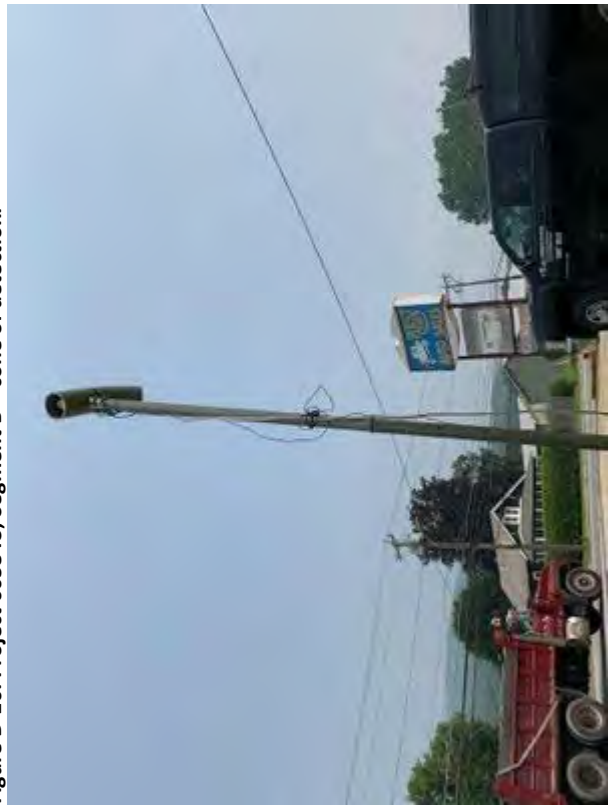


Figure D-12. Project 605843; Segment B – facing east.

Figure D-9. Project 605843; Segment B – overview of set-up.

Figure D-11. Project 605843; Segment B – facing north.

Figure D-14. Project 605843; Segment B – facing west.

Figure D-16. Project 605843; Segment B – bridge.

Figure D-13. Project 605843; Segment B – facing south.

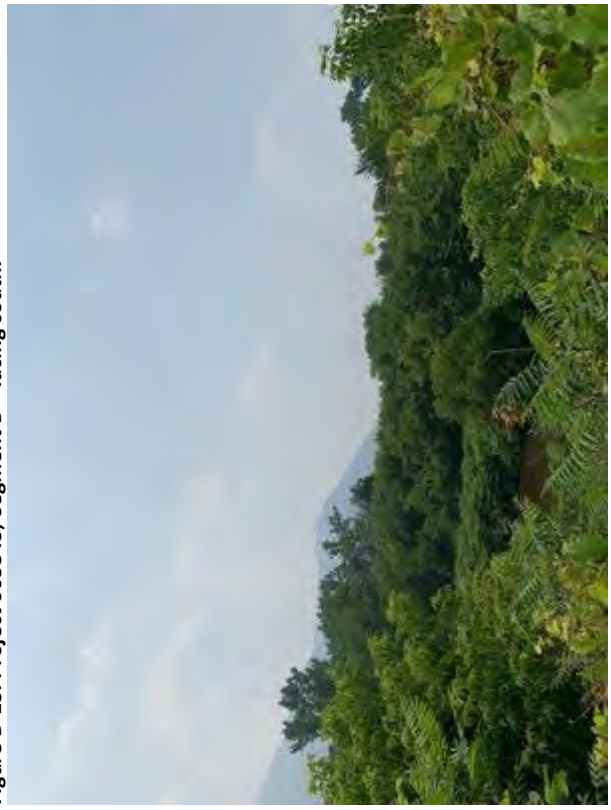


Figure D-15. Project 605843; Segment B – habitat area of detection.

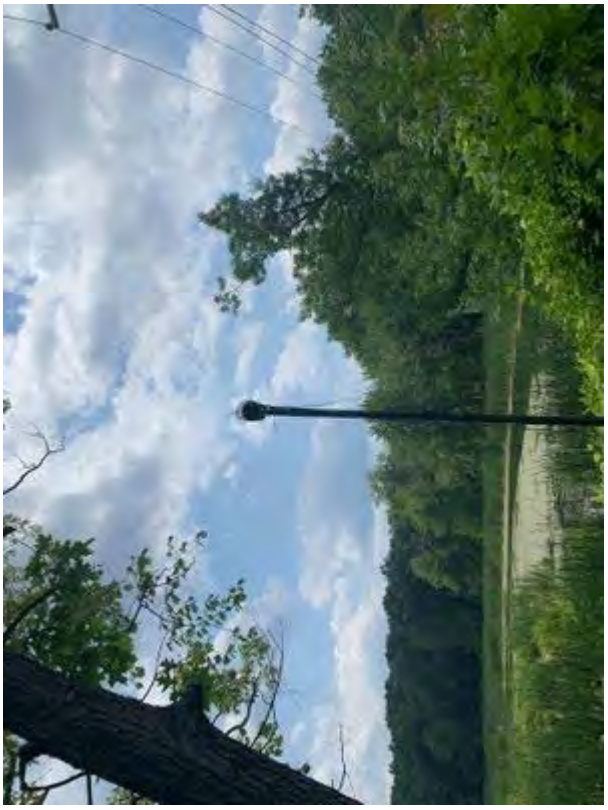


Figure D-18. Project 608830; Segment A – cone of detection.

Figure D-20. Project 608830; Segment A – facing east.

Figure D-17. Project 608830; Segment A – overview of set-up.

Figure D-19. Project 608830; Segment A – facing north.

Figure D-22. Project 608830; Segment A – facing west.

Figure D-24. Project 608830; Segment A –habitat east.

Figure D-21. Project 608830; Segment A – facing south.

Figure D-23. Project 608830; Segment A – habitat south.

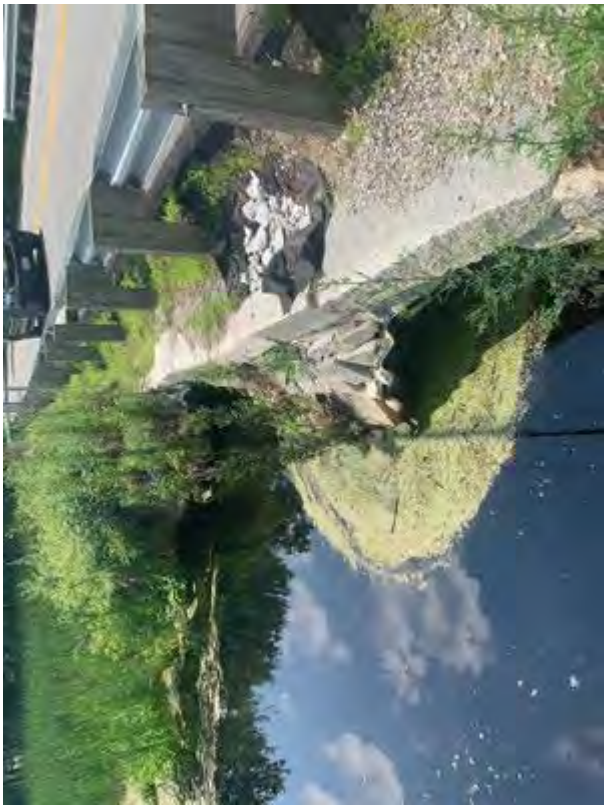


Figure D-26. Project 608830; Segment A – bridge southeast.

Figure D-28. Project 608830; Segment 1B – cone of detection.

Figure D-25. Project 608830; Segment A –bridge northwest.

Figure D-27. Project 608830; Segment 1B – overview of set-up.

Figure D-30. Project 608830; Segment 1B – facing east.

Figure D-32. Project 608830; Segment 1B – facing west.

Figure D-29. Project 608830; Segment 1B – facing north.

Figure D-31. Project 608830; Segment 1B – facing south.

Figure D-34. Project 608830; Segment 1B – habitat southwest.

Figure D-36. Project 608856; Segment A – cone of detection.

Figure D-33. Project 608830; Segment 1B – habitat area of detection.

Figure D-35. Project 608856; Segment A – overview of set-up.

Figure D-38. Project 608856; Segment A – facing east.

Figure D-40. Project 608856; Segment A – facing west.

Figure D-37. Project 608856; Segment A – facing north.

Figure D-39. Project 608856; Segment A – facing south.

Figure D-42. Project 608856; Segment A – bridge.

Figure D-44. Project 608856; Segment A – bridge under beams.

Figure D-41. Project 608856; Segment A – habitat area of detection.

Figure D-43. Project 608856; Segment A – bridge end wall.

Figure D-46. Project 608856; Segment B – cone of detection.

Figure D-48. Project 608856; Segment B – facing east.

Figure D-45. Project 608856; Segment B – overview of set-up.

Figure D-47. Project 608856; Segment B – facing north.

Figure D-50. Project 608856; Segment B – facing west.

Figure D-52. Project 608856; Segment B – habitat west.

Figure D-49. Project 608856; Segment B – facing south.

Figure D-51. Project 608856; Segment B – habitat area of detection.

Figure D-53. Project 608858; Segment A – overview of set-up.

Figure D-54. Project 608858; Segment A – cone of detection.

Figure D-55. Project 608858; Segment A – facing north.

Figure D-56. Project 608858; Segment A – facing east.

Figure D-58. Project 608858; Segment A – facing west.

Figure D-60. Project 608858; Segment A – bridge.

Figure D-57. Project 608858; Segment A – facing south.

Figure D-59. Project 608858; Segment A – habitat west.

Figure D-62. Project 608858; Segment A – bridge support.

Figure D-64. Project 608858; Segment B – cone of detection.

Figure D-61. Project 608858; Segment A – underside of bridge.

Figure D-63. Project 608858; Segment B – overview of set-up.

Figure D-66. Project 608858; Segment B – facing east.

Figure D-68. Project 608858; Segment B – facing west.

Figure D-65. Project 608858; Segment B – facing north.

Figure D-67. Project 608858; Segment B – facing south.

Figure D-70. Project 608858; Segment B – bridge.

Figure D-72. Project 609072; Segment A – cone of detection.

Figure D-69. Project 608858; Segment B – habitat.

Figure D-71. Project 609072; Segment A – overview of set-up.

Figure D-74. Project 609072; Segment A – facing east.

Figure D-76. Project 609072; Segment A – facing west.

Figure D-73. Project 609072; Segment A – facing north.

Figure D-75. Project 609072; Segment A – facing south.

Figure D-78. Project 609072; Segment A – bridge south Guardrail.

Figure D-80. Project 609072; Segment A – bridge, south side facing north.

Figure D-77. Project 609072; Segment A – habitat area of detection.

Figure D-79. Project 609072; Segment A – bridge, north side facing south.

Figure D-82. Project 609072; Segment B – cone of detection.

Figure D-84. Project 609072; Segment B – facing east.

Figure D-81. Project 609072; Segment B – overview of set-up.

Figure D-83. Project 609072; Segment B – facing north.

Figure D-86. Project 609072; Segment B – facing west.

Figure D-88. Project 609162; Segment A – cone of detection.

Figure D-85. Project 609072; Segment B – facing south.

Figure D-87. Project 609162; Segment A – overview of set-up.

Figure D-90. Project 609162; Segment A – facing east.

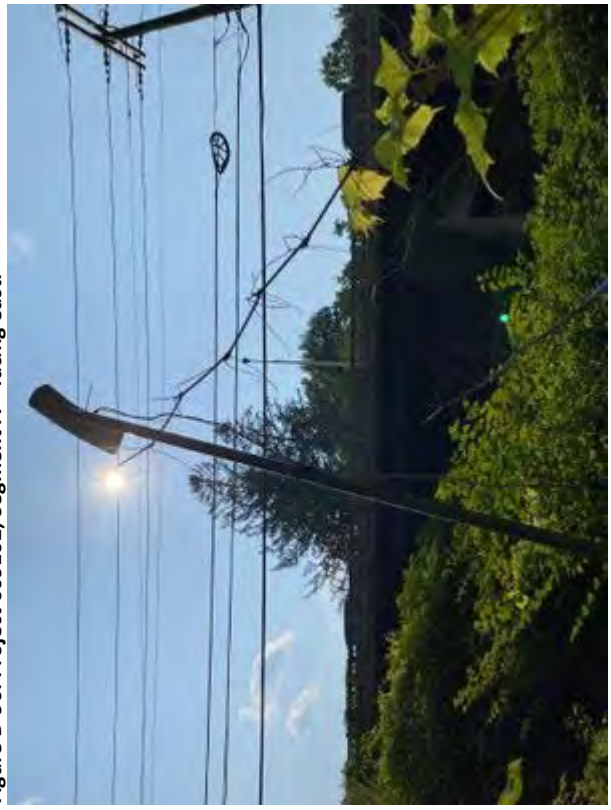


Figure D-92. Project 609162; Segment A – facing west.

Figure D-89. Project 609162; Segment A – facing north.

Figure D-91. Project 609162; Segment A – facing south.

Figure D-94. Project 609162; Segment A – bridge.

Figure D-93. Project 609162; Segment A – habitat area of detection.

Figure D-96. Project 610857; Segment A – cone of detection.

Figure D-95. Project 610857; Segment A – overview of set-up.

Figure D-98. Project 610857; Segment A – facing east.

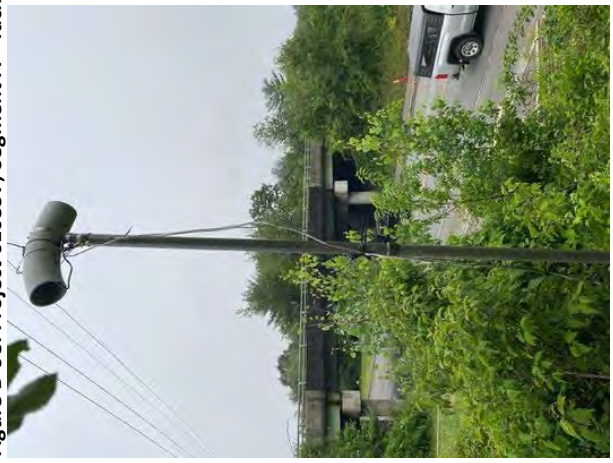


Figure D-100. Project 610857; Segment A – facing west.

Figure D-97. Project 610857; Segment A – facing north.

Figure D-99. Project 610857; Segment A – facing south.

Figure D-102. Project 610857; Segment A – west bound bridge, west underside.

Figure D-104. Project 610857; Segment B – cone of detection.

Figure D-101. Project 610857; Segment A – west bound bridge, view north.

Figure D-103. Project 610857; Segment B – overview of set-up.

Figure D-106. Project 610857; Segment B – facing east.

Figure D-108. Project 610857; Segment B – facing west.

Figure D-105. Project 610857; Segment B – facing north.

Figure D-107. Project 610857; Segment B – facing south.

Figure D-110. Project 610857; Segment B – habitat west.

Figure D-112. Project 610857; Segment B – east bound bridge, underside east.

Figure D-109. Project 610857; Segment B – habitat area of detection.

Figure D-111. Project 610857; Segment B – east bound bridge, view northwest.

Figure D-114. Project 610857; Segment C – cone of detection.

Figure D-113. Project 610857; Segment C – overview of set-up.

Figure D-116. Project 610857; Segment C – facing east.

Figure D-118. Project 610857; Segment C – facing west.

Figure D-115. Project 610857; Segment C – facing north.

Figure D-117. Project 610857; Segment C – facing south.

Figure D-120. Project 610857; Segment C – bridge abutment.

Figure D-119. Project 610857; Segment C – habitat area of detection.

Figure D-122. Project 610857; Segment D – cone of detection.

Figure D-121. Project 610857; Segment D – overview of set-up.

Figure D-124. Project 610857; Segment D – facing east.

Figure D-126. Project 610857; Segment D – facing west.

Figure D-123. Project 610857; Segment D – facing north.

Figure D-125. Project 610857; Segment D – facing south.

Figure D-128. Project 610857; Segment D – habitat north.

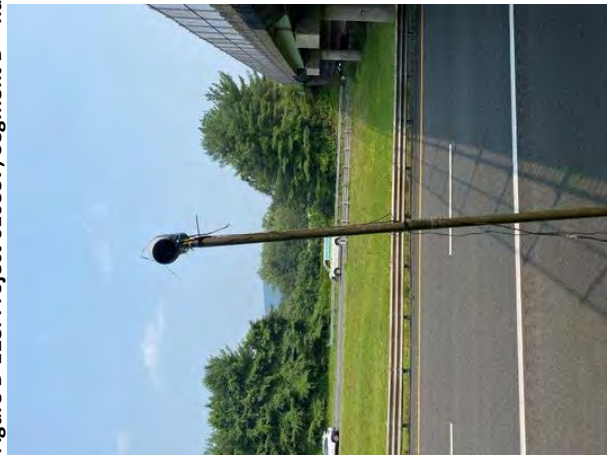


Figure D-130. Project 610857; Segment E – cone of detection.

Figure D-127. Project 610857; Segment D – habitat area of detection.

Figure D-129. Project 610857; Segment E – overview of set-up.

Figure D-132. Project 610857; Segment E – facing east.

Figure D-134. Project 610857; Segment E – facing west.

Figure D-131. Project 610857; Segment E – facing north.

Figure D-133. Project 610857; Segment E – facing south.

Figure D-136. Project 610857; Segment E – bridge abutment.

Figure D-138. Project 610857; Segment F – cone of detection.

Figure D-135. Project 610857; Segment E – habitat area of detection.

Figure D-137. Project 610857; Segment F – overview of set-up.

Figure D-140. Project 610857; Segment F – facing east.

Figure D-142. Project 610857; Segment F – facing west.

Figure D-139. Project 610857; Segment F – facing north.

Figure D-141. Project 610857; Segment F – facing south.

Figure D-144. Project 610857; Segment F – bridge abutment.

Figure D-143. Project 610857; Segment F – bridge.

Appendix E. Summary of Call Analyst's Findings

This appendix summarizes the findings of the manual call analysis, by Project and location. As required by the USFWS Guidelines, if KPro identified one or more northern long-eared bat calls on a night at a segment with p value(s) <0.05, all calls recorded on that night at that location were subsequently examined by the call analyst. Manual review confirms or refutes species identified by KPro when the call quality allows for such determinations. Some calls, however, are determined by the analyst as 'Unkn HiFreq' or 'Multi_Unkn'. These calls are generally of poor call quality and/or contain characteristics for multiple species of interest. Because of this ambiguity, these calls cannot be ruled out as belonging to state and/or federal listed species. In the following tables, the calls confirmed through manual review as northern long-eared bat (MYSE), or those calls than could not be ruled out as belonging to the northern long-eared bat, are highlighted in orange (if applicable). State-listed species calls (MYLE, MYLU, and PESU) confirmed through manual review, or those that could not be ruled out as such, are highlighted in green (if applicable).

Table E-1. Summary of the call analyst's findings for Location B, Project #608830, Bridge Rehabilitation of Beaver Brook Road Over Beaver Brook (Westford)

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/10/2021, 19:33	NoID	NOISE	
7/10/2021, 20:15	NoID	NOISE	
7/10/2021, 20:15	NoID	NOISE	
7/10/2021, 20:15	NoID	NOISE	
7/10/2021, 20:15	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	Noise	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:16	NoID	NOISE	
7/10/2021, 20:41	MYSE	MYLU	Call characteristics indicate bat species; F max < 90 kHz

Table E-2. Summary of the call analyst's findings for Location B, Project #609072, Bridge Replacement on Main Street Over Hemlock Brook (Williamstown)

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/31/2021, 20:35	MYSE	MYLU	Call characteristics indicate a different species
7/31/2021, 20:36	NA	NOISE	
7/31/2021, 20:41	NA	NOISE	
8/1/2021, 03:10	NA	NOISE	
8/1/2021, 03:33	NA	NOISE	

Table E-3. Summary of the call analyst's findings for Location C, Project #610857, Bridge Preservation of Three Bridges (Northfield)

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 20:32	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 20:32	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 20:32	LABO	LABO	
7/23/2021, 20:32	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 20:33	LABO	LABO	
7/23/2021, 20:52	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 20:52	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 20:54	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 20:54	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 20:59	LABO	LABO	
7/23/2021, 20:59	LABO	LABO	
7/23/2021, 20:59	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 20:59	LABO	LABO	
7/23/2021, 20:59	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 20:59	LABO	LABO	
7/23/2021, 21:02	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:03	MYLU	MYLU	
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:03	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:03	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:03	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:03	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:03	Noise	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:03	EPFU	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:03	EPFU	EPFU	
7/23/2021, 21:03	EPFU	EPFU	
7/23/2021, 21:03	NoID	EPFU	
7/23/2021, 21:03	EPFU	EPFU	
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:03	LABO	LABO	
7/23/2021, 21:04	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:04	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:04	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:04	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:04	NA	NOISE	
7/23/2021, 21:04	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:04	LABO	LABO	
7/23/2021, 21:04	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:04	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:04	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:04	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:04	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:04	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:05	NA	NOISE	
7/23/2021, 21:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:05	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:05	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:05	LABO	LABO	
7/23/2021, 21:05	LABO	LABO	
7/23/2021, 21:05	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:05	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:05	LABO	LABO	
7/23/2021, 21:05	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:05	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:05	LABO	LABO	
7/23/2021, 21:05	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	MYLU	LABO	Call characteristics indicate a different species
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	NA	LABO	Call characteristics indicate a different species
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	PESU	LABO	
7/23/2021, 21:06	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:06	LABO	LABO	
7/23/2021, 21:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:07	LABO	LABO	
7/23/2021, 21:07	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:07	NA	NOISE	
7/23/2021, 21:07	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:08	LABO	LABO	
7/23/2021, 21:08	LABO	LABO	
7/23/2021, 21:08	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:08	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:08	LABO	LABO	
7/23/2021, 21:08	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:08	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:08	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:08	NA	NOISE	
7/23/2021, 21:08	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:09	LABO	LABO	
7/23/2021, 21:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:09	LABO	LABO	
7/23/2021, 21:09	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:09	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:09	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:09	Noise	NOISE	
7/23/2021, 21:09	NA	NOISE	
7/23/2021, 21:12	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:13	LABO	LABO	
7/23/2021, 21:13	LABO	LABO	
7/23/2021, 21:14	Noise	NOISE	
7/23/2021, 21:14	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	LABO	LABO	
7/23/2021, 21:14	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:14	LABO	LABO	
7/23/2021, 21:15	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:15	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:15	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:15	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:15	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:15	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:15	NoID	EPFU	
7/23/2021, 21:15	NoID	EPFU	
7/23/2021, 21:15	EPFU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:15	EPFU	EPFU	
7/23/2021, 21:15	EPFU	EPFU	
7/23/2021, 21:15	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:16	LABO	LABO	
7/23/2021, 21:16	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	EPFU	EPFU	
7/23/2021, 21:16	EPFU	EPFU	
7/23/2021, 21:16	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:16	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	LABO	LABO	
7/23/2021, 21:16	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	PESU	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:16	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:16	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:16	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:16	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:16	NA	NOISE	
7/23/2021, 21:16	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 21:17	LABO	LABO	
7/23/2021, 21:17	LABO	LABO	
7/23/2021, 21:17	LABO	LABO	
7/23/2021, 21:17	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:17	LABO	LABO	
7/23/2021, 21:17	NA	NOISE	
7/23/2021, 21:17	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:17	NA	NOISE	
7/23/2021, 21:17	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:17	LABO	LABO	
7/23/2021, 21:17	NA	NOISE	
7/23/2021, 21:17	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:17	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 21:17	LABO	LABO	
7/23/2021, 21:17	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:18	LABO	LABO	
7/23/2021, 21:18	LABO	LABO	
7/23/2021, 21:18	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:18	LABO	LABO	
7/23/2021, 21:18	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:18	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:18	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:18	LABO	LABO	
7/23/2021, 21:18	LANO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:18	EPFU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:18	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:19	LABO	LABO	
7/23/2021, 21:19	LABO	LABO	
7/23/2021, 21:19	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:19	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:19	LABO	LABO	
7/23/2021, 21:19	LABO	LABO	
7/23/2021, 21:19	NA	NOISE	
7/23/2021, 21:19	LABO	LABO	
7/23/2021, 21:19	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:19	LABO	LABO	
7/23/2021, 21:20	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:20	LABO	LABO	
7/23/2021, 21:20	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:20	LABO	LABO	
7/23/2021, 21:20	LABO	LABO	
7/23/2021, 21:20	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:20	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:20	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:20	LABO	LABO	
7/23/2021, 21:20	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:20	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:20	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:21	LABO	LABO	
7/23/2021, 21:21	Noise	NOISE	
7/23/2021, 21:21	PESU	LABO	
7/23/2021, 21:21	NA	NOISE	
7/23/2021, 21:21	LABO	LABO	
7/23/2021, 21:21	LABO	LABO	
7/23/2021, 21:21	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:21	LABO	LABO	
7/23/2021, 21:21	NoID	EPFU	
7/23/2021, 21:21	EPFU	EPFU	
7/23/2021, 21:21	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 21:21	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:21	NA	NOISE	
7/23/2021, 21:21	LABO	LABO	
7/23/2021, 21:21	NA	NOISE	
7/23/2021, 21:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:22	NA	NOISE	
7/23/2021, 21:22	LABO	LABO	
7/23/2021, 21:22	NA	NOISE	
7/23/2021, 21:22	LABO	LABO	
7/23/2021, 21:22	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:22	LABO	LABO	
7/23/2021, 21:22	NA	NOISE	
7/23/2021, 21:22	LABO	LABO	
7/23/2021, 21:22	LABO	LABO	
7/23/2021, 21:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:23	LABO	LABO	
7/23/2021, 21:23	LABO	LABO	
7/23/2021, 21:23	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:23	LABO	LABO	
7/23/2021, 21:23	LABO	LABO	
7/23/2021, 21:23	PESU	LABO	
7/23/2021, 21:23	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:23	NA	NOISE	
7/23/2021, 21:23	PESU	LABO	
7/23/2021, 21:23	NA	NOISE	
7/23/2021, 21:24	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	PESU	LABO	
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	EPFU	EPFU	
7/23/2021, 21:24	EPFU	EPFU	
7/23/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:24	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:24	LABO	EPFU	
7/23/2021, 21:24	EPFU	EPFU	
7/23/2021, 21:24	LABO	LABO	
7/23/2021, 21:25	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:25	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:25	NA	NOISE	
7/23/2021, 21:25	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:25	EPFU	EPFU	
7/23/2021, 21:25	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:25	LABO	LABO	
7/23/2021, 21:25	LACI	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:25	LABO	LABO	
7/23/2021, 21:25	NoID	HiF-FeedingBuzz	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:25	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:25	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:25	NA	NOISE	
7/23/2021, 21:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:26	Noise	NOISE	
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	NA	NOISE	
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	Noise	NOISE	
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	LABO	LABO	
7/23/2021, 21:26	EPFU	EPFU	
7/23/2021, 21:27	EPFU	EPFU	
7/23/2021, 21:27	NoID	EPFU	
7/23/2021, 21:27	LABO	LABO	
7/23/2021, 21:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:27	EPFU	EPFU	
7/23/2021, 21:27	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:27	EPFU	EPFU	
7/23/2021, 21:27	NoID	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:27	EPFU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:27	EPFU	EPFU	
7/23/2021, 21:27	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:27	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:27	LABO	LABO	
7/23/2021, 21:27	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:27	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:27	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:27	LABO	LABO	
7/23/2021, 21:27	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:27	NoID	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:28	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:28	LABO	LABO	
7/23/2021, 21:28	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:28	LABO	LABO	
7/23/2021, 21:28	NA	NOISE	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:28	LABO	LABO	
7/23/2021, 21:28	MYSE	LABO with feeding buzz	Call characteristics indicate a different species
7/23/2021, 21:28	LABO	LABO	
7/23/2021, 21:28	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:28	LABO	LABO	
7/23/2021, 21:28	NA	NOISE	
7/23/2021, 21:28	LABO	LABO	
7/23/2021, 21:28	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:28	LABO	LABO	
7/23/2021, 21:28	EPFU	EPFU	
7/23/2021, 21:28	EPFU	EPFU	
7/23/2021, 21:29	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:29	NA	NOISE	
7/23/2021, 21:29	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:29	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:29	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:29	LABO	LABO	
7/23/2021, 21:29	LABO	LABO	
7/23/2021, 21:29	LABO	LABO with feeding buzz	
7/23/2021, 21:29	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:29	EPFU	EPFU	
7/23/2021, 21:29	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:29	LABO	LABO	
7/23/2021, 21:29	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:29	LABO	LABO	
7/23/2021, 21:29	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:29	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:29	EPFU	EPFU	
7/23/2021, 21:29	LABO	LABO	
7/23/2021, 21:29	LABO	EPFU	
7/23/2021, 21:30	NoID	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:30	LABO	LABO	
7/23/2021, 21:30	LABO	LABO	
7/23/2021, 21:30	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:30	EPFU	EPFU	
7/23/2021, 21:30	LABO	LABO	
7/23/2021, 21:30	NA	NOISE	
7/23/2021, 21:30	LABO	LABO	
7/23/2021, 21:30	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:30	EPFU	EPFU	
7/23/2021, 21:30	LABO	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:30	LABO	LABO	
7/23/2021, 21:30	EPFU	EPFU	
7/23/2021, 21:30	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:30	LACI	LACI	
7/23/2021, 21:30	LACI	LACI	
7/23/2021, 21:30	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:30	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:30	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:31	LABO	LABO	
7/23/2021, 21:31	NoID	NOISE	
7/23/2021, 21:31	LABO	LABO	
7/23/2021, 21:31	NA	NOISE	
7/23/2021, 21:31	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:31	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:31	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:31	LABO	LABO	
7/23/2021, 21:31	LABO	LABO	
7/23/2021, 21:31	EPFU	EPFU	
7/23/2021, 21:31	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:31	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:31	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:31	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:31	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:31	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:31	LABO	LABO	
7/23/2021, 21:31	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:32	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:32	LABO	LABO	
7/23/2021, 21:32	NA	NOISE	
7/23/2021, 21:32	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:32	EPFU	EPFU	
7/23/2021, 21:32	Noise	NOISE	
7/23/2021, 21:33	EPFU	EPFU	
7/23/2021, 21:33	EPFU	EPFU	
7/23/2021, 21:33	NA	NOISE	
7/23/2021, 21:33	NoID	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:33	EPFU	EPFU	
7/23/2021, 21:33	LABO	EPFU	
7/23/2021, 21:33	Noise	NOISE	
7/23/2021, 21:33	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:33	NoID	EPFU	
7/23/2021, 21:33	EPFU	EPFU_LANO	Poor quality &/or Ambiguous

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:33	LABO	LABO	
7/23/2021, 21:33	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:33	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:33	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:33	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:33	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:34	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:34	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:34	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:34	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:34	LABO	LABO	
7/23/2021, 21:34	LABO	LABO	
7/23/2021, 21:34	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:34	LACI	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:34	NoID	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:34	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:34	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:34	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:34	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:35	LABO	LABO	
7/23/2021, 21:35	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:35	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:35	LABO	LABO	
7/23/2021, 21:35	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:35	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:35	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:35	NoID	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:35	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:35	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:35	LABO	LABO	
7/23/2021, 21:35	LABO	LABO	
7/23/2021, 21:35	LABO	LABO	
7/23/2021, 21:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:36	EPFU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:36	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:36	NoID	EPFU	
7/23/2021, 21:36	EPFU	EPFU	
7/23/2021, 21:36	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:36	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:36	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:36	LABO	LABO	
7/23/2021, 21:36	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:36	LABO	LABO	
7/23/2021, 21:36	LABO	LABO	
7/23/2021, 21:36	NA	NOISE	
7/23/2021, 21:36	LABO	LABO	
7/23/2021, 21:36	NA	NOISE	
7/23/2021, 21:37	LABO	LABO	
7/23/2021, 21:37	NA	NOISE	
7/23/2021, 21:37	LABO	LABO	
7/23/2021, 21:37	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:37	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:37	NoID	EPFU	
7/23/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:37	LABO	LABO	
7/23/2021, 21:37	EPFU	EPFU	
7/23/2021, 21:37	EPFU	EPFU	
7/23/2021, 21:37	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:37	LABO	LABO	
7/23/2021, 21:37	LABO	LABO	
7/23/2021, 21:37	PESU	LABO-with buzz	Call characteristics indicate a different species
7/23/2021, 21:37	NA	NOISE	
7/23/2021, 21:37	LABO	LABO	
7/23/2021, 21:37	NA	NOISE	
7/23/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:38	NA	NOISE	
7/23/2021, 21:38	LABO	LABO	
7/23/2021, 21:38	EPFU	EPFU	
7/23/2021, 21:38	EPFU	EPFU	
7/23/2021, 21:38	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:38	EPFU	EPFU	
7/23/2021, 21:38	EPFU	EPFU	
7/23/2021, 21:38	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:38	EPFU	EPFU	
7/23/2021, 21:38	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:38	LABO	LABO	
7/23/2021, 21:38	LABO	LABO	
7/23/2021, 21:38	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:38	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:38	LABO	LABO	
7/23/2021, 21:38	LABO	LABO	
7/23/2021, 21:39	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:39	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:39	LABO	LABO	
7/23/2021, 21:39	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:39	NoID	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:39	LABO	LABO	
7/23/2021, 21:39	LABO	LABO	
7/23/2021, 21:39	LABO	LABO	
7/23/2021, 21:40	EPFU	EPFU	
7/23/2021, 21:40	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:40	NA	NOISE	
7/23/2021, 21:40	NoID	EPFU	
7/23/2021, 21:40	EPFU	EPFU	
7/23/2021, 21:40	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:40	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:40	LABO	LABO	
7/23/2021, 21:40	LABO	EPFU	
7/23/2021, 21:40	EPFU	EPFU	
7/23/2021, 21:40	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:40	LABO	LABO	
7/23/2021, 21:40	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:40	LABO	LABO	
7/23/2021, 21:40	NA	NOISE	
7/23/2021, 21:41	LABO	LABO	
7/23/2021, 21:41	LABO	LABO	
7/23/2021, 21:41	LABO	LABO	
7/23/2021, 21:41	LABO	LABO	
7/23/2021, 21:41	NoID	EPFU	
7/23/2021, 21:41	LABO	LABO	
7/23/2021, 21:41	EPFU	EPFU	
7/23/2021, 21:41	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:41	LABO	LABO	
7/23/2021, 21:41	EPFU	EPFU	
7/23/2021, 21:41	EPFU	EPFU	
7/23/2021, 21:41	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:41	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:41	LABO	LABO	
7/23/2021, 21:41	EPFU	EPFU	
7/23/2021, 21:41	EPFU	EPFU	
7/23/2021, 21:42	LABO	LABO	
7/23/2021, 21:42	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:42	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:42	NA	NOISE	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:42	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:42	EPFU	EPFU	
7/23/2021, 21:42	NoID	EPFU	
7/23/2021, 21:42	EPFU	EPFU	
7/23/2021, 21:42	EPFU	EPFU	
7/23/2021, 21:42	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:42	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:42	EPFU	EPFU	
7/23/2021, 21:42	EPFU	EPFU	
7/23/2021, 21:42	Noise	NOISE	
7/23/2021, 21:42	LABO	LABO	
7/23/2021, 21:42	EPFU	EPFU	
7/23/2021, 21:42	EPFU	EPFU	
7/23/2021, 21:42	LABO	LABO	
7/23/2021, 21:42	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:43	EPFU	EPFU	
7/23/2021, 21:43	EPFU	EPFU	
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:43	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	NA	NOISE	
7/23/2021, 21:43	LABO	LABO	
7/23/2021, 21:43	Noise	NOISE	
7/23/2021, 21:43	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:44	LABO	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:44	EPFU	EPFU	
7/23/2021, 21:44	LABO	LABO	
7/23/2021, 21:44	LABO	LABO	
7/23/2021, 21:44	EPFU	EPFU	
7/23/2021, 21:44	EPFU	EPFU	
7/23/2021, 21:44	LABO	LABO	
7/23/2021, 21:44	NoID	EPFU	
7/23/2021, 21:44	EPFU	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:44	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:44	LABO	LABO	
7/23/2021, 21:44	NA	NOISE	
7/23/2021, 21:44	LABO	LABO	
7/23/2021, 21:44	NA	NOISE	
7/23/2021, 21:44	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:44	EPFU	EPFU	
7/23/2021, 21:44	EPFU	EPFU	
7/23/2021, 21:44	LABO	LABO	
7/23/2021, 21:44	NoID	NOISE	
7/23/2021, 21:44	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:44	EPFU	EPFU	
7/23/2021, 21:44	Noise	NOISE	
7/23/2021, 21:45	LABO	LABO	
7/23/2021, 21:45	EPFU	EPFU	
7/23/2021, 21:45	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:45	EPFU	HiF_LoF	Two species present
7/23/2021, 21:45	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:45	LABO	LABO	
7/23/2021, 21:45	NA	NOISE	
7/23/2021, 21:45	LABO	LABO	
7/23/2021, 21:45	NA	NOISE	
7/23/2021, 21:45	LABO	LABO	
7/23/2021, 21:45	LABO	LABO	
7/23/2021, 21:45	LABO	LABO	
7/23/2021, 21:45	NA	NOISE	
7/23/2021, 21:45	EPFU	EPFU	
7/23/2021, 21:45	EPFU	EPFU	
7/23/2021, 21:45	LABO	LABO	
7/23/2021, 21:45	Noise	NOISE	
7/23/2021, 21:45	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:45	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:45	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:45	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 21:45	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:46	LABO	LABO	
7/23/2021, 21:46	EPFU	EPFU	
7/23/2021, 21:46	EPFU	EPFU	
7/23/2021, 21:46	LABO	LABO	
7/23/2021, 21:46	LABO	LABO	
7/23/2021, 21:46	LABO	LABO	
7/23/2021, 21:46	EPFU	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:46	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:46	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:46	NA	NOISE	
7/23/2021, 21:46	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:46	NoID	HiF and LoF	Two species present
7/23/2021, 21:46	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:46	LABO	LABO	
7/23/2021, 21:46	LABO	LABO	
7/23/2021, 21:46	LABO	LABO	
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:47	LABO	LABO	
7/23/2021, 21:47	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:47	Noise	NOISE	
7/23/2021, 21:47	EPFU	EPFU	
7/23/2021, 21:47	EPFU	EPFU	
7/23/2021, 21:47	EPFU	EPFU	
7/23/2021, 21:48	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:48	NA	NOISE	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	LABO	LABO	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	LABO	HiF and LoF	Two species present
7/23/2021, 21:48	LABO	LABO	
7/23/2021, 21:48	EPFU	HiF and LoF	Two species present
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	NoID	HiF and LoF	Two species present
7/23/2021, 21:48	LABO	LABO	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:48	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	LABO	LABO	
7/23/2021, 21:48	LABO	LABO	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	EPFU	EPFU	
7/23/2021, 21:48	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:48	LABO	LABO	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	NA	NOISE	
7/23/2021, 21:49	LABO	LABO	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:49	LABO	LABO	
7/23/2021, 21:49	NA	NOISE	
7/23/2021, 21:49	LABO	LABO	
7/23/2021, 21:49	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:49	PESU	LABO	
7/23/2021, 21:49	LABO	LABO	
7/23/2021, 21:49	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	Noise	NOISE	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	NoID	NOISE	
7/23/2021, 21:49	LABO	HiF and LoF	Two species present
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:49	EPFU	EPFU	
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	EPFU	EPFU	
7/23/2021, 21:50	EPFU	EPFU	
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:50	EPFU	EPFU	
7/23/2021, 21:50	EPFU	EPFU	
7/23/2021, 21:50	NoID	HiF and LoF	Two species present
7/23/2021, 21:50	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:50	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:50	NoID	HiF and LoF	Two species present
7/23/2021, 21:50	EPFU	EPFU	
7/23/2021, 21:50	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	LABO	LABO	
7/23/2021, 21:50	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:51	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:51	LABO	LABO	
7/23/2021, 21:51	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:51	LABO	LABO	
7/23/2021, 21:51	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:51	NA	NOISE	
7/23/2021, 21:51	LABO	LABO	
7/23/2021, 21:51	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:51	EPFU	EPFU	
7/23/2021, 21:51	LABO	LABO	
7/23/2021, 21:51	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:51	LABO	LABO	
7/23/2021, 21:51	Noise	NOISE	
7/23/2021, 21:51	PESU	HiF and LoF	Two species present
7/23/2021, 21:51	Noise	NOISE	
7/23/2021, 21:51	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:51	LABO	LABO	
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:52	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	EPFU	EPFU	
7/23/2021, 21:52	EPFU	EPFU	
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:52	EPFU	EPFU	
7/23/2021, 21:52	EPFU	EPFU	
7/23/2021, 21:52	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	EPFU	EPFU	
7/23/2021, 21:53	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	LABO	
7/23/2021, 21:53	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:54	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	NA	NOISE	
7/23/2021, 21:54	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:54	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:54	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	LABO	LABO	
7/23/2021, 21:54	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:55	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:55	EPFU	EPFU	
7/23/2021, 21:55	EPFU	EPFU	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:55	EPFU	EPFU	
7/23/2021, 21:55	EPFU	EPFU	
7/23/2021, 21:55	EPFU	EPFU	
7/23/2021, 21:55	LABO	LABO	
7/23/2021, 21:55	NoID	HiF and LoF	Two species present
7/23/2021, 21:55	EPFU	EPFU	
7/23/2021, 21:56	LABO	LABO	
7/23/2021, 21:56	LABO	LABO	
7/23/2021, 21:56	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:56	LABO	LABO	
7/23/2021, 21:56	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:56	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:56	NA	NOISE	
7/23/2021, 21:56	LABO	LABO	
7/23/2021, 21:56	LABO	LABO	
7/23/2021, 21:56	NA	NOISE	
7/23/2021, 21:56	LABO	LABO	
7/23/2021, 21:56	NA	NOISE	
7/23/2021, 21:56	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:56	NA	NOISE	
7/23/2021, 21:56	LABO	LABO	
7/23/2021, 21:56	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:57	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:58	LABO	LABO	
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:59	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	NA	LABO	Call characteristics indicate a different species
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	NA	NOISE	
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 21:59	LABO	LABO	
7/23/2021, 21:59	Noise	LABO	Call characteristics indicate a different species
7/23/2021, 22:00	LABO	LABO	
7/23/2021, 22:00	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:00	LABO	LABO	
7/23/2021, 22:00	NA	NOISE	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:00	LABO	LABO	
7/23/2021, 22:00	LABO	LABO	
7/23/2021, 22:00	LABO	LABO	
7/23/2021, 22:00	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:00	LABO	LABO	
7/23/2021, 22:00	EPFU	EPFU	
7/23/2021, 22:00	EPFU	EPFU	
7/23/2021, 22:00	EPFU	EPFU	
7/23/2021, 22:00	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:00	EPFU	HiF and LoF	Two species present
7/23/2021, 22:00	EPFU	EPFU	
7/23/2021, 22:00	EPFU	EPFU	
7/23/2021, 22:00	LABO	HiF and LoF	Two species present
7/23/2021, 22:00	EPFU	EPFU	
7/23/2021, 22:01	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:01	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:01	EPFU	HiF and LoF	Two species present
7/23/2021, 22:01	LABO	LABO	
7/23/2021, 22:01	Noise	NOISE	
7/23/2021, 22:01	LABO	LABO	
7/23/2021, 22:01	LABO	LABO	
7/23/2021, 22:01	NA	NOISE	
7/23/2021, 22:01	LABO	LABO	
7/23/2021, 22:01	LABO	LABO	
7/23/2021, 22:01	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:01	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:01	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:01	LABO	LABO	
7/23/2021, 22:01	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:02	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:02	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:02	LABO	LABO	
7/23/2021, 22:02	LABO	LABO	
7/23/2021, 22:02	LABO	LABO	
7/23/2021, 22:02	LABO	LABO	
7/23/2021, 22:02	LABO	LABO	
7/23/2021, 22:02	NoID	NOISE	
7/23/2021, 22:02	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:02	NA	NOISE	
7/23/2021, 22:02	LABO	LABO	
7/23/2021, 22:02	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:02	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:02	LANO	HiF and LoF	Two species present
7/23/2021, 22:03	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:03	LABO	LABO	
7/23/2021, 22:03	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:03	LABO	LABO	
7/23/2021, 22:03	NA	NOISE	
7/23/2021, 22:03	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:03	NA	NOISE	
7/23/2021, 22:03	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:03	LABO	LABO	
7/23/2021, 22:03	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:04	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:04	NA	NOISE	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	LABO	LABO	
7/23/2021, 22:04	EPFU	EPFU	
7/23/2021, 22:04	EPFU	EPFU	
7/23/2021, 22:05	LABO	LABO	
7/23/2021, 22:05	EPFU	HiF and LoF	Two species present
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	LABO	LABO	
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:05	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	Noise	NOISE	
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	EPFU	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:05	NA	NOISE	
7/23/2021, 22:05	NoID	HiF and LoF	Two species present
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	LABO	LABO	
7/23/2021, 22:05	LABO	LABO	
7/23/2021, 22:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:05	EPFU	EPFU	
7/23/2021, 22:05	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:06	LABO	LABO	
7/23/2021, 22:06	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 22:06	EPFU	HiF and LoF	Two species present
7/23/2021, 22:06	NoID	HiF and LoF	Two species present
7/23/2021, 22:06	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:06	LABO	HiF and LoF	Two species present
7/23/2021, 22:06	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:06	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:06	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:06	EPFU	EPFU	
7/23/2021, 22:06	EPFU	EPFU	
7/23/2021, 22:06	EPFU	EPFU	
7/23/2021, 22:07	EPFU	EPFU	
7/23/2021, 22:07	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:07	LABO	LABO	
7/23/2021, 22:07	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:07	LABO	LABO	
7/23/2021, 22:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:07	LABO	LABO	
7/23/2021, 22:07	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:07	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:07	LANO	LANO	
7/23/2021, 22:07	LABO	LABO	
7/23/2021, 22:07	LABO	LABO	
7/23/2021, 22:08	LABO	LABO	
7/23/2021, 22:08	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:08	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:08	LABO	LABO	
7/23/2021, 22:08	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:08	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:08	NA	NOISE	
7/23/2021, 22:08	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 22:08	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:08	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:08	LABO	LABO	
7/23/2021, 22:08	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 22:08	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:09	LABO	LABO	
7/23/2021, 22:09	LABO	LABO	
7/23/2021, 22:09	LABO	LABO	
7/23/2021, 22:09	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:09	Noise	LABO	Call characteristics indicate a different species
7/23/2021, 22:09	LABO	LABO	
7/23/2021, 22:09	LABO	LABO	
7/23/2021, 22:09	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:09	LABO	LABO	
7/23/2021, 22:09	LABO	LABO	
7/23/2021, 22:10	LABO	LABO	
7/23/2021, 22:10	NA	NOISE	
7/23/2021, 22:10	LABO	LABO	
7/23/2021, 22:10	LABO	LABO	
7/23/2021, 22:10	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:10	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:10	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:10	LABO	LABO	
7/23/2021, 22:10	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:10	LABO	LABO	
7/23/2021, 22:10	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:10	LABO	LABO	
7/23/2021, 22:11	LABO	LABO	
7/23/2021, 22:11	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:11	LABO	LABO	
7/23/2021, 22:11	LABO	LABO	
7/23/2021, 22:11	LABO	LABO	
7/23/2021, 22:11	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:11	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:11	LABO	LABO	
7/23/2021, 22:11	LABO	LABO	
7/23/2021, 22:11	LABO	LABO	
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:17	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:17	LABO	LABO	
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	NA	NOISE	
7/23/2021, 22:18	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	LABO	LABO	
7/23/2021, 22:18	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:19	LABO	LABO	
7/23/2021, 22:19	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:19	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:19	NA	NOISE	
7/23/2021, 22:19	LABO	LABO	
7/23/2021, 22:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:19	LABO	LABO	
7/23/2021, 22:19	NA	NOISE	
7/23/2021, 22:19	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:19	NA	NOISE	
7/23/2021, 22:19	LABO	LABO	
7/23/2021, 22:19	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:19	LABO	LABO	
7/23/2021, 22:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:19	LABO	LABO	
7/23/2021, 22:19	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:20	LABO	LABO	
7/23/2021, 22:20	NA	NOISE	
7/23/2021, 22:20	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:20	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:20	LABO	LABO	
7/23/2021, 22:20	NA	NOISE	
7/23/2021, 22:20	LABO	LABO	
7/23/2021, 22:20	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:20	LABO	LABO	
7/23/2021, 22:20	NA	NOISE	
7/23/2021, 22:20	LABO	LABO	
7/23/2021, 22:20	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:20	Noise	NOISE	
7/23/2021, 22:20	LABO	LABO	
7/23/2021, 22:20	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:21	LABO	LABO	
7/23/2021, 22:21	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:21	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:21	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:21	LABO	LABO	
7/23/2021, 22:21	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:21	EPFU	EPFU	
7/23/2021, 22:21	EPFU	EPFU	
7/23/2021, 22:21	Noise	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:21	LABO	LABO	
7/23/2021, 22:21	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 22:21	EPFU	EPFU	
7/23/2021, 22:21	EPFU	EPFU	
7/23/2021, 22:21	LABO	HiF and LoF	Two species present
7/23/2021, 22:21	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:21	NA	NOISE	
7/23/2021, 22:21	LABO	LABO	
7/23/2021, 22:21	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:21	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:21	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 22:22	EPFU	EPFU	
7/23/2021, 22:22	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 22:22	LABO	LABO	
7/23/2021, 22:22	NA	NOISE	
7/23/2021, 22:22	LABO	LABO	
7/23/2021, 22:22	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:22	LABO	LABO	
7/23/2021, 22:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:22	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:22	EPFU	EPFU_LANO	Poor quality &/or Ambiguous

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:22	EPFU	EPFU	
7/23/2021, 22:22	NoID	EPFU	
7/23/2021, 22:22	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:22	EPFU	EPFU	
7/23/2021, 22:22	EPFU	EPFU	
7/23/2021, 22:22	NA	NOISE	
7/23/2021, 22:22	NoID	EPFU	
7/23/2021, 22:22	EPFU	EPFU	
7/23/2021, 22:22	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:22	LABO	LABO	
7/23/2021, 22:23	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:23	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:23	LABO	LABO	
7/23/2021, 22:23	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:24	LABO	LABO	
7/23/2021, 22:24	Noise	NOISE	
7/23/2021, 22:24	LABO	LABO	
7/23/2021, 22:24	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:24	LABO	LABO	
7/23/2021, 22:24	NA	NOISE	
7/23/2021, 22:24	LABO	LABO	
7/23/2021, 22:24	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:24	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:24	LABO	LABO	
7/23/2021, 22:24	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:24	LABO	LABO	
7/23/2021, 22:24	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:25	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:25	EPFU	EPFU	
7/23/2021, 22:25	EPFU	EPFU	
7/23/2021, 22:25	EPFU	EPFU	
7/23/2021, 22:25	LABO	LABO	
7/23/2021, 22:25	LABO	LABO	
7/23/2021, 22:25	LABO	LABO	
7/23/2021, 22:25	LABO	EPFU	
7/23/2021, 22:25	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:25	LABO	LABO	
7/23/2021, 22:26	LABO	LABO	
7/23/2021, 22:26	Noise	NOISE	
7/23/2021, 22:26	LABO	LABO	
7/23/2021, 22:26	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:26	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:26	LABO	LABO	
7/23/2021, 22:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:26	NA	NOISE	
7/23/2021, 22:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:26	LABO	LABO	
7/23/2021, 22:26	NA	NOISE	
7/23/2021, 22:27	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:27	LABO	LABO	
7/23/2021, 22:27	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:27	LABO	LABO	
7/23/2021, 22:27	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:27	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:27	NA	NOISE	
7/23/2021, 22:27	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:27	LABO	LABO	
7/23/2021, 22:27	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:27	LABO	LABO	
7/23/2021, 22:27	EPFU	EPFU	
7/23/2021, 22:27	EPFU	EPFU	
7/23/2021, 22:27	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 22:27	LABO	LABO	
7/23/2021, 22:27	Noise	HiF and LoF	Two species present
7/23/2021, 22:28	LABO	LABO	
7/23/2021, 22:28	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:28	NA	NOISE	
7/23/2021, 22:28	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:28	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:28	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:28	LABO	LABO	
7/23/2021, 22:28	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:28	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:28	NA	NOISE	
7/23/2021, 22:28	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:28	NA	NOISE	
7/23/2021, 22:28	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:28	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:28	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:28	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:29	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:29	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:29	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:29	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:30	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:30	LABO	LABO	
7/23/2021, 22:30	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:30	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:31	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:31	LABO	LABO	
7/23/2021, 22:31	Noise	LABO	Call characteristics indicate a different species
7/23/2021, 22:31	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:31	NA	NOISE	
7/23/2021, 22:31	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:31	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:31	LABO	LABO	
7/23/2021, 22:31	LABO	LABO	
7/23/2021, 22:31	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:31	LABO	LABO	
7/23/2021, 22:31	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:31	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:31	LABO	LABO	
7/23/2021, 22:32	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:32	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:32	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:32	LABO	LABO	
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:33	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:33	LABO	LABO	
7/23/2021, 22:34	LABO	LABO	
7/23/2021, 22:34	LABO	LABO	
7/23/2021, 22:34	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:34	LABO	LABO	
7/23/2021, 22:34	LABO	LABO	
7/23/2021, 22:34	Noise	NOISE	
7/23/2021, 22:34	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:34	Noise	NOISE	
7/23/2021, 22:34	LABO	LABO	
7/23/2021, 22:34	LABO	LABO	
7/23/2021, 22:34	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:34	NA	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:35	LABO	LABO	
7/23/2021, 22:35	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:35	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 22:36	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:36	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:36	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:36	LABO	LABO	
7/23/2021, 22:36	NA	NOISE	
7/23/2021, 22:36	LABO	LABO	
7/23/2021, 22:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:36	LABO	LABO	
7/23/2021, 22:37	LABO	LABO	
7/23/2021, 22:37	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:37	LABO	LABO	
7/23/2021, 22:37	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:37	LABO	LABO	
7/23/2021, 22:37	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:37	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:37	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:37	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:37	LABO	LABO	
7/23/2021, 22:37	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:37	LABO	LABO	
7/23/2021, 22:37	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:37	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:37	NA	NOISE	
7/23/2021, 22:37	LABO	LABO	
7/23/2021, 22:37	LABO	LABO	
7/23/2021, 22:38	LABO	LABO	
7/23/2021, 22:38	LABO	LABO	
7/23/2021, 22:38	LABO	LABO	
7/23/2021, 22:38	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:38	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:38	LABO	LABO	
7/23/2021, 22:38	LABO	LABO	
7/23/2021, 22:38	NA	NOISE	
7/23/2021, 22:38	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:38	LABO	LABO	
7/23/2021, 22:38	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:39	LABO	LABO	
7/23/2021, 22:39	NA	NOISE	
7/23/2021, 22:39	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:39	LABO	LABO	
7/23/2021, 22:39	LABO	LABO	
7/23/2021, 22:39	LABO	LABO	
7/23/2021, 22:39	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:40	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:40	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:40	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:40	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:40	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:40	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:40	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:40	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:40	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	LABO	LABO	
7/23/2021, 22:41	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:42	LABO	LABO	
7/23/2021, 22:43	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:43	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:43	LABO	LABO	
7/23/2021, 22:43	LABO	LABO	
7/23/2021, 22:43	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:43	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 22:43	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:43	LABO	LABO	
7/23/2021, 22:43	LABO	LABO	
7/23/2021, 22:43	NA	NOISE	
7/23/2021, 22:44	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:44	LABO	LABO	
7/23/2021, 22:44	LABO	LABO	
7/23/2021, 22:44	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:44	LABO	LABO	
7/23/2021, 22:44	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:44	LABO	LABO	
7/23/2021, 22:44	NA	NOISE	
7/23/2021, 22:45	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 22:45	Noise	NOISE	
7/23/2021, 22:45	LABO	LABO	
7/23/2021, 22:45	LABO	LABO	
7/23/2021, 22:45	LABO	LABO	
7/23/2021, 22:45	LABO	LABO	
7/23/2021, 22:45	LABO	LABO	
7/23/2021, 22:45	LABO	LABO	
7/23/2021, 22:45	EPFU	EPFU	
7/23/2021, 22:45	NoID	EPFU	
7/23/2021, 22:45	EPFU	EPFU	
7/23/2021, 22:45	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/23/2021, 22:45	LABO	LABO	
7/23/2021, 22:46	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 22:46	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:46	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:46	LABO	LABO	
7/23/2021, 22:54	EPFU	LoF	Poor quality &/or Ambiguous
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	LABO	LABO	
7/23/2021, 22:58	NA	NOISE	
7/23/2021, 22:59	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 22:59	LABO	LABO	
7/23/2021, 22:59	LABO	LABO	
7/23/2021, 22:59	LABO	LABO	
7/23/2021, 23:01	LABO	LABO	
7/23/2021, 23:01	PESU	LABO	
7/23/2021, 23:02	LABO	LABO	
7/23/2021, 23:05	LABO	LABO	
7/23/2021, 23:05	LABO	LABO	
7/23/2021, 23:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:06	PESU	HiF	Poor quality &/or Ambiguous
7/23/2021, 23:06	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:11	LABO	LABO	
7/23/2021, 23:11	LABO	LABO	
7/23/2021, 23:11	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:11	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:11	LABO	LABO	
7/23/2021, 23:11	NoID	MYLU	Call characteristics indicate bat species
7/23/2021, 23:11	LABO	LABO	
7/23/2021, 23:11	LABO	LABO	
7/23/2021, 23:11	LABO	LABO	
7/23/2021, 23:11	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:12	LABO	LABO	
7/23/2021, 23:12	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:12	PESU	LABO	Call characteristics indicate a different species
7/23/2021, 23:12	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:12	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:12	LABO	LABO	
7/23/2021, 23:12	LABO	LABO	
7/23/2021, 23:12	LABO	LABO	
7/23/2021, 23:12	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:12	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:13	LABO	LABO	
7/23/2021, 23:13	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 23:13	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 23:13	LABO	HiF	Poor quality &/or Ambiguous
7/23/2021, 23:13	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:13	LABO	LABO	
7/23/2021, 23:13	LABO	LABO	
7/23/2021, 23:13	LABO	LABO	
7/23/2021, 23:13	LABO	LABO	
7/23/2021, 23:13	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:13	LABO	LABO	
7/23/2021, 23:13	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:13	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:17	LABO	LABO	
7/23/2021, 23:17	LABO	LABO	
7/23/2021, 23:17	LABO	LABO	
7/23/2021, 23:17	LABO	LABO	
7/23/2021, 23:17	LABO	LABO	
7/23/2021, 23:17	LABO	LABO	
7/23/2021, 23:17	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:17	LABO	LABO	
7/23/2021, 23:17	NA	NOISE	
7/23/2021, 23:18	LABO	LABO	
7/23/2021, 23:18	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:18	LABO	LABO	
7/23/2021, 23:18	LABO	LABO	
7/23/2021, 23:18	LABO	LABO	
7/23/2021, 23:18	LABO	LABO	
7/23/2021, 23:20	MYLU	LABO	Call characteristics indicate a different species
7/23/2021, 23:20	LABO	LABO	
7/23/2021, 23:20	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:20	LABO	LABO	
7/23/2021, 23:20	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:20	LABO	LABO	
7/23/2021, 23:20	NA	NOISE	
7/23/2021, 23:20	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:20	LABO	LABO	
7/23/2021, 23:20	LABO	LABO	
7/23/2021, 23:23	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:23	LABO	LABO	
7/23/2021, 23:23	LABO	LABO	
7/23/2021, 23:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:23	LABO	LABO	
7/23/2021, 23:23	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:24	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/23/2021, 23:24	NA	NOISE	
7/23/2021, 23:24	MYLU	MYLU	
7/23/2021, 23:24	MYLU	MYLU	
7/23/2021, 23:24	MYLU	MYLU	
7/23/2021, 23:24	NoID	MYLU	Call characteristics indicate bat species
7/23/2021, 23:25	LABO	LABO	
7/23/2021, 23:25	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:25	LABO	LABO	
7/23/2021, 23:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:26	LABO	LABO	
7/23/2021, 23:26	LABO	LABO	
7/23/2021, 23:26	NA	NOISE	
7/23/2021, 23:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:26	NA	NOISE	
7/23/2021, 23:26	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:26	LABO	LABO	
7/23/2021, 23:28	MYLU	MYLU	
7/23/2021, 23:28	MYLU	MYLU	
7/23/2021, 23:29	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:29	LABO	LABO	
7/23/2021, 23:29	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:29	LABO	LABO	
7/23/2021, 23:29	LABO	LABO	
7/23/2021, 23:29	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/23/2021, 23:32	LABO	LABO	
7/23/2021, 23:32	NoID	LABO	Call characteristics indicate a different species
7/23/2021, 23:48	MYLU	MYLU	
7/23/2021, 23:48	MYLU	MYLU	
7/23/2021, 23:58	MYLU	HiF	Poor quality &/or Ambiguous
7/23/2021, 23:58	MYLU	MYLU	
7/24/2021, 00:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:17	LABO	LABO	
7/24/2021, 00:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:18	LABO	LABO	
7/24/2021, 00:19	LABO	LABO	
7/24/2021, 00:19	LABO	LABO	
7/24/2021, 00:19	LABO	LABO	
7/24/2021, 00:19	LABO	LABO	
7/24/2021, 00:20	LABO	LABO	
7/24/2021, 00:20	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:21	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 00:21	LABO	LABO	
7/24/2021, 00:21	LABO	LABO	
7/24/2021, 00:21	LABO	LABO	
7/24/2021, 00:21	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 00:21	LABO	LABO	
7/24/2021, 00:21	LABO	LABO	
7/24/2021, 00:21	LABO	LABO	
7/24/2021, 00:21	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:21	LABO	LABO	
7/24/2021, 00:21	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	LABO	LABO	
7/24/2021, 00:22	LABO	LABO	
7/24/2021, 00:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	LABO	LABO	
7/24/2021, 00:22	LABO	LABO	
7/24/2021, 00:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:22	LABO	LABO	
7/24/2021, 00:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:23	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:23	LABO	LABO	
7/24/2021, 00:23	LABO	LABO	
7/24/2021, 00:23	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:23	LABO	LABO	
7/24/2021, 00:23	LABO	LABO	
7/24/2021, 00:23	NA	NOISE	
7/24/2021, 00:25	LABO	LABO	
7/24/2021, 00:25	LABO	LABO	
7/24/2021, 00:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:26	LABO	LABO	
7/24/2021, 00:26	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 00:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:26	LABO	LABO	
7/24/2021, 00:26	LABO	LABO	
7/24/2021, 00:26	LABO	LABO	
7/24/2021, 00:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:26	LABO	LABO	
7/24/2021, 00:27	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 00:27	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 00:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:27	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 00:27	LABO	LABO	
7/24/2021, 00:28	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:28	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:28	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:28	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:29	LABO	LABO	
7/24/2021, 00:29	LABO	LABO	
7/24/2021, 00:29	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:29	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:29	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:29	LABO	LABO	
7/24/2021, 00:29	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:29	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:29	LABO	LABO	
7/24/2021, 00:29	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 00:34	LABO	LABO	
7/24/2021, 00:38	LABO	LABO	
7/24/2021, 00:38	LABO	LABO	
7/24/2021, 00:38	LABO	LABO	
7/24/2021, 00:38	LABO	LABO	
7/24/2021, 00:38	LABO	LABO	
7/24/2021, 00:40	LABO	LABO	
7/24/2021, 00:40	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:40	LABO	LABO	
7/24/2021, 00:40	LABO	LABO	
7/24/2021, 00:44	LABO	LABO	
7/24/2021, 00:44	LABO	LABO	
7/24/2021, 00:44	LABO	LABO	
7/24/2021, 00:45	LABO	LABO	
7/24/2021, 00:45	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:45	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 00:45	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:45	LABO	LABO	
7/24/2021, 00:45	LABO	LABO	
7/24/2021, 00:45	LABO	LABO	
7/24/2021, 00:45	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:45	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:45	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:46	PESU	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 00:46	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 00:46	LABO	LABO	
7/24/2021, 00:46	LABO	LABO	
7/24/2021, 00:46	LABO	LABO	
7/24/2021, 00:46	LABO	LABO	
7/24/2021, 00:46	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:46	MYLU	LABO	Call characteristics indicate a different species
7/24/2021, 00:47	LABO	LABO	
7/24/2021, 00:47	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:47	LABO	LABO	
7/24/2021, 00:47	LABO	LABO	
7/24/2021, 00:50	LABO	LABO	
7/24/2021, 00:50	LABO	LABO	
7/24/2021, 00:51	LABO	LABO	
7/24/2021, 00:51	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:51	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 00:51	MYLU	MYLU	
7/24/2021, 00:51	MYLU	MYLU	
7/24/2021, 00:51	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:53	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:53	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:56	LABO	LABO	
7/24/2021, 00:57	LABO	LABO	
7/24/2021, 00:57	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 00:57	LABO	LABO	
7/24/2021, 00:57	LABO	LABO	
7/24/2021, 00:57	LABO	LABO	
7/24/2021, 00:57	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 00:57	LABO	LABO	
7/24/2021, 00:57	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:57	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:57	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 00:57	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:58	LABO	LABO	
7/24/2021, 00:58	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 00:58	LABO	LABO	
7/24/2021, 00:58	LABO	LABO	
7/24/2021, 00:58	LABO	LABO	
7/24/2021, 00:58	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:58	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 00:58	NA	NOISE	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 00:59	LABO	LABO	
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	LABO	LABO	
7/24/2021, 01:00	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:01	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:01	LABO	LABO	
7/24/2021, 01:10	LABO	LABO	
7/24/2021, 01:11	LABO	LABO	
7/24/2021, 01:11	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 01:16	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 01:16	NoID	LABO	
7/24/2021, 01:16	NoID	LABO	
7/24/2021, 01:16	LABO	LABO	
7/24/2021, 01:24	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 01:24	LABO	LABO	
7/24/2021, 01:24	LABO	LABO	
7/24/2021, 01:27	LABO	LABO	
7/24/2021, 01:27	Noise	NOISE	
7/24/2021, 01:28	LABO	LABO	
7/24/2021, 01:28	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:28	LABO	LABO	
7/24/2021, 01:28	LABO	LABO	
7/24/2021, 01:33	NA	NOISE	
7/24/2021, 01:37	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 01:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:39	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:39	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:39	LABO	LABO	
7/24/2021, 01:39	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 01:41	MYLU	MYLU	
7/24/2021, 01:41	MYLU	MYLU	
7/24/2021, 01:43	PESU	HiF	
7/24/2021, 01:43	LABO	HiF	
7/24/2021, 01:45	LABO	LABO	
7/24/2021, 01:49	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 01:49	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 01:52	LABO	LABO	
7/24/2021, 01:52	LABO	LABO	
7/24/2021, 01:54	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 01:54	LABO	LABO	
7/24/2021, 01:54	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 01:59	LABO	LABO	
7/24/2021, 01:59	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 02:03	LABO	LABO	
7/24/2021, 02:03	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:03	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 02:03	LABO	LABO	
7/24/2021, 02:03	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:03	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 02:03	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:03	LABO	LABO	
7/24/2021, 02:03	LABO	LABO	
7/24/2021, 02:04	LABO	LABO	
7/24/2021, 02:04	LABO	LABO	
7/24/2021, 02:04	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 02:05	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 02:07	LABO	LABO	
7/24/2021, 02:10	LABO	LABO	
7/24/2021, 02:11	LABO	LABO	
7/24/2021, 02:11	LABO	LABO	
7/24/2021, 02:11	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:15	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:19	LABO	LABO	
7/24/2021, 02:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 02:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 02:31	LABO	LABO	
7/24/2021, 02:35	LABO	LABO	
7/24/2021, 02:35	LABO	LABO	
7/24/2021, 02:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:39	LABO	LABO	
7/24/2021, 02:43	LABO	LABO	
7/24/2021, 02:43	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 02:48	LABO	LABO	
7/24/2021, 02:48	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 02:50	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 02:53	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:05	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 03:05	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 03:06	LABO	LABO	
7/24/2021, 03:06	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:17	LABO	LABO	
7/24/2021, 03:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 03:19	LABO	LABO	
7/24/2021, 03:19	NA	NOISE	
7/24/2021, 03:20	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:20	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:20	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:20	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:34	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:34	LABO	LABO	
7/24/2021, 03:34	LABO	LABO	
7/24/2021, 03:35	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 03:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:36	LABO	LABO	
7/24/2021, 03:37	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:37	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 03:37	NA	NOISE	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 03:37	LABO	LABO	
7/24/2021, 03:37	NA	NOISE	
7/24/2021, 03:37	LABO	LABO	
7/24/2021, 03:37	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:38	LABO	LABO	
7/24/2021, 03:38	Noise	NOISE	
7/24/2021, 03:38	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 03:38	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 03:39	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:47	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 03:47	LABO	LABO	
7/24/2021, 03:47	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 04:08	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 20:25	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 20:25	LABO	LABO	
7/24/2021, 20:25	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 20:27	LABO	LABO	
7/24/2021, 20:43	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 20:43	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 20:47	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 20:47	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 20:52	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 20:52	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 20:54	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 20:56	LABO	LABO	
7/24/2021, 20:56	LABO	LABO	
7/24/2021, 20:56	LABO	LABO	
7/24/2021, 20:56	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 20:56	LABO	LABO	
7/24/2021, 20:56	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 20:57	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 20:58	EPFU	EPFU	
7/24/2021, 20:59	EPFU	EPFU	
7/24/2021, 20:59	EPFU	EPFU	
7/24/2021, 21:00	EPFU	EPFU	
7/24/2021, 21:00	EPFU	EPFU	
7/24/2021, 21:00	EPFU	EPFU	
7/24/2021, 21:00	NoID	EPFU	
7/24/2021, 21:00	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:02	EPFU	EPFU	
7/24/2021, 21:02	EPFU	EPFU	
7/24/2021, 21:02	EPFU	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:02	NoID	EPFU	
7/24/2021, 21:02	EPFU	EPFU	
7/24/2021, 21:02	NoID	EPFU	
7/24/2021, 21:03	NoID	EPFU	
7/24/2021, 21:03	EPFU	EPFU	
7/24/2021, 21:03	EPFU	EPFU	
7/24/2021, 21:03	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:03	EPFU	EPFU	
7/24/2021, 21:03	EPFU	EPFU	
7/24/2021, 21:03	EPFU	EPFU	
7/24/2021, 21:03	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:03	EPFU	EPFU	
7/24/2021, 21:03	EPFU	EPFU	
7/24/2021, 21:03	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	LANO	LoF	Poor quality &/or Ambiguous
7/24/2021, 21:04	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:04	NA	NOISE	
7/24/2021, 21:04	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:05	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:05	LABO	LABO	
7/24/2021, 21:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:05	LABO	LABO	
7/24/2021, 21:05	LABO	LABO	
7/24/2021, 21:05	Noise	NOISE	
7/24/2021, 21:05	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:05	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:05	EPFU	EPFU	
7/24/2021, 21:05	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:05	LABO	LABO	
7/24/2021, 21:06	NA	NOISE	
7/24/2021, 21:06	LABO	LABO	
7/24/2021, 21:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:06	LABO	LABO	
7/24/2021, 21:06	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:06	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:06	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:06	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:06	EPFU	EPFU	
7/24/2021, 21:06	EPFU	EPFU	
7/24/2021, 21:06	LABO	LABO	
7/24/2021, 21:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:06	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:06	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:06	LABO	LABO	
7/24/2021, 21:06	EPFU	EPFU	
7/24/2021, 21:06	Noise	NOISE	
7/24/2021, 21:06	EPFU	EPFU	
7/24/2021, 21:06	EPFU	EPFU	
7/24/2021, 21:06	Noise	EPFU_LANO	Call characteristics indicate a different species
7/24/2021, 21:06	LABO	LABO	
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	NA	NOISE	
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	EPFU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	EPFU	EPFU	
7/24/2021, 21:07	LABO	LABO	
7/24/2021, 21:07	NoID	EPFU	
7/24/2021, 21:07	LABO	NOISE	Call quality too low to classify as having charateristics of bat
7/24/2021, 21:07	Noise	NOISE	
7/24/2021, 21:07	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:07	LABO	LABO	
7/24/2021, 21:07	LABO	LABO	
7/24/2021, 21:08	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:08	NA	NOISE	
7/24/2021, 21:08	Noise	NOISE	
7/24/2021, 21:08	Noise	NOISE	
7/24/2021, 21:08	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:08	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:08	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:09	LABO	LABO	
7/24/2021, 21:09	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:09	LABO	LABO	
7/24/2021, 21:09	LABO	LABO	
7/24/2021, 21:09	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:09	LABO	LABO	
7/24/2021, 21:09	LABO	LABO	
7/24/2021, 21:09	LANO	LABO	Call characteristics indicate a different species
7/24/2021, 21:10	LABO	LABO	
7/24/2021, 21:10	LABO	LABO	
7/24/2021, 21:10	EPFU	EPFU	
7/24/2021, 21:10	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:10	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:10	NoID	LABO_w_buzz	Call characteristics indicate a different species
7/24/2021, 21:10	LABO	LABO	
7/24/2021, 21:10	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:10	LABO	LABO	
7/24/2021, 21:10	NA	NOISE	
7/24/2021, 21:10	LABO	LABO	
7/24/2021, 21:10	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:11	NoID	hi_lo	Call characteristics indicate a different species
7/24/2021, 21:11	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:11	LABO	LABO	
7/24/2021, 21:11	LABO	LABO	
7/24/2021, 21:11	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:11	NA	NOISE	
7/24/2021, 21:11	LABO	LABO	
7/24/2021, 21:11	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:11	LABO	LABO	
7/24/2021, 21:11	LABO	hi_lo	Poor quality &/or Ambiguous
7/24/2021, 21:11	NoID	EPFU	
7/24/2021, 21:11	LABO	LABO	
7/24/2021, 21:11	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:11	LABO	LABO	
7/24/2021, 21:11	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:11	LABO	LABO	
7/24/2021, 21:12	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:12	NA	NOISE	
7/24/2021, 21:12	LABO	LABO	
7/24/2021, 21:12	LABO	LABO	
7/24/2021, 21:12	EPFU	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:12	EPFU	EPFU	
7/24/2021, 21:12	LABO	LABO	
7/24/2021, 21:12	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:12	LABO	LABO	
7/24/2021, 21:12	LABO	LABO	
7/24/2021, 21:12	LANO	NOISE	Call quality too low to classify as having charateristics of bat
7/24/2021, 21:12	LABO	LABO	
7/24/2021, 21:12	EPFU	EPFU	
7/24/2021, 21:12	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:12	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:12	Noise	NOISE	
7/24/2021, 21:12	Noise	NOISE	
7/24/2021, 21:12	LABO	LABO	
7/24/2021, 21:12	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:13	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	NA	LABO	Call characteristics indicate a different species
7/24/2021, 21:13	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:13	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:13	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:13	LABO	hi_lo	Poor quality &/or Ambiguous
7/24/2021, 21:13	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:13	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:13	LABO	LABO	
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	PESU	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:14	EPFU	EPFU	
7/24/2021, 21:14	LABO	hi_lo	Poor quality &/or Ambiguous
7/24/2021, 21:14	NoID	hi_lo	Call characteristics indicate a different species
7/24/2021, 21:14	EPFU	EPFU	
7/24/2021, 21:14	EPFU	EPFU	
7/24/2021, 21:14	LABO	LABO	
7/24/2021, 21:14	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:14	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:15	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:15	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:15	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:15	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:15	NoID	EPFU	
7/24/2021, 21:15	EPFU	EPFU	
7/24/2021, 21:15	EPFU	EPFU	
7/24/2021, 21:15	EPFU	EPFU and LABO	Two species present
7/24/2021, 21:15	EPFU	EPFU and LABO	Two species present
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:15	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:15	EPFU	EPFU	
7/24/2021, 21:15	LABO	LABO	
7/24/2021, 21:16	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:16	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:16	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:16	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:16	LABO	LABO	
7/24/2021, 21:16	LACI	LACI	
7/24/2021, 21:16	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:16	LABO	LABO	
7/24/2021, 21:16	LABO	LABO	
7/24/2021, 21:16	LABO	LABO	
7/24/2021, 21:16	LABO	LABO	
7/24/2021, 21:16	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:16	LABO	LABO	
7/24/2021, 21:16	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:16	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:16	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	MYLU	LABO	Call characteristics indicate a different species
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	Noise	LABO	Call characteristics indicate a different species
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	EPFU	EPFU	
7/24/2021, 21:17	EPFU	EPFU	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:17	LABO	LABO	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	EPFU	LoF	Poor quality &/or Ambiguous
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	NA	NOISE	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	Noise	NOISE	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	LABO	LABO	
7/24/2021, 21:18	NoID	EPFU	
7/24/2021, 21:19	EPFU	EPFU	
7/24/2021, 21:19	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:19	LABO	LABO	
7/24/2021, 21:19	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:19	LABO	LABO	
7/24/2021, 21:19	LABO	LABO	
7/24/2021, 21:19	EPFU	EPFU and LABO	Two species present

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:19	EPFU	EPFU and LABO	Two species present
7/24/2021, 21:19	Noise	NOISE	
7/24/2021, 21:19	Noise	NOISE	
7/24/2021, 21:19	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:19	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	NA	NOISE	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:20	Noise	NOISE	
7/24/2021, 21:20	LABO	LABO	
7/24/2021, 21:21	LABO	LABO	
7/24/2021, 21:21	LABO	LABO	
7/24/2021, 21:21	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:21	LABO	LABO	
7/24/2021, 21:21	LABO	LABO	
7/24/2021, 21:21	LABO	LABO	
7/24/2021, 21:21	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:21	LABO	LABO	
7/24/2021, 21:21	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:21	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:22	LABO	LABO	
7/24/2021, 21:22	LABO	LABO	
7/24/2021, 21:22	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:22	NA	NOISE	
7/24/2021, 21:22	LABO	LABO	
7/24/2021, 21:22	LABO	LABO	
7/24/2021, 21:22	LABO	LABO	
7/24/2021, 21:22	NA	NOISE	
7/24/2021, 21:22	LABO	LABO	
7/24/2021, 21:22	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:22	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:22	EPFU	EPFU	
7/24/2021, 21:23	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:23	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:23	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:23	EPFU	EPFU and LABO	Two species present
7/24/2021, 21:23	EPFU	EPFU	
7/24/2021, 21:23	EPFU	EPFU	
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:23	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:23	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:23	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:23	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:23	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:23	LABO	LABO	
7/24/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	EPFU	EPFU	
7/24/2021, 21:24	EPFU	EPFU	
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	NA	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:24	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:24	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:24	LABO	LABO	
7/24/2021, 21:24	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	NA	NOISE	
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	Noise	LABO	Call characteristics indicate a different species
7/24/2021, 21:25	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:25	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:25	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:25	LABO	LABO	
7/24/2021, 21:25	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:26	LABO	LABO	
7/24/2021, 21:26	LABO	LABO	
7/24/2021, 21:26	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:26	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:26	LABO	LABO	
7/24/2021, 21:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:26	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:26	NA	NOISE	
7/24/2021, 21:26	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:26	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:26	LABO	LABO	
7/24/2021, 21:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:26	LABO	LABO	
7/24/2021, 21:26	LABO	LABO	
7/24/2021, 21:26	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:27	Noise	LABO	Call characteristics indicate a different species
7/24/2021, 21:27	NA	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:27	LABO	LABO	
7/24/2021, 21:27	LABO	LABO	
7/24/2021, 21:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:27	LABO	LABO	
7/24/2021, 21:27	LABO	LABO	
7/24/2021, 21:27	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:27	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:28	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:28	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:28	LACI	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:28	LABO	LABO	
7/24/2021, 21:28	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:28	LABO	LABO	
7/24/2021, 21:28	LABO	LABO	
7/24/2021, 21:28	LABO	LABO	
7/24/2021, 21:28	Noise	NOISE	
7/24/2021, 21:28	LACI	LACI	
7/24/2021, 21:28	LACI	LACI	
7/24/2021, 21:28	LABO	LABO	
7/24/2021, 21:28	NA	NOISE	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	NA	NOISE	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	LABO	LABO	
7/24/2021, 21:29	LABO	hi_lo	Poor quality &/or Ambiguous
7/24/2021, 21:29	EPFU	EPFU	
7/24/2021, 21:29	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:29	Noise	NOISE	
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	NoID	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	NA	LABO	Call characteristics indicate a different species
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:30	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:30	LABO	LABO	
7/24/2021, 21:31	LABO	LABO	
7/24/2021, 21:31	LABO	LABO	
7/24/2021, 21:31	LABO	LABO	
7/24/2021, 21:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:31	LABO	LABO	
7/24/2021, 21:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:31	LABO	LABO	
7/24/2021, 21:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:31	LABO	LABO	
7/24/2021, 21:31	NA	NOISE	
7/24/2021, 21:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:31	LABO	LABO	
7/24/2021, 21:32	LABO	LABO	
7/24/2021, 21:32	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:32	LABO	LABO	
7/24/2021, 21:32	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:32	LABO	LABO	
7/24/2021, 21:32	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:32	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:32	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:32	LABO	LABO	
7/24/2021, 21:32	LABO	LABO	
7/24/2021, 21:32	LABO	LABO	
7/24/2021, 21:32	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:32	MYLU	LABO	Call characteristics indicate a different species
7/24/2021, 21:32	MYLU	LABO_withBuzz	Call characteristics indicate a different species
7/24/2021, 21:33	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:33	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	MYLU	LABO	Call characteristics indicate a different species
7/24/2021, 21:33	LABO	LABO	
7/24/2021, 21:33	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	LABO	LABO	
7/24/2021, 21:34	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:35	LABO	LABO	
7/24/2021, 21:35	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:35	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:35	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:35	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:35	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:35	LABO	LABO	
7/24/2021, 21:35	LABO	LABO	
7/24/2021, 21:35	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:36	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:36	MYLU	MYLU	
7/24/2021, 21:36	NA	MYLU	Call characteristics indicate bat species
7/24/2021, 21:36	LABO	LABO	
7/24/2021, 21:36	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:36	LABO	LABO	
7/24/2021, 21:36	MYLU	HiF_FeedingBuzz	Poor quality &/or Ambiguous
7/24/2021, 21:36	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:36	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:36	LABO	LABO	
7/24/2021, 21:36	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:36	LABO	LABO	
7/24/2021, 21:36	LABO	LABO	
7/24/2021, 21:36	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:36	LABO	LABO	
7/24/2021, 21:36	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:37	LABO	LABO	
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	LABO	LABO	
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	LABO	LABO	
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	LABO	LABO	
7/24/2021, 21:37	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:37	LABO	LABO	
7/24/2021, 21:37	LABO	LABO	
7/24/2021, 21:37	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:38	LABO	LABO	
7/24/2021, 21:38	LABO	LABO	
7/24/2021, 21:38	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:38	LABO	LABO	
7/24/2021, 21:38	NA	NOISE	
7/24/2021, 21:38	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:38	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 21:38	LABO	LABO	
7/24/2021, 21:38	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:38	LABO	LABO	
7/24/2021, 21:38	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:39	MYLU	MYLU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:39	NoID	LABO_and_MYLU	Two species present
7/24/2021, 21:39	MYLU	MYLU	
7/24/2021, 21:39	LABO	LABO	
7/24/2021, 21:39	NA	NOISE	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	Noise	LABO	Call characteristics indicate a different species
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:40	LABO	NOISE	Call quality too low to classify as having charateristics of bat
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	LABO	LABO	
7/24/2021, 21:40	MYLU	LABO	Call characteristics indicate a different species
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:41	LABO	LABO	
7/24/2021, 21:42	LABO	LABO	
7/24/2021, 21:42	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:42	LABO	LABO	
7/24/2021, 21:42	LABO	LABO	
7/24/2021, 21:42	LABO	LABO	
7/24/2021, 21:42	LABO	LABO	
7/24/2021, 21:42	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	NA	NOISE	
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:43	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	LABO	LABO	
7/24/2021, 21:43	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:47	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:47	NoID	LABO-withbuzz	Call characteristics indicate a different species
7/24/2021, 21:47	LABO	LABO	
7/24/2021, 21:47	MYLU	LABO	Call characteristics indicate a different species
7/24/2021, 21:47	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:48	LABO	LABO	
7/24/2021, 21:48	LABO	LABO	
7/24/2021, 21:48	LABO	LABO	
7/24/2021, 21:48	LABO	LABO	
7/24/2021, 21:48	LABO	LABO	
7/24/2021, 21:48	LABO	LABO	
7/24/2021, 21:48	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:48	LABO	LABO	
7/24/2021, 21:49	LABO	LABO	
7/24/2021, 21:49	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:49	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:49	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:49	Noise	NOISE	
7/24/2021, 21:49	LABO	LABO	
7/24/2021, 21:49	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:49	LABO	LABO	
7/24/2021, 21:49	LABO	LABO	
7/24/2021, 21:49	LABO	LABO	
7/24/2021, 21:49	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:49	LACI	LACI	
7/24/2021, 21:49	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:49	LABO	LABO	
7/24/2021, 21:49	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:49	LABO	LABO	
7/24/2021, 21:49	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:50	LABO	LABO	
7/24/2021, 21:50	LABO	LABO	
7/24/2021, 21:50	LANO	HiF	Poor quality &/or Ambiguous

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:50	LANO	LoF	Poor quality &/or Ambiguous
7/24/2021, 21:50	LABO	LABO	
7/24/2021, 21:50	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:50	LABO	LABO	
7/24/2021, 21:50	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:50	LABO	LABO	
7/24/2021, 21:50	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:50	LABO	LABO	
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:51	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	LABO	LABO	
7/24/2021, 21:51	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:52	LABO	LABO	
7/24/2021, 21:52	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:52	LABO	LABO	
7/24/2021, 21:52	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:52	LABO	LABO	
7/24/2021, 21:52	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:52	LABO	LABO	
7/24/2021, 21:52	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:52	LABO	LABO	
7/24/2021, 21:52	LABO	LABO	
7/24/2021, 21:52	MYLU	HiF	
7/24/2021, 21:53	LABO	LABO	
7/24/2021, 21:53	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:53	LABO	LABO	
7/24/2021, 21:53	Noise	LABO	Call characteristics indicate a different species
7/24/2021, 21:53	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:53	LABO	LABO	
7/24/2021, 21:53	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:53	LABO	LABO	
7/24/2021, 21:53	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:53	LABO	LABO	
7/24/2021, 21:53	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 21:53	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	MYLU	MYLU	
7/24/2021, 21:54	MYLU	MYLU	
7/24/2021, 21:54	NoID	MYLU	Call characteristics indicate bat species
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	PESU	LABO	
7/24/2021, 21:54	LABO	LABO	
7/24/2021, 21:54	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:54	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 21:55	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:56	MYLU	MYLU	
7/24/2021, 21:56	MYLU	MYLU	
7/24/2021, 21:58	LABO	LABO	
7/24/2021, 21:59	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:59	LABO	LABO	
7/24/2021, 21:59	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 21:59	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 21:59	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 21:59	LABO	LABO	
7/24/2021, 22:00	LABO	LABO	
7/24/2021, 22:00	NA	NOISE	
7/24/2021, 22:00	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:00	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:00	LABO	LABO	
7/24/2021, 22:00	NA	NOISE	
7/24/2021, 22:00	LABO	LABO	
7/24/2021, 22:00	NA	NOISE	
7/24/2021, 22:00	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:00	LABO	LABO	
7/24/2021, 22:00	LABO	LABO	
7/24/2021, 22:00	LABO	LABO	
7/24/2021, 22:00	LABO	LABO	
7/24/2021, 22:00	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:01	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:01	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:01	NA	NOISE	
7/24/2021, 22:01	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:01	NA	NOISE	
7/24/2021, 22:01	LACI	LACI	
7/24/2021, 22:01	NA	NOISE	
7/24/2021, 22:01	LABO	LABO	
7/24/2021, 22:01	NA	NOISE	
7/24/2021, 22:01	LABO	LABO	
7/24/2021, 22:01	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:01	LABO	LABO	
7/24/2021, 22:01	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:01	LABO	LABO	
7/24/2021, 22:01	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:01	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:01	LABO	LABO	
7/24/2021, 22:01	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:01	LABO	LABO	
7/24/2021, 22:02	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:02	LABO	LABO	
7/24/2021, 22:02	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:02	LACI	LACI	
7/24/2021, 22:02	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:02	LABO	LABO	
7/24/2021, 22:02	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:02	LABO	LABO	
7/24/2021, 22:02	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:02	LABO	LABO	
7/24/2021, 22:02	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:02	LABO	LABO	
7/24/2021, 22:02	LABO	LABO	
7/24/2021, 22:02	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	EPFU	HiF and LoF	Two species present
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:03	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:03	Noise	NOISE	
7/24/2021, 22:03	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:03	LABO	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	PESU	LABO	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:04	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:04	LACI	LACI	
7/24/2021, 22:04	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:05	LABO	LABO	
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:06	LABO	LABO	
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:07	NoID	EPFU_LANO	Call characteristics indicate a different species
7/24/2021, 22:07	LABO	LABO	
7/24/2021, 22:07	NoID	LACI	
7/24/2021, 22:08	LACI	LACI	
7/24/2021, 22:08	NoID	HiF_LoF	Two species present
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:08	LACI	LACI	
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	NoID	LABO	
7/24/2021, 22:08	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	LABO	LABO	
7/24/2021, 22:08	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:09	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:09	LABO	LABO	
7/24/2021, 22:09	LABO	LABO	
7/24/2021, 22:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:09	LABO	LABO	
7/24/2021, 22:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:09	LABO	LABO	
7/24/2021, 22:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:09	LABO	LABO	
7/24/2021, 22:09	LABO	LABO	
7/24/2021, 22:09	LABO	LABO	
7/24/2021, 22:09	MYLU	MYLU	
7/24/2021, 22:09	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:09	MYLU	MYLU	
7/24/2021, 22:10	MYLU	MYLU	
7/24/2021, 22:10	MYLU	MYLU	
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	Noise	NOISE	
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	LABO	LABO	
7/24/2021, 22:10	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:11	LABO	LABO	
7/24/2021, 22:12	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:12	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:12	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:12	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:12	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:12	LABO	LABO	
7/24/2021, 22:13	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:13	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:13	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	NA	NOISE	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:14	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:14	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	LABO	LABO	
7/24/2021, 22:15	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	PESU	LABO	
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:16	LABO	LABO	
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:17	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:17	LABO	LABO	
7/24/2021, 22:17	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:18	LABO	LABO	
7/24/2021, 22:19	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:19	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:19	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:19	LABO	LABO	
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:20	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:20	LABO	LABO	
7/24/2021, 22:21	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	LABO	LABO	
7/24/2021, 22:21	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:21	LABO	LABO	
7/24/2021, 22:21	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	LABO	LABO	
7/24/2021, 22:21	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	LABO	LABO	
7/24/2021, 22:21	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	NA	NOISE	
7/24/2021, 22:21	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	LABO	LABO	
7/24/2021, 22:21	NA	EPFU	
7/24/2021, 22:21	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:21	LABO	LABO	
7/24/2021, 22:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:22	LABO	LABO	
7/24/2021, 22:22	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:22	EPFU	EPFU	
7/24/2021, 22:22	EPFU	EPFU	
7/24/2021, 22:22	EPFU	EPFU	
7/24/2021, 22:23	LABO	LABO	
7/24/2021, 22:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:23	LABO	LABO	
7/24/2021, 22:23	LABO	LABO	
7/24/2021, 22:23	LABO	LABO	
7/24/2021, 22:24	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:24	NA	NOISE	
7/24/2021, 22:24	LABO	LABO	
7/24/2021, 22:24	LABO	LABO	
7/24/2021, 22:24	NA	NOISE	
7/24/2021, 22:28	Noise	LABO	Call characteristics indicate a different species
7/24/2021, 22:28	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:28	LABO	LABO	
7/24/2021, 22:28	NA	NOISE	
7/24/2021, 22:28	LABO	LABO	
7/24/2021, 22:28	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:28	LABO	LABO	
7/24/2021, 22:29	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:29	LABO	LABO	
7/24/2021, 22:29	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:29	LABO	LABO	
7/24/2021, 22:29	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:29	LABO	LABO	
7/24/2021, 22:29	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:29	LABO	LABO	
7/24/2021, 22:29	NA	NOISE	
7/24/2021, 22:29	LABO	LABO	
7/24/2021, 22:29	Noise	NOISE	
7/24/2021, 22:29	LABO	LABO	
7/24/2021, 22:29	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:29	LABO	LABO	
7/24/2021, 22:30	Noise	NOISE	
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	Noise	NOISE	
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	Noise	NOISE	
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:30	LABO	LABO	
7/24/2021, 22:30	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:31	LABO	LABO	
7/24/2021, 22:32	LABO	LABO	
7/24/2021, 22:32	NA	NOISE	
7/24/2021, 22:32	LABO	LABO	
7/24/2021, 22:32	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:32	LABO	LABO	
7/24/2021, 22:32	NA	NOISE	
7/24/2021, 22:32	LABO	LABO	
7/24/2021, 22:32	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:32	LABO	LABO	
7/24/2021, 22:32	Noise	NOISE	
7/24/2021, 22:32	LABO	LABO	
7/24/2021, 22:32	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:32	LABO	LABO	
7/24/2021, 22:32	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	MYLU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:33	LABO	LABO	
7/24/2021, 22:33	NA	NOISE	
7/24/2021, 22:34	LABO	LABO	
7/24/2021, 22:34	LABO	LABO	
7/24/2021, 22:34	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:34	LABO	LABO	
7/24/2021, 22:34	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:34	LABO	LABO	
7/24/2021, 22:34	LABO	LABO	
7/24/2021, 22:34	LABO	LABO	
7/24/2021, 22:35	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:35	LABO	LABO	
7/24/2021, 22:35	LABO	LABO	
7/24/2021, 22:35	Noise	NOISE	
7/24/2021, 22:36	LABO	LABO	
7/24/2021, 22:36	MYLU	Foraging_Buzz	Call Characteristics are indicative of approach and terminal phase vocalizations
7/24/2021, 22:36	LABO	EPFU_LANO	Poor quality &/or Ambiguous
7/24/2021, 22:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:36	LABO	LABO	
7/24/2021, 22:36	LABO	LABO	
7/24/2021, 22:36	LABO	LABO	
7/24/2021, 22:36	LABO	LABO	
7/24/2021, 22:36	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:37	LABO	LABO	
7/24/2021, 22:38	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:38	LABO	LABO	
7/24/2021, 22:38	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:38	LABO	LABO	
7/24/2021, 22:38	LABO	LABO	
7/24/2021, 22:38	LABO	LABO	
7/24/2021, 22:38	LABO	LABO	
7/24/2021, 22:38	LABO	LABO	
7/24/2021, 22:39	LABO	LABO	
7/24/2021, 22:39	LABO	LABO	
7/24/2021, 22:39	LABO	LABO	
7/24/2021, 22:39	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:40	LABO	LABO	
7/24/2021, 22:40	PESU	HiF	Poor quality &/or Ambiguous

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:40	LABO	LABO	
7/24/2021, 22:40	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:40	LABO	LABO	
7/24/2021, 22:40	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:40	LABO	LABO	
7/24/2021, 22:40	LABO	LABO	
7/24/2021, 22:40	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:40	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:40	LABO	LABO	
7/24/2021, 22:40	NA	NOISE	
7/24/2021, 22:40	LABO	LABO	
7/24/2021, 22:40	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:41	EPFU	EPFU	
7/24/2021, 22:41	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:41	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:41	LABO	LABO	
7/24/2021, 22:41	LABO	LABO	
7/24/2021, 22:41	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:41	LABO	LABO	
7/24/2021, 22:41	LABO	LABO	
7/24/2021, 22:41	LABO	LABO	
7/24/2021, 22:41	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:41	LABO	LABO	
7/24/2021, 22:42	LABO	LABO	
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	NA	NOISE	
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	NA	NOISE	
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	NA	NOISE	
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:43	LABO	LABO	
7/24/2021, 22:43	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:44	LABO	LABO	
7/24/2021, 22:44	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:44	LABO	LABO	
7/24/2021, 22:44	LABO	LABO	
7/24/2021, 22:44	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:44	LABO	LABO	
7/24/2021, 22:44	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:44	LABO	LABO	
7/24/2021, 22:44	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:44	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:44	LABO	LABO	
7/24/2021, 22:45	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:45	LABO	LABO	
7/24/2021, 22:45	LABO	LABO	
7/24/2021, 22:45	LABO	LABO	
7/24/2021, 22:45	LABO	LABO	
7/24/2021, 22:45	LABO	LABO	
7/24/2021, 22:45	LABO	LABO	
7/24/2021, 22:46	LABO	LABO	
7/24/2021, 22:46	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:46	LABO	LABO	
7/24/2021, 22:46	NA	NOISE	
7/24/2021, 22:46	LABO	LABO	
7/24/2021, 22:46	LABO	LABO	
7/24/2021, 22:46	NA	NOISE	
7/24/2021, 22:46	LABO	LABO	
7/24/2021, 22:46	PESU	NOISE	Call quality too low to classify as having charateristics of bat
7/24/2021, 22:46	LABO	LABO	
7/24/2021, 22:46	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:46	LABO	LABO	
7/24/2021, 22:46	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:47	LABO	LABO	
7/24/2021, 22:47	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:47	LABO	LABO	
7/24/2021, 22:47	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:47	LABO	LABO	
7/24/2021, 22:47	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:47	LACI	LACI	
7/24/2021, 22:47	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:47	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:47	LABO	LABO	
7/24/2021, 22:47	NA	NOISE	
7/24/2021, 22:47	LABO	LABO	
7/24/2021, 22:47	NA	NOISE	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:47	LABO	LABO	
7/24/2021, 22:47	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:47	LABO	LABO	
7/24/2021, 22:47	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	NA	NOISE	
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	MYLU	LABO	Call characteristics indicate a different species
7/24/2021, 22:48	LABO	LABO_buzz	Call characteristics indicate a different species
7/24/2021, 22:48	LABO	LABO	
7/24/2021, 22:48	LABO	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:49	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:49	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:49	LABO	LABO	
7/24/2021, 22:49	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:49	MYLU	MYLU	
7/24/2021, 22:49	LABO	LABO	
7/24/2021, 22:49	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 22:49	LABO	LABO	
7/24/2021, 22:49	LABO	LABO	
7/24/2021, 22:49	NA	NOISE	
7/24/2021, 22:49	LABO	LABO	
7/24/2021, 22:49	NA	NOISE	
7/24/2021, 22:49	LABO	LABO	
7/24/2021, 22:49	NA	NOISE	
7/24/2021, 22:50	LABO	LABO	
7/24/2021, 22:50	PESU	HiF	Poor quality &/or Ambiguous
7/24/2021, 22:50	LABO	LABO	
7/24/2021, 22:50	NA	NOISE	
7/24/2021, 22:50	LABO	LABO	
7/24/2021, 22:50	LABO	LABO	
7/24/2021, 22:50	LABO	LABO	
7/24/2021, 22:50	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:51	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:51	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:51	LABO	LABO	
7/24/2021, 22:51	LABO	LABO	
7/24/2021, 22:51	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:51	LABO	LABO	
7/24/2021, 22:51	LABO	LABO	
7/24/2021, 22:51	LABO	LABO	
7/24/2021, 22:52	LABO	LABO	
7/24/2021, 22:52	LABO	LABO	
7/24/2021, 22:52	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:52	LABO	LABO	
7/24/2021, 22:52	LABO	LABO	
7/24/2021, 22:52	LABO	LABO	
7/24/2021, 22:52	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:52	LABO	LABO	
7/24/2021, 22:52	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:52	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:53	LABO	LABO	
7/24/2021, 22:54	LABO	LABO	
7/24/2021, 22:54	NA	NOISE	
7/24/2021, 22:54	LABO	LABO	
7/24/2021, 22:54	NA	NOISE	
7/24/2021, 22:54	LABO	LABO	
7/24/2021, 22:54	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:54	LABO	LABO	
7/24/2021, 22:54	NA	NOISE	
7/24/2021, 22:54	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:54	NA	NOISE	
7/24/2021, 22:54	LABO	LABO	
7/24/2021, 22:54	LABO	LABO	
7/24/2021, 22:55	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:55	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 22:55	PESU	LABO	Call characteristics indicate a different species
7/24/2021, 22:55	LABO	LABO	
7/24/2021, 22:55	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:55	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 22:56	LABO	LABO	
7/24/2021, 22:56	LABO	LABO	
7/24/2021, 22:56	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 22:56	LABO	LABO	
7/24/2021, 22:56	LABO	LABO	
7/24/2021, 22:56	NA	NOISE	
7/24/2021, 22:57	LABO	LoF	Poor quality &/or Ambiguous
7/24/2021, 22:57	LABO	LABO_and_MYLU	Two species present
7/24/2021, 23:06	LABO	LABO	
7/24/2021, 23:07	LABO	LABO	
7/24/2021, 23:08	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:08	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:08	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:09	LABO	LABO	
7/24/2021, 23:09	NA	NOISE	
7/24/2021, 23:10	LABO	LABO	
7/24/2021, 23:10	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:11	LABO	LABO	
7/24/2021, 23:11	LABO	LABO	
7/24/2021, 23:12	NoID	MYLU	Call characteristics indicate bat species
7/24/2021, 23:23	LABO	LABO	
7/24/2021, 23:24	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:25	LABO	LABO	
7/24/2021, 23:25	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:25	LABO	LABO	
7/24/2021, 23:26	LABO	LABO	
7/24/2021, 23:26	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:27	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:27	NA	NOISE	
7/24/2021, 23:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:27	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:27	MYLU	MYLU	
7/24/2021, 23:27	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:28	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:39	NA	NOISE	
7/24/2021, 23:39	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:39	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:40	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/24/2021, 23:49	EPFU	EPFU	
7/24/2021, 23:50	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:51	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:51	Noise	NOISE	
7/24/2021, 23:51	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:51	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:52	EPFU	LoF	Poor quality &/or Ambiguous
7/24/2021, 23:53	LABO	LABO	
7/24/2021, 23:53	NA	NOISE	
7/24/2021, 23:53	LABO	NOISE	Call quality too low to classify as having charateristics of bat
7/24/2021, 23:53	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:53	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:53	LABO	LABO	
7/24/2021, 23:53	LABO	LABO	
7/24/2021, 23:54	LABO	LABO	
7/24/2021, 23:54	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:54	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:54	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:54	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/24/2021, 23:54	LABO	LABO	
7/24/2021, 23:56	LABO	LABO	
7/24/2021, 23:56	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:57	LABO	LABO	
7/24/2021, 23:57	LABO	LABO	
7/24/2021, 23:57	LABO	LABO	
7/24/2021, 23:57	LABO	LABO	
7/24/2021, 23:57	LABO	LABO	
7/24/2021, 23:58	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:58	LABO	LABO	
7/24/2021, 23:58	LABO	LABO	
7/24/2021, 23:58	NoID	LABO	Call characteristics indicate a different species
7/24/2021, 23:58	LABO	LABO	
7/24/2021, 23:58	LABO	LABO	
7/24/2021, 23:58	NA	NOISE	
7/25/2021, 00:01	LABO	LABO	
7/25/2021, 00:01	LABO	LABO	
7/25/2021, 00:01	LABO	LABO	
7/25/2021, 00:01	NA	NOISE	
7/25/2021, 00:01	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:01	LABO	LABO	
7/25/2021, 00:01	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:01	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 00:01	LABO	LABO	
7/25/2021, 00:02	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:02	LABO	LABO	
7/25/2021, 00:02	LABO	LABO	
7/25/2021, 00:02	LABO	LABO	
7/25/2021, 00:02	LABO	LABO	
7/25/2021, 00:02	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:02	LABO	LABO	
7/25/2021, 00:02	LABO	LABO	
7/25/2021, 00:02	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:02	LABO	LABO	
7/25/2021, 00:02	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:03	Noise	LABO	Call characteristics indicate a different species
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:03	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:03	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:03	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:03	LABO	LABO	
7/25/2021, 00:04	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:04	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 00:04	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:04	NA	NOISE	
7/25/2021, 00:04	LABO	LABO	
7/25/2021, 00:04	LABO	LABO	
7/25/2021, 00:04	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:04	LABO	LABO	
7/25/2021, 00:04	NA	NOISE	
7/25/2021, 00:05	LABO	LABO	
7/25/2021, 00:05	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:05	LABO	LABO	
7/25/2021, 00:05	NA	NOISE	
7/25/2021, 00:05	LABO	LABO	
7/25/2021, 00:05	Noise	NOISE	
7/25/2021, 00:05	LABO	LABO	
7/25/2021, 00:05	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:05	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 00:05	LABO	LABO	
7/25/2021, 00:05	LABO	LABO	
7/25/2021, 00:05	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:05	NA	NOISE	
7/25/2021, 00:06	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:06	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:06	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:06	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:06	LABO	LABO	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:07	NoID	Foraging_Buzz	Call Characteristics are indicative of approach and terminal phase vocalizations
7/25/2021, 00:07	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 00:07	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:07	NA	NOISE	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:07	NA	NOISE	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:07	LABO	LABO	
7/25/2021, 00:08	LABO	LABO	
7/25/2021, 00:08	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:08	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:08	NA	NOISE	
7/25/2021, 00:08	LABO	LABO	
7/25/2021, 00:08	LABO	LABO	
7/25/2021, 00:08	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 00:08	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:08	LABO	LABO	
7/25/2021, 00:08	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:09	LABO	LABO	
7/25/2021, 00:09	LABO	LABO	
7/25/2021, 00:10	LABO	LABO	
7/25/2021, 00:10	NA	NOISE	
7/25/2021, 00:10	LABO	LABO	
7/25/2021, 00:10	LABO	LABO	
7/25/2021, 00:10	LABO	LABO	
7/25/2021, 00:10	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:10	NA	NOISE	
7/25/2021, 00:10	LABO	LABO	
7/25/2021, 00:10	LABO	LABO	
7/25/2021, 00:10	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:11	LABO	LABO	
7/25/2021, 00:11	NA	NOISE	
7/25/2021, 00:11	LABO	LABO	
7/25/2021, 00:11	NA	NOISE	
7/25/2021, 00:11	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:11	NA	NOISE	
7/25/2021, 00:11	LABO	LABO	
7/25/2021, 00:12	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 00:12	NA	NOISE	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	NA	NOISE	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:12	Noise	LABO	Call characteristics indicate a different species
7/25/2021, 00:12	LABO	LABO	
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	NA	NOISE	
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	NA	NOISE	
7/25/2021, 00:13	NoID	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	MYLU	MYLU	
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	LABO	LABO	
7/25/2021, 00:13	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:14	LABO	LABO	
7/25/2021, 00:14	LABO	LABO	
7/25/2021, 00:14	LABO	LABO	
7/25/2021, 00:14	LABO	LABO	
7/25/2021, 00:14	LABO	LABO	
7/25/2021, 00:14	NA	NOISE	
7/25/2021, 00:14	LABO	LABO	
7/25/2021, 00:14	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:14	LABO	LABO	
7/25/2021, 00:14	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:15	LABO	LABO	
7/25/2021, 00:15	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 00:15	LABO	LABO	
7/25/2021, 00:15	LABO	LABO	
7/25/2021, 00:15	LABO	LABO	
7/25/2021, 00:15	NA	NOISE	
7/25/2021, 00:15	LABO	LABO	
7/25/2021, 00:15	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:15	LABO	LABO	
7/25/2021, 00:15	LABO	LABO	
7/25/2021, 00:16	LABO	LABO	
7/25/2021, 00:16	LABO	LABO	
7/25/2021, 00:16	LABO	LABO	
7/25/2021, 00:16	LABO	LABO	
7/25/2021, 00:16	LABO	LABO	
7/25/2021, 00:16	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:16	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:16	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	NoID	LABO	Call characteristics indicate a different species

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:17	LABO	LABO	
7/25/2021, 00:18	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 00:18	LABO	LABO	
7/25/2021, 00:18	LABO	LABO	
7/25/2021, 00:18	LABO	LABO	
7/25/2021, 00:18	LABO	LABO	
7/25/2021, 00:22	LABO	LABO	
7/25/2021, 00:22	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 00:22	LABO	LABO	
7/25/2021, 00:22	LABO	LABO	
7/25/2021, 00:22	LABO	LABO	
7/25/2021, 00:23	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:23	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/25/2021, 00:23	LABO	LABO	
7/25/2021, 00:23	LABO	LABO	
7/25/2021, 00:23	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:23	NA	NOISE	
7/25/2021, 00:24	LABO	LABO	
7/25/2021, 00:24	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:25	NoID	LABO-buzz	Call characteristics indicate a different species
7/25/2021, 00:25	LABO	LABO	
7/25/2021, 00:25	LABO	LABO	
7/25/2021, 00:25	LABO	LABO	
7/25/2021, 00:25	LABO	LABO	
7/25/2021, 00:25	LABO	LABO	
7/25/2021, 00:25	LABO	LABO	
7/25/2021, 00:25	NA	NOISE	
7/25/2021, 00:27	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:27	NA	NOISE	
7/25/2021, 00:27	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:27	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:28	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:28	NA	NOISE	
7/25/2021, 00:28	LABO	LABO	
7/25/2021, 00:28	NA	NOISE	
7/25/2021, 00:28	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 00:28	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:28	LABO	LABO	
7/25/2021, 00:28	LABO	LABO	
7/25/2021, 00:28	LABO	LABO	
7/25/2021, 00:28	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:29	LABO	LABO	
7/25/2021, 00:29	LABO	LABO	
7/25/2021, 00:32	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:32	NoID	feeding_buzz	Call characteristics indicate a different species
7/25/2021, 00:32	LABO	LABO	
7/25/2021, 00:32	LABO	LABO	
7/25/2021, 00:32	LABO	LABO	
7/25/2021, 00:33	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:33	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:33	LABO	LABO	
7/25/2021, 00:33	LABO	LABO	
7/25/2021, 00:33	Noise	LABO	Call characteristics indicate a different species
7/25/2021, 00:33	NoID	LABO_buzz	Call characteristics indicate a different species
7/25/2021, 00:33	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:33	LABO	LABO	
7/25/2021, 00:33	LABO	LABO	
7/25/2021, 00:33	LABO	LABO	
7/25/2021, 00:33	LABO	LABO	
7/25/2021, 00:33	LABO	LABO	
7/25/2021, 00:34	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:34	LABO	LABO	
7/25/2021, 00:34	NA	NOISE	
7/25/2021, 00:34	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:34	NA	NOISE	
7/25/2021, 00:34	LABO	LABO	
7/25/2021, 00:34	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:34	LABO	LABO	
7/25/2021, 00:34	LABO	LABO	
7/25/2021, 00:34	LABO	LABO	
7/25/2021, 00:34	LABO	LABO	
7/25/2021, 00:34	LABO	LABO	
7/25/2021, 00:34	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:35	LABO	LABO	
7/25/2021, 00:35	LABO	LABO	
7/25/2021, 00:35	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 00:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:37	LABO	LABO	
7/25/2021, 00:37	LABO	LABO	
7/25/2021, 00:37	LABO	LABO	
7/25/2021, 00:37	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:38	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:38	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:38	LABO	LABO	
7/25/2021, 00:38	LABO	LABO	
7/25/2021, 00:38	LABO	LABO	
7/25/2021, 00:38	LABO	LABO	
7/25/2021, 00:39	LABO	LABO	
7/25/2021, 00:39	LABO	LABO	
7/25/2021, 00:39	LABO	LABO	
7/25/2021, 00:40	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:40	LABO	LABO	
7/25/2021, 00:40	NA	NOISE	
7/25/2021, 00:40	LABO	LABO	
7/25/2021, 00:40	NA	NOISE	
7/25/2021, 00:41	Noise	NOISE	
7/25/2021, 00:41	LABO	LABO	
7/25/2021, 00:41	NA	NOISE	
7/25/2021, 00:41	LABO	LABO	
7/25/2021, 00:42	LABO	LABO	
7/25/2021, 00:42	LABO	LABO	
7/25/2021, 00:42	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:42	LABO	LABO	
7/25/2021, 00:42	LABO	LABO	
7/25/2021, 00:42	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 00:43	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 00:43	LABO	LABO	
7/25/2021, 01:04	MYLU	MYLU	
7/25/2021, 01:04	MYLU	MYLU	
7/25/2021, 01:04	MYLU	MYLU	
7/25/2021, 01:04	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:22	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:22	LABO	LABO	
7/25/2021, 01:22	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 01:22	LABO	LABO	
7/25/2021, 01:23	EPFU	EPFU	
7/25/2021, 01:23	LABO	LABO	
7/25/2021, 01:23	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 01:23	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:24	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:24	LABO	LABO	
7/25/2021, 01:24	LABO	LABO	
7/25/2021, 01:24	LABO	LABO	
7/25/2021, 01:24	LABO	LABO	
7/25/2021, 01:24	LABO	LABO	
7/25/2021, 01:24	LABO	LABO	
7/25/2021, 01:24	LABO	LABO	
7/25/2021, 01:25	LABO	LABO	
7/25/2021, 01:25	LABO	LABO	
7/25/2021, 01:25	LABO	LABO	
7/25/2021, 01:25	LABO	LABO	
7/25/2021, 01:25	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:25	LABO	LABO	
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:26	PESU	LABO_w_shortBuzz	Call characteristics indicate a different species
7/25/2021, 01:26	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:26	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:26	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:26	LABO	LABO	
7/25/2021, 01:27	LABO	LABO	
7/25/2021, 01:27	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:27	LABO	LABO	
7/25/2021, 01:27	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:28	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:28	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:28	LABO	LABO	
7/25/2021, 01:28	LABO	LABO	
7/25/2021, 01:28	LABO	LABO	
7/25/2021, 01:29	LABO	LABO	
7/25/2021, 01:29	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:29	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:29	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:29	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 01:30	LABO	LABO	
7/25/2021, 01:30	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:30	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:30	LABO	LABO	
7/25/2021, 01:30	NoID	NOISE	
7/25/2021, 01:30	LABO	LABO	
7/25/2021, 01:30	LABO	LABO	
7/25/2021, 01:31	LABO	LABO	
7/25/2021, 01:31	LABO	LABO	
7/25/2021, 01:31	LABO	LABO	
7/25/2021, 01:31	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:31	LABO	LABO	
7/25/2021, 01:31	LABO	LABO	
7/25/2021, 01:31	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:32	LABO	LABO	
7/25/2021, 01:32	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:32	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:32	LABO	LABO	
7/25/2021, 01:32	LABO	LABO	
7/25/2021, 01:32	NA	NOISE	
7/25/2021, 01:32	LABO	LABO	
7/25/2021, 01:32	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:32	LABO	LABO	
7/25/2021, 01:32	LABO	LABO	
7/25/2021, 01:32	LABO	LABO	
7/25/2021, 01:33	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:33	LABO	LABO	
7/25/2021, 01:33	LABO	LABO	
7/25/2021, 01:33	NoID	LABO-buzz	Call characteristics indicate a different species
7/25/2021, 01:33	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:33	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:33	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:33	LABO	LABO	
7/25/2021, 01:33	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:33	LABO	LABO	
7/25/2021, 01:34	LABO	LABO	
7/25/2021, 01:34	LABO	LABO	
7/25/2021, 01:34	LABO	LABO	
7/25/2021, 01:34	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:34	LABO	LABO	
7/25/2021, 01:34	LABO	LABO	
7/25/2021, 01:34	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 01:34	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:34	LABO	LABO	
7/25/2021, 01:35	LABO	LABO	
7/25/2021, 01:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:35	LABO	LABO	
7/25/2021, 01:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:35	LABO	LABO	
7/25/2021, 01:36	LABO	LABO	
7/25/2021, 01:36	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:36	LABO	LABO	
7/25/2021, 01:36	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:36	LABO	LABO	
7/25/2021, 01:36	LABO	LABO	
7/25/2021, 01:36	LABO	LABO	
7/25/2021, 01:36	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:36	LABO	LABO	
7/25/2021, 01:36	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:36	NoID	LABO_buzz	Call characteristics indicate a different species
7/25/2021, 01:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:37	LABO	LABO	
7/25/2021, 01:38	LABO	LABO	
7/25/2021, 01:38	LABO	LABO	
7/25/2021, 01:38	LABO	LABO	
7/25/2021, 01:38	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:38	PESU	LABO	
7/25/2021, 01:38	LABO	LABO	
7/25/2021, 01:39	LABO	LABO	
7/25/2021, 01:39	LABO	LABO	
7/25/2021, 01:39	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:39	LABO	LABO	
7/25/2021, 01:39	LABO	LABO	
7/25/2021, 01:39	LABO	LABO	
7/25/2021, 01:39	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 01:39	LABO	LABO	
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:40	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:40	LABO	LABO	
7/25/2021, 01:41	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:41	LABO	LABO	
7/25/2021, 01:41	LABO	LABO	
7/25/2021, 01:41	LABO	LABO	
7/25/2021, 01:41	LABO	LABO	
7/25/2021, 01:42	LABO	LABO	
7/25/2021, 01:42	LABO	LABO	
7/25/2021, 01:42	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:42	LABO	LABO	
7/25/2021, 01:42	LABO	LABO	
7/25/2021, 01:42	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:43	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:43	LABO	LABO	
7/25/2021, 01:43	LABO	LABO	
7/25/2021, 01:43	LABO	LABO	
7/25/2021, 01:43	LABO	LABO	
7/25/2021, 01:43	LABO	LABO	
7/25/2021, 01:45	LABO	LABO	
7/25/2021, 01:45	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:45	LABO	LABO	
7/25/2021, 01:45	LABO	LABO	
7/25/2021, 01:45	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:45	EPFU	EPFU	
7/25/2021, 01:46	EPFU	EPFU	
7/25/2021, 01:46	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:46	NA	NOISE	
7/25/2021, 01:46	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:46	EPFU	EPFU	
7/25/2021, 01:46	EPFU	EPFU	
7/25/2021, 01:46	EPFU	EPFU	
7/25/2021, 01:46	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:47	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 01:47	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:47	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:47	LABO	LABO	
7/25/2021, 01:47	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:47	LABO	LABO	
7/25/2021, 01:47	LABO	LABO	
7/25/2021, 01:47	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:48	LABO	LABO	
7/25/2021, 01:48	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:48	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:48	LABO	LABO	
7/25/2021, 01:48	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:48	LABO	LABO	
7/25/2021, 01:48	LABO	LABO	
7/25/2021, 01:49	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:49	LABO	LABO	
7/25/2021, 01:49	LABO	LABO	
7/25/2021, 01:50	LABO	LABO	
7/25/2021, 01:50	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:50	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:50	LABO	LABO	
7/25/2021, 01:50	LABO	LABO	
7/25/2021, 01:50	LABO	LABO	
7/25/2021, 01:50	LABO	LABO	
7/25/2021, 01:50	Noise	NOISE	
7/25/2021, 01:51	LABO	LABO	
7/25/2021, 01:51	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:51	LABO	LABO	
7/25/2021, 01:51	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 01:51	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 01:51	LABO	LABO	
7/25/2021, 01:52	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:52	NA	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:52	LABO	LABO	
7/25/2021, 01:52	LABO	LABO	
7/25/2021, 01:52	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:52	LABO	LABO	
7/25/2021, 01:52	LABO	LABO	
7/25/2021, 01:52	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:52	LABO	LABO	
7/25/2021, 01:53	LABO	LABO	
7/25/2021, 01:53	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 01:53	LABO	LABO	
7/25/2021, 01:53	NA	NOISE	
7/25/2021, 01:53	LABO	LABO	
7/25/2021, 01:53	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:53	LABO	LABO_buzz	
7/25/2021, 01:53	LABO	LABO	
7/25/2021, 01:53	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:54	LABO	LABO	
7/25/2021, 01:55	LABO	LABO	
7/25/2021, 01:55	LABO	LABO	
7/25/2021, 01:55	LABO	LABO	
7/25/2021, 01:55	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 01:55	NoID	NOISE	
7/25/2021, 01:55	LABO	LABO	
7/25/2021, 01:55	LABO	LABO	
7/25/2021, 01:55	LABO	LABO	
7/25/2021, 01:55	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 01:55	LABO	LABO	
7/25/2021, 01:55	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:56	LABO	LABO	
7/25/2021, 01:57	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 01:57	LABO	LABO	
7/25/2021, 01:57	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 01:57	LABO	LABO	
7/25/2021, 01:58	LABO	LABO	
7/25/2021, 01:58	LABO	LABO	
7/25/2021, 01:58	LABO	LABO	
7/25/2021, 01:58	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 01:58	LABO	LABO	
7/25/2021, 01:58	LABO	LABO	
7/25/2021, 01:58	LABO	LABO	
7/25/2021, 01:59	LABO	LABO	
7/25/2021, 02:00	LABO	LABO	
7/25/2021, 02:00	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 02:00	LABO	LABO	
7/25/2021, 02:00	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 02:00	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 02:00	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:00	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:00	LABO	LABO	
7/25/2021, 02:00	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:00	LABO	LABO	
7/25/2021, 02:00	LABO	LABO	
7/25/2021, 02:01	LABO	LABO	
7/25/2021, 02:01	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 02:01	LABO	LABO	
7/25/2021, 02:01	LABO	LABO	
7/25/2021, 02:01	LABO	LABO	
7/25/2021, 02:01	LABO	LABO	
7/25/2021, 02:01	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:04	LABO	LABO	
7/25/2021, 02:04	LABO	LABO	
7/25/2021, 02:05	LABO	LABO	
7/25/2021, 02:05	LABO	LABO	
7/25/2021, 02:06	LABO	LABO	
7/25/2021, 02:08	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:09	LABO	LoF	Poor quality &/or Ambiguous
7/25/2021, 02:09	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 02:10	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:10	LABO	LABO	
7/25/2021, 02:10	LABO	LABO	
7/25/2021, 02:11	LABO	LABO	
7/25/2021, 02:11	LABO	LABO	
7/25/2021, 02:12	LABO	LABO	
7/25/2021, 02:12	LABO	LABO	
7/25/2021, 02:12	LABO	LABO	
7/25/2021, 02:12	MYSE	LABO Foraging_Buzz	Call characteristics indicate a different species
7/25/2021, 02:12	Noise	LABO	Call characteristics indicate a different species
7/25/2021, 02:13	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 02:13	LABO	LABO	
7/25/2021, 02:13	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:14	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:14	LABO	LABO	
7/25/2021, 02:22	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:23	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 02:23	LABO	LABO	
7/25/2021, 02:23	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:23	LABO	LABO	
7/25/2021, 02:24	LABO	LABO	
7/25/2021, 02:24	LABO	LABO	
7/25/2021, 02:26	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 02:26	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 02:26	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:26	LABO	LABO	
7/25/2021, 02:26	LABO	LABO	
7/25/2021, 02:27	LABO	LABO	
7/25/2021, 02:27	LABO	LABO	
7/25/2021, 02:27	LABO	LABO	
7/25/2021, 02:28	LABO	LABO	
7/25/2021, 02:28	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:28	LABO	LABO	
7/25/2021, 02:28	NA	NOISE	
7/25/2021, 02:28	LABO	LABO	
7/25/2021, 02:29	LABO	LABO	
7/25/2021, 02:29	LABO	LABO	
7/25/2021, 02:30	LABO	LABO	
7/25/2021, 02:30	LABO	LABO	
7/25/2021, 02:30	LABO	LABO	
7/25/2021, 02:30	LABO	LABO	
7/25/2021, 02:30	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:30	LABO	LABO	
7/25/2021, 02:30	LABO	LABO	
7/25/2021, 02:30	LABO	LABO	
7/25/2021, 02:30	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:31	LABO	LABO	
7/25/2021, 02:31	LABO	LABO	
7/25/2021, 02:31	LABO	LABO	
7/25/2021, 02:31	LABO	LABO	
7/25/2021, 02:31	LABO	LABO_w_buzz	
7/25/2021, 02:31	LABO	LABO	
7/25/2021, 02:31	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 02:33	LABO	LABO	
7/25/2021, 02:33	LABO	LABO	
7/25/2021, 02:34	LABO	LABO	
7/25/2021, 02:35	LABO	LABO	
7/25/2021, 02:35	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 02:35	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 02:35	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 02:36	LABO	LABO	
7/25/2021, 02:36	LABO	LABO	
7/25/2021, 02:36	LABO	LABO	
7/25/2021, 02:36	LABO	LABO	
7/25/2021, 02:36	Noise	HiF	Call characteristics bat species but call quality is poor
7/25/2021, 02:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 02:36	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 02:36	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 02:37	LABO	LABO	
7/25/2021, 02:37	LABO	LABO	
7/25/2021, 02:37	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 02:37	LABO	LABO	
7/25/2021, 02:37	LABO	LABO	
7/25/2021, 02:37	LABO	LABO	
7/25/2021, 02:37	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:38	LABO	LABO	
7/25/2021, 02:38	LABO	LABO	
7/25/2021, 02:38	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:38	LABO	LABO	
7/25/2021, 02:38	LABO	LABO	
7/25/2021, 02:38	LABO	LABO	
7/25/2021, 02:38	LABO	LABO	
7/25/2021, 02:39	LABO	LABO	
7/25/2021, 02:39	LABO	LABO	
7/25/2021, 02:39	LABO	LABO	
7/25/2021, 02:40	LABO	LABO	
7/25/2021, 02:41	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:41	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:42	LABO	LABO	
7/25/2021, 02:42	LABO	LABO	
7/25/2021, 02:43	MYLU	MYLU	
7/25/2021, 02:43	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:44	LABO	LABO	
7/25/2021, 02:46	LABO	LABO	
7/25/2021, 02:47	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 02:48	LABO	LABO	
7/25/2021, 02:49	LABO	LABO	
7/25/2021, 02:49	LABO	LABO	
7/25/2021, 02:50	LABO	LABO	
7/25/2021, 02:51	LABO	LABO	
7/25/2021, 02:51	NoID	LABO_buzz	Call characteristics indicate a different species
7/25/2021, 02:51	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:51	LABO	LABO	
7/25/2021, 02:51	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:51	LABO	LABO	
7/25/2021, 02:51	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 02:53	LABO	LABO	
7/25/2021, 02:53	LABO	LABO	
7/25/2021, 02:54	LABO	LABO	
7/25/2021, 02:54	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:55	LABO	LABO	
7/25/2021, 02:56	LABO	LABO	
7/25/2021, 02:56	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 02:56	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 02:56	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 02:56	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 02:56	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 02:56	NA	NOISE	
7/25/2021, 02:58	LABO	LABO	
7/25/2021, 03:06	LABO	LABO	
7/25/2021, 03:07	LABO	LABO	
7/25/2021, 03:09	MYLU	MYLU	
7/25/2021, 03:09	Noise	MYLU	Call characteristics indicate bat species
7/25/2021, 03:10	LABO	LABO	
7/25/2021, 03:11	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 03:11	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 03:11	LABO	LABO	
7/25/2021, 03:12	LABO	LABO	
7/25/2021, 03:13	LABO	LABO	
7/25/2021, 03:13	LABO	LABO	
7/25/2021, 03:13	LABO	LABO	
7/25/2021, 03:13	LABO	LABO	
7/25/2021, 03:13	LABO	LABO	
7/25/2021, 03:13	LABO	LABO	
7/25/2021, 03:13	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:14	LABO	LABO	
7/25/2021, 03:14	NoID	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 03:14	LABO	LABO	
7/25/2021, 03:15	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:15	LABO	LABO	
7/25/2021, 03:15	LABO	LABO	
7/25/2021, 03:16	LABO	LABO	
7/25/2021, 03:16	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 03:16	LABO	LABO	
7/25/2021, 03:16	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:16	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:16	LABO	LABO	
7/25/2021, 03:16	LABO	LABO	
7/25/2021, 03:17	LABO	LABO	
7/25/2021, 03:17	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:18	LABO	LABO	
7/25/2021, 03:18	LABO	LABO	
7/25/2021, 03:18	LABO	LABO	
7/25/2021, 03:18	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:19	NoID	NOISE	
7/25/2021, 03:19	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:19	LABO	LABO	
7/25/2021, 03:19	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:19	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 03:20	LABO	LABO	
7/25/2021, 03:20	LABO	LABO	
7/25/2021, 03:20	LABO	LABO	
7/25/2021, 03:21	LABO	LABO	
7/25/2021, 03:21	LABO	LABO	
7/25/2021, 03:21	LABO	LABO	
7/25/2021, 03:21	LABO	LABO	
7/25/2021, 03:21	LABO	LABO	
7/25/2021, 03:22	LABO	LABO	
7/25/2021, 03:22	Noise	NOISE	
7/25/2021, 03:22	MYLU	Foraging_Buzz	Call Characteristics are indicative of approach and terminal phase vocalizations
7/25/2021, 03:22	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:22	LABO	LABO	
7/25/2021, 03:22	NA	NOISE	
7/25/2021, 03:23	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:23	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:24	LABO	LABO	
7/25/2021, 03:25	NoID	EPFU	
7/25/2021, 03:25	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 03:25	LABO	LABO	
7/25/2021, 03:25	LABO	LABO	
7/25/2021, 03:26	MYLU	MYLU	
7/25/2021, 03:26	MYLU	MYLU	
7/25/2021, 03:26	LABO	LABO	
7/25/2021, 03:26	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:27	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:27	NoID	EPFU	
7/25/2021, 03:27	EPFU	EPFU	
7/25/2021, 03:27	EPFU	EPFU	
7/25/2021, 03:28	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:28	NoID	LABO_w_buzz	Call characteristics indicate a different species
7/25/2021, 03:28	NoID	LABO_w_buzz	Call characteristics indicate a different species
7/25/2021, 03:28	EPFU	EPFU	
7/25/2021, 03:28	Noise	NOISE	
7/25/2021, 03:28	LABO	LABO	
7/25/2021, 03:28	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:28	NoID	EPFU	
7/25/2021, 03:28	NA	NOISE	
7/25/2021, 03:29	EPFU	EPFU	
7/25/2021, 03:29	Noise	NOISE	
7/25/2021, 03:29	NoID	EPFU	
7/25/2021, 03:29	EPFU	LoF	Poor quality &/or Ambiguous
7/25/2021, 03:29	LABO	LABO	
7/25/2021, 03:30	LABO	LABO	
7/25/2021, 03:30	LABO	LABO	
7/25/2021, 03:30	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:30	EPFU	EPFU	
7/25/2021, 03:30	LABO	LABO	
7/25/2021, 03:30	LABO	LABO	
7/25/2021, 03:30	LABO	LABO	
7/25/2021, 03:30	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:30	LABO	LABO	
7/25/2021, 03:30	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:31	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:31	LABO	LABO	
7/25/2021, 03:31	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:32	LABO	LABO	
7/25/2021, 03:32	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:32	LABO	LABO	
7/25/2021, 03:32	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 03:33	LABO	LABO	
7/25/2021, 03:33	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:33	LABO	LABO	
7/25/2021, 03:34	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:34	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:34	LABO	LABO	
7/25/2021, 03:34	LABO	LABO	
7/25/2021, 03:35	LABO	LABO	
7/25/2021, 03:35	LABO	LABO	
7/25/2021, 03:35	LABO	LABO	
7/25/2021, 03:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:36	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:36	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:37	LABO	LABO	
7/25/2021, 03:37	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:40	MYLU	MYLU	
7/25/2021, 03:44	LABO	LABO	
7/25/2021, 03:44	LABO	LABO	
7/25/2021, 03:44	LABO	LABO	
7/25/2021, 03:44	LABO	LABO	
7/25/2021, 03:45	LABO	LABO	
7/25/2021, 03:45	LABO	LABO	
7/25/2021, 03:45	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:45	LABO	LABO	
7/25/2021, 03:46	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:46	LABO	LABO	
7/25/2021, 03:47	LABO	LABO	
7/25/2021, 03:47	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:48	LABO	LABO	
7/25/2021, 03:48	LABO	LABO	
7/25/2021, 03:49	LABO	LABO	
7/25/2021, 03:49	LABO	LABO	
7/25/2021, 03:49	LABO	LABO	
7/25/2021, 03:49	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:49	LABO	LABO	
7/25/2021, 03:49	LABO	LABO	
7/25/2021, 03:50	LABO	LABO	
7/25/2021, 03:51	LABO	LABO	
7/25/2021, 03:51	LABO	LABO	
7/25/2021, 03:51	LABO	LABO	
7/25/2021, 03:51	LABO	LABO	
7/25/2021, 03:52	Noise	NOISE	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 03:52	LACI	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:52	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:52	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:52	LABO	LABO	
7/25/2021, 03:52	LABO	LABO	
7/25/2021, 03:52	LABO	LABO	
7/25/2021, 03:53	LABO	LABO	
7/25/2021, 03:53	LABO	LABO	
7/25/2021, 03:53	LABO	LABO	
7/25/2021, 03:53	LABO	LABO	
7/25/2021, 03:53	LABO	LABO	
7/25/2021, 03:54	LABO	LABO	
7/25/2021, 03:54	MYLU	LABO_buzz	Call characteristics indicate a different species
7/25/2021, 03:54	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:54	NA	NOISE	
7/25/2021, 03:54	LABO	LABO	
7/25/2021, 03:54	LABO	LABO	
7/25/2021, 03:54	LABO	LABO	
7/25/2021, 03:55	LABO	LABO	
7/25/2021, 03:55	LABO	LABO	
7/25/2021, 03:55	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:55	LABO	LABO	
7/25/2021, 03:55	LABO	LABO	
7/25/2021, 03:55	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:55	LABO	LABO	
7/25/2021, 03:55	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:55	LABO	LABO	
7/25/2021, 03:55	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:56	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 03:57	LABO	LABO	
7/25/2021, 03:57	NA	NOISE	
7/25/2021, 03:57	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:57	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:57	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:57	Noise	NOISE	
7/25/2021, 03:57	Noise	NOISE	
7/25/2021, 03:57	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:57	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:57	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:58	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:58	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:58	Noise	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 03:58	NA	NOISE	
7/25/2021, 03:58	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:58	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:58	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:58	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 03:58	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:58	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	NA	NOISE	
7/25/2021, 03:59	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 03:59	Noise	NOISE	
7/25/2021, 04:00	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:00	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:00	LABO	LABO	
7/25/2021, 04:00	NA	NOISE	
7/25/2021, 04:00	NA	NOISE	
7/25/2021, 04:00	MYLU	LABO	Call characteristics indicate a different species
7/25/2021, 04:00	NoID	NOISE	
7/25/2021, 04:00	Noise	NOISE	
7/25/2021, 04:01	NA	NOISE	
7/25/2021, 04:01	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:02	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:02	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:02	NA	NOISE	
7/25/2021, 04:02	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:02	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:02	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:02	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:02	NA	NOISE	
7/25/2021, 04:02	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:02	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:02	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:02	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:03	LABO	LABO	
7/25/2021, 04:03	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:03	NoID	HiF	Call characteristics indicate bat species but call quality is poor

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 04:03	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:03	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:03	NA	NOISE	
7/25/2021, 04:03	NA	NOISE	
7/25/2021, 04:03	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:03	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:03	NA	NOISE	
7/25/2021, 04:03	NA	NOISE	
7/25/2021, 04:04	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:04	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:04	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:04	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:04	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:04	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:04	NA	NOISE	
7/25/2021, 04:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:05	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:05	Noise	NOISE	
7/25/2021, 04:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:05	LABO	LABO	
7/25/2021, 04:05	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:05	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:05	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:05	Noise	NOISE	
7/25/2021, 04:06	NA	NOISE	
7/25/2021, 04:06	LABO	LABO	
7/25/2021, 04:06	NA	NOISE	
7/25/2021, 04:06	NA	NOISE	
7/25/2021, 04:06	NA	NOISE	
7/25/2021, 04:06	LABO	LABO	
7/25/2021, 04:06	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:06	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:06	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:06	NA	NOISE	
7/25/2021, 04:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:07	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:07	LABO	LABO	
7/25/2021, 04:07	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:07	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:07	Noise	NOISE	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 04:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:07	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:08	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:08	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:08	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:08	NA	NOISE	
7/25/2021, 04:08	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:08	LABO	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:08	Noise	NOISE	
7/25/2021, 04:08	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:09	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:09	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:09	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:09	Noise	NOISE	
7/25/2021, 04:09	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:09	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:09	NA	NOISE	
7/25/2021, 04:09	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:10	NA	NOISE	
7/25/2021, 04:10	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:10	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:10	LABO	LABO	
7/25/2021, 04:10	NA	NOISE	
7/25/2021, 04:10	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:10	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:10	NA	NOISE	
7/25/2021, 04:10	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:10	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:11	Noise	NOISE	
7/25/2021, 04:25	EPFU	EPFU	
7/25/2021, 04:25	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:25	EPFU	EPFU	
7/25/2021, 04:25	EPFU	EPFU	
7/25/2021, 04:25	Noise	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:25	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 04:26	NA	NOISE	
7/25/2021, 04:33	LABO	LABO	
7/25/2021, 04:34	LABO	LABO	
7/25/2021, 04:34	NA	NOISE	
7/25/2021, 04:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:35	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:35	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/25/2021, 04:37	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:37	LABO	LABO	
7/25/2021, 04:37	LABO	LABO	
7/25/2021, 04:37	LABO	LABO	
7/25/2021, 04:37	PESU	LABO	Call characteristics indicate a different species
7/25/2021, 04:39	LABO	LABO	
7/25/2021, 04:40	LABO	LABO	
7/25/2021, 04:40	LABO	LABO	
7/25/2021, 04:40	LABO	LABO	
7/25/2021, 04:41	LABO	LABO	
7/25/2021, 04:41	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:41	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:43	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:43	LABO	LABO	
7/25/2021, 04:43	LABO	LABO	
7/25/2021, 04:45	LABO	LABO	
7/25/2021, 04:45	PESU	HiF	Poor quality &/or Ambiguous
7/25/2021, 04:45	LABO	LABO	
7/25/2021, 04:49	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:55	LABO	LABO	
7/25/2021, 04:55	NoID	LABO	Call characteristics indicate a different species
7/25/2021, 04:55	LABO	LABO	
7/25/2021, 04:56	LABO	LABO	
7/25/2021, 04:58	LABO	LABO	
7/25/2021, 04:58	LABO	LABO	
7/25/2021, 04:59	LABO	LABO	
7/25/2021, 04:59	MYLU	HiF	Poor quality &/or Ambiguous
7/25/2021, 05:02	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/25/2021, 05:02	LABO	LABO	
7/25/2021, 05:02	NoID	LABO	
7/25/2021, 05:02	NA	NOISE	

Table E-4. Summary of the call analyst's findings for Location D, Project #610857, Bridge Preservation of Three Bridges (Northfield)

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:35	LABO	LABO	
7/20/2021, 20:36	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:36	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:37	Noise	LABO	Call characteristics indicate a different species
7/20/2021, 20:37	NA	LABO	Call characteristics indicate a different species
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	NoID	NOISE	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	NA	LABO	Call characteristics indicate a different species
7/20/2021, 20:37	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:37	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:37	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:38	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	PESU	LABO	Call characteristics indicate a different species
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:39	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:40	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	NA	NOISE	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:41	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	LABO	LABO	
7/20/2021, 20:42	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	LABO	LABO	
7/20/2021, 20:43	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:44	LABO	LABO	
7/20/2021, 20:44	LABO	LABO	
7/20/2021, 20:44	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 20:44	LABO	LABO	
7/20/2021, 20:44	LABO	LABO	
7/20/2021, 20:44	LABO	LABO	
7/20/2021, 20:44	LABO	LABO	
7/20/2021, 20:45	LABO	LABO	
7/20/2021, 20:45	LABO	LABO	
7/20/2021, 20:45	MYLU	HiF	Poor quality &/or Ambiguous
7/20/2021, 21:09	NoID	EPFU_LANO	Call characteristics indicate a different species
7/20/2021, 21:09	EPFU	EPFU	
7/20/2021, 21:09	EPFU	EPFU	
7/20/2021, 21:09	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:10	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:15	NoID	EPFU	Call characteristics indicate bat species
7/20/2021, 21:15	NoID	EPFU	Call characteristics indicate bat species
7/20/2021, 21:15	NA	NOISE	
7/20/2021, 21:15	NoID	EPFU	Call characteristics indicate bat species
7/20/2021, 21:15	EPFU	EPFU	
7/20/2021, 21:15	EPFU	EPFU	

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/20/2021, 21:15	EPFU	EPFU	
7/20/2021, 21:15	EPFU	EPFU	
7/20/2021, 21:15	EPFU	EPFU	
7/20/2021, 21:15	EPFU	EPFU	
7/20/2021, 21:15	EPFU	EPFU	
7/20/2021, 21:16	EPFU	EPFU	
7/20/2021, 21:16	EPFU	EPFU	
7/20/2021, 21:16	EPFU	EPFU	
7/20/2021, 21:16	EPFU	EPFU	
7/20/2021, 21:16	EPFU	EPFU	
7/20/2021, 21:21	EPFU	EPFU	
7/20/2021, 21:22	EPFU	EPFU	
7/20/2021, 21:22	Noise	EPFU	
7/20/2021, 21:23	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:23	EPFU	EPFU	
7/20/2021, 21:23	NoID	EPFU	
7/20/2021, 21:24	NoID	EPFU	
7/20/2021, 21:24	EPFU	EPFU	
7/20/2021, 21:24	EPFU	EPFU	
7/20/2021, 21:25	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:25	EPFU	EPFU	
7/20/2021, 21:25	Noise	EPFU_LANO	Call characteristics indicate a different species
7/20/2021, 21:28	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:28	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:28	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:28	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:28	EPFU	LoF	Poor quality &/or Ambiguous
7/20/2021, 21:28	EPFU	EPFU	
7/20/2021, 21:29	EPFU	EPFU	
7/20/2021, 21:29	EPFU	EPFU	
7/20/2021, 21:29	EPFU	EPFU	
7/20/2021, 21:29	EPFU	EPFU	
7/20/2021, 21:29	EPFU	EPFU	
7/20/2021, 21:32	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:32	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:32	EPFU	EPFU	
7/20/2021, 21:32	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 21:34	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:35	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:35	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 21:42	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:42	EPFU	EPFU_LANO	Poor quality &/or Ambiguous

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/20/2021, 21:42	EPFU	EPFU	
7/20/2021, 21:50	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:50	NoID	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:54	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:54	EPFU	EPFU	
7/20/2021, 21:54	EPFU	LoF	Poor quality &/or Ambiguous
7/20/2021, 21:54	EPFU	EPFU	
7/20/2021, 21:54	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 21:58	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 22:03	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 22:03	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 22:03	EPFU	EPFU	
7/20/2021, 22:03	EPFU	HiF	Poor quality &/or Ambiguous
7/20/2021, 22:07	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 22:07	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 22:07	EPFU	EPFU	
7/20/2021, 22:07	EPFU	EPFU	
7/20/2021, 22:07	EPFU	HiF	Poor quality &/or Ambiguous
7/20/2021, 22:26	EPFU	EPFU	
7/20/2021, 22:26	EPFU	EPFU	
7/20/2021, 22:42	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 22:42	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 22:45	EPFU	EPFU	
7/20/2021, 22:45	EPFU	EPFU	
7/20/2021, 22:45	EPFU	EPFU	
7/20/2021, 22:45	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 22:45	LABO	LABO	
7/20/2021, 22:45	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 22:45	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 22:45	Noise	LoF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 22:51	NA	NOISE	
7/20/2021, 22:53	NA	NOISE	
7/20/2021, 22:53	MYSE	MYLU	F max < 80 kHz, poor call quality
7/20/2021, 22:55	NA	NOISE	
7/20/2021, 23:01	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:01	EPFU	EPFU	
7/20/2021, 23:01	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 23:06	EPFU	EPFU	
7/20/2021, 23:06	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 23:15	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:15	EPFU	EPFU	
7/20/2021, 23:29	EPFU	LoF	Poor quality &/or Ambiguous

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/20/2021, 23:29	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:29	EPFU	EPFU	
7/20/2021, 23:29	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/20/2021, 23:30	NoID	LABO	Call characteristics indicate a different species
7/20/2021, 23:31	Noise	NOISE	
7/20/2021, 23:31	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:31	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:31	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:31	EPFU	EPFU	
7/20/2021, 23:51	EPFU	LoF	Poor quality &/or Ambiguous
7/20/2021, 23:51	EPFU	EPFU	
7/20/2021, 23:51	NoID	EPFU	
7/20/2021, 23:56	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:56	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:56	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:56	EPFU	LoF	Poor quality &/or Ambiguous
7/20/2021, 23:57	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:57	EPFU	EPFU	
7/20/2021, 23:57	EPFU	LoF	Poor quality &/or Ambiguous
7/20/2021, 23:57	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:57	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/20/2021, 23:57	EPFU	EPFU	
7/21/2021, 00:15	NoID	EPFU_LANO	Call characteristics indicate a different species
7/21/2021, 00:15	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:15	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:16	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:16	EPFU	EPFU	
7/21/2021, 00:16	EPFU	EPFU	
7/21/2021, 00:18	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:18	EPFU	EPFU	
7/21/2021, 00:18	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 00:18	EPFU	EPFU	
7/21/2021, 00:18	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:20	EPFU	EPFU	
7/21/2021, 00:20	EPFU	EPFU	
7/21/2021, 00:20	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:20	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:21	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:23	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:23	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:25	NoID	EPFU_LANO	Call characteristics indicate a different species
7/21/2021, 00:25	EPFU	NOISE	Call quality too low to classify as having charateristics of bat

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/21/2021, 00:29	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:29	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:29	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:29	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:29	EPFU	EPFU	
7/21/2021, 00:29	EPFU	EPFU	
7/21/2021, 00:29	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:35	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:36	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:36	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 00:36	Noise	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:37	LABO	LABO	
7/21/2021, 00:37	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:37	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:38	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 00:40	NoID	EPFU	
7/21/2021, 00:43	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:43	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:43	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:43	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 00:43	EPFU	EPFU	
7/21/2021, 00:43	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:43	EPFU	EPFU	
7/21/2021, 00:43	NoID	EPFU	
7/21/2021, 00:43	EPFU	EPFU	
7/21/2021, 00:43	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:43	EPFU	EPFU	
7/21/2021, 00:43	Noise	NOISE	
7/21/2021, 00:48	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:48	Noise	LoF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 00:53	LABO	LABO	
7/21/2021, 00:53	LABO	LABO	
7/21/2021, 00:53	LABO	LoF	Poor quality &/or Ambiguous
7/21/2021, 00:56	LABO	LABO	
7/21/2021, 00:56	LABO	LABO	
7/21/2021, 01:03	EPFU	EPFU	
7/21/2021, 01:03	EPFU	EPFU	
7/21/2021, 01:03	Noise	NOISE	
7/21/2021, 01:06	Noise	LoF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 01:07	EPFU	EPFU	
7/21/2021, 01:07	NA	NOISE	
7/21/2021, 01:11	EPFU	EPFU_LANO	Poor quality &/or Ambiguous

Date, Time	KPro ID	Analyst ID	Analyst Notes, Conclusions
7/21/2021, 01:11	EPFU	EPFU	
7/21/2021, 01:11	Noise	NOISE	
7/21/2021, 01:22	NA	NOISE	
7/21/2021, 01:27	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 01:27	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 01:35	Noise	NOISE	
7/21/2021, 01:37	EPFU	LoF	Poor quality &/or Ambiguous
7/21/2021, 01:37	NoID	NOISE	
7/21/2021, 01:56	MYLU	MYLU	
7/21/2021, 01:56	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 02:24	MYLU	MYLU	
7/21/2021, 02:24	MYLU	MYLU	
7/21/2021, 02:24	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 03:12	NA	HiF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 03:14	NA	NOISE	
7/21/2021, 03:15	NA	NOISE	
7/21/2021, 03:16	NA	NOISE	
7/21/2021, 03:17	Noise	NOISE	
7/21/2021, 03:17	Noise	NOISE	
7/21/2021, 03:17	NoID	NOISE	
7/21/2021, 03:18	NoID	NOISE	
7/21/2021, 03:38	NoID	LoF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 03:38	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 03:59	NA	NOISE	
7/21/2021, 03:59	Noise	HiF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 04:01	Noise	NOISE	
7/21/2021, 04:07	NoID	HiF	Call characteristics indicate bat species but call quality is poor
7/21/2021, 04:07	NA	NOISE	
7/21/2021, 04:08	LANO	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 04:08	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 04:08	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 04:14	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 04:14	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 04:14	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 04:14	EPFU	EPFU	
7/21/2021, 04:14	LABO	HiF	Poor quality &/or Ambiguous
7/21/2021, 05:09	EPFU	EPFU_LANO	Poor quality &/or Ambiguous
7/21/2021, 05:09	EPFU	LoF	Poor quality &/or Ambiguous

Appendix F. Resumes

JASON D. COLLINS, QBS
Senior Wildlife Biologist

Mr. Collins has over ten years of professional experienced as a biological consultant and Certified Wildlife Biologist® through The Wildlife Society. His technical expertise includes chiropteran biology and GIS based habitat modeling. He has in-depth knowledge of wildlife of the Eastern United States including threatened and endangered species.

His project experience includes mid-stream transmission pipelines, military installations, and wind farms, where he has conducted wildlife impact assessments, compensatory mitigation planning and monitoring, wildlife habitat surveys, small-mammal trapping, fish surveys, and amphibian survey.

Mr. Collins has co-authored Bird and Bat Conservation Strategies, Biological Assessments, and Construction and Operation Plans for various projects. He completed his Master's thesis investigating the distributions and habitat associations of bats in West Virginia under leading bat expert Dr. Allen Kurta and is currently pursuing a Master's of Business Administration with a concentration in Environmental Compliance and Sustainability from Southern New Hampshire University.

EDUCATION

Pursuing M.B.A., Environmental Compliance and Sustainability, Southern New Hampshire University

M.S., General Biology, Eastern Michigan University

B.S., Wildlife and Fisheries Science, Delaware State University

PROFESSIONAL EXPERIENCE

2015-Present	Normandeau Associates
2008-2015	Sanders Environmental Inc

PROFESSIONAL CERTIFICATIONS

- Certified Wildlife Biologist®

PROFESSIONAL AFFILIATIONS

- The Wildlife Society
- North American Society for Bat Research
- North Eastern Bat Working Group

REPRESENTATIVE PROJECT EXPERIENCE

Biological Surveys, Massachusetts Department of Transportation, State Wide (2016-2020). An environmental open-end contract for biological surveys including northern long-eared bat acoustics surveys, mussel surveys, wetlands, and other environmental related tasks for the construction and rehabilitation of roadways and bridges in the state of Massachusetts. Mr. Collins is the acting Project Manager for this contract.

PPL Sugar Notch Re-power Project, Woodland Design, Luzerne Co., PA (2016-2020). A Phase 1 habitat assessment was conducted for eastern small-footed bats for a proposal re-power of 18 miles of powerline right of way. The site was located in close proximity to known eastern small-footed habitat and Mr. Collins developed the study protocol, installed exclusion devices, oversaw construction of artificial habitat structures for mitigation, and conducted follow up surveys of the structures. Project Manager, Qualified Bat Surveyor.

Fort Pickett Bat Surveys, EEE Consulting Inc., Nottoway Co., VA (2019). A general bat survey was requested to assist with natural resources planning for the Virginia Department of Military at Fort Pickett Maneuver Training Center. Mr. Collins developed the study plan and oversaw mist-netting, radio-telemetry, emergence surveys, and reporting.

PennDOT Oley Interchange, H&K Engineering, Berks Co., PA (2019). Mr. Collins assisted with an emergence survey that was necessary to facilitate the construction of a roundabout for the Pennsylvania Department of Transportation. Six trees were visually overserved for bats allowing for the continuation of project construction.

Camp Pendleton Small Mammal Surveys, EEE Consulting Inc., Virginia Beach, VA (2018). A small mammal trapping survey was conducted in order to assist with natural resources planning for the Virginia Department of Military at Camp Pendleton State Military Reservation. Mr. Collins oversaw survey design, placement of traps, and reporting.

Bat Surveys at Three Air National Guard Bases, WA, NH, WV, Ledios (2017-2018). Mr. Collins is the lead researcher and qualified bat survey to ascertain bat resources at three large ANG bases. Both Spring and Summer surveys were performed at each base using a combination of mist netting and acoustics. Mr. Collins wrote Study Plans for approval by the USFWS and State Endangered Species Biologists. Wildlife Biologist/Qualified Bat Surveyor.

Hazleton Materials Quarry Expansion, H&K Engineering, Luzerne Co. PA (2016). A Phase 1 habitat assessment was conducted for eastern small-footed bats for a proposed 80 acre quarry expansion project. Mr. Collins developed the proposal, conducted the survey, and reported his findings. Project Manager, Qualified Bat Surveyor.

Northeast Energy Direct Pipeline, Ecology and Environmental, NY (2015). Kinder Morgan was seeking to construct a pipeline and pumping stations that had the potential to impact endangered species of bats. Mr. Collins worked with the Lead Bat Team Leader and providing his skillset in scientific research, endangered bat presence/absence protocols, and lead surveys for the project.

X-4 Mine Survey, STV, Luzerne Co., PA (2015). A presence/absence survey using harp-trapping was conducted on an abandoned mine for nearby development. Mr. Colling led the team conducting the surveys. Team leader, and Qualified Bat Surveyor.

Long Prairie Wind, APEX, Van Wert Co. OH (2015). APEX Clean Energy is exploring the feasibility of constructing Long Prairie Wind, a wind farm in southern Van Wert County, Ohio. Mr. Collins was responsible for presence/absence surveys of Indiana bats, and Northern long-eared bats on the proposed project area. He coordinated with the client, selected site locations, oversaw the mist-netting and radio telemetry surveys, and developed the report. Project Manager, Bat Identifier, and Team Leader.

Confidential Client, (PA and NY) (2015). A confidential client is expanding their pipeline from the Marcellus Shale gas wells to the Northeast US. Jason is working with the Lead Bat Team Leader and providing his skillset in scientific research, endangered bat presence/absence protocols, and leading harp-trapping survey teams on gathering data for the project.

Atlantic Sunrise Project, Williams (Pennsylvania) (2015). Williams is proposing the construction and operation of the Atlantic Sunrise Project. The pipeline is approximately 180 miles of greenfield pipeline, two pipeline loops, and two new compressor facilities that will connect producing regions in northeastern PA to markets in the Mid-Atlantic. Mr. Collins was a Qualified Indiana Bat Surveyor conducting mist-netting and radio telemetry surveys. Bat Identifier and Team Leader.

JAMIE L. O'BRIEN
Biologist/Data Analyst

Ms. O'Brien is a biologist with nine years of professional experience in wildlife research, conservation, and natural resource management and permitting throughout New England. Her projects have emphasized protecting and managing threatened and endangered species, assessing environmental impacts, regulating and managing natural resources and wildlife, and ensuring Federal Endangered Species Act compliance. Her diverse wildlife background includes experience with forest, wetlands, and marsh birds, shorebirds, waterfowl, songbirds, raptors, amphibians, freshwater mussels, and small mammals. Ms. O'Brien is adept at using visual and auditory clues to identify species. Furthermore, she has performed numerous vegetation surveys as part of visual assessments, plot based surveys, and wetland delineations. In addition to her field skills, Ms. O'Brien possesses a strong foundation in project planning and implementation, project management and organization, and data analysis and quality control.

Additionally, Ms. O'Brien is a GIS Analyst and SAS Programmer, competent in working with and running analysis on large datasets. She is skilled at quality control procedures that involve the integrity and quality of data and generation of final data deliverables.

EDUCATION

M.S.E.S., Applied Ecology, Indiana University, Bloomington

M.P.A., Environmental Policy and Natural Resource Management, Indiana University, Bloomington

B.A., (cum laude) Biology, Saint Anselm College

PROFESSIONAL EXPERIENCE

2013-Present	Normandeau Associates
2011-2013	U.S. Fish & Wildlife Service, Umbagog National Wildlife Refuge
2012	Ducks Unlimited, Inc. U.S. Great Lakes Region
2009-2011	Office of Sustainability, Indiana University, Bloomington
Summer 2008	Office of Sustainability, Dickinson College

PROFESSIONAL AFFILIATIONS

- New Hampshire Audubon
- New Hampshire Association of Natural Resource Scientists
- The Wildlife Society
- Maine DIFW Credentialed Vernal Pool Observer

REPRESENTATIVE PROJECT EXPERIENCE

Massachusetts Statewide Northern Long-eared Bat Surveys, MassDOT, MA (2016-Present). In support of over 50 MassDOT projects, Normandeau conducted acoustic surveys in 2016, 2017, 2018, 2019, and 2020 for the state and federally listed northern long-eared bat. Ms. O'Brien is assisting with Northern long-eared bat surveys, which involve deployment and retrieval of acoustic detectors, weather recording, habitat characterization, and reporting. Project Manager, Biologist.

I-93 Exit 4A FEIS, CDL Consulting Engineers, Londonderry/Derry, NH (2016-Present). Normandeau is preparing a Final Environmental Impact Statement for a proposed new exit between Exits 4 and 5 on I-93 in southern NH. Ms. O'Brien conducted the northern long-eared bat surveys, which involved deployment and retrieval of acoustic detectors and habitat analysis of detector sites. Additionally, Ms. O'Brien assisted with wetland and vernal pool impact assessments and review, field delineation of proposed stormwater areas, and wetland permitting associated with the DEIS. Biologist.

Acoustic Bat Surveys, Lamprey River Advisory Committee, Lamprey River Watershed, NH (2018). Normandeau conducted Northern long-eared bat surveys throughout the Lamprey River Watershed. Ms. O'Brien conducted the surveys, which involved coordination with property owners and advisory committee members, deployment and retrieval of acoustic detectors, habitat analysis of detector sites, and reporting.

Northern Pass HVDC New Hampshire Transmission Line Expansion Project, Northern Pass, LLC, Multiple Locations, NH (2014-2018). Northeast Utilities proposed the Northern Pass Transmission Line, a 180-mile HVDC and

AC Transmission project to bring hydropower from Quebec into New Hampshire and the New England region. Ms. O'Brien performed wetland mitigation research, prepared NHDES Shorelands, Wetlands, and Alteration of Terrain Permits, provided GPS support for delineated wetland boundaries, and participated in natural resource surveys including rare plants, vernal pools, and bats. Additionally, Ms. O'Brien oversaw geotechnical borings at the Deerfield Substation and installation of a work pad in Pittsfield to ensure compliance of wetland regulations and rare, threatened, and endangered species avoidance. Biologist.

Linking Landscapes for Massachusetts Wildlife Roadkill Mortality Study (2017). The Linking Landscapes data is a collaborative effort between Massachusetts Department of Transportation and the Massachusetts Division of Fisheries and Wildlife – Natural Heritage and Endangered Species Program to reduce wildlife-vehicle collisions and improve public safety, restore and protect habitats, and incorporate conservation strategies into transportation projects. Normandeau was contracted to analyze citizen science data collected over the past ten years and compare it to other available wildlife mortality data to assess what areas should be targeted for conservation projects. Ms. O'Brien performed data analysis on all mortality data collected and co-authored the final report. Biologist.

Balsams Ski Resort Expansion, Dixville LLC, Dixville, NH (2015-2017). Normandeau was retained to undertake natural resources surveys and provide permitting support for the revival and expansion of the Balsams Grand Resort and Wilderness Ski Area. Ms. O'Brien played a large role in the 2015 Northern long-eared bat surveys, where, in addition to deployment and retrieval of detectors, she coordinated site access and field crew schedules, and was responsible for data reporting and habitat assessments. Biologist.

Blackstone River Northern Long-eared Bat Surveys, New England Hydropower Company, LLC, Lincoln/Cumberland, RI (2016). Normandeau conducted Northern long-eared bat surveys for proposed bridge repairs and upgrades along the Blackstone River. Ms. O'Brien conducted the surveys, which involved deployment and retrieval of acoustic detectors, habitat analysis of detector sites, and reporting. Biologist.

Philips Exeter Academy Northern Long-eared Bat Surveys, Altus Engineering, Inc., Exeter, NH (2016). Normandeau conducted Northern long-eared bat surveys for a proposed drain outfall replacement project at Philips Exeter Academy. Ms. O'Brien conducted the Northern long-eared bat surveys, which involved deployment and retrieval of acoustic detectors, habitat analysis of detector sites, and reporting. Biologist.

Pike Industries Northern Long-eared Bat Surveys, Hooksett, NH (2015). Normandeau was hired to perform Northern long-eared bat surveys for a proposed quarry expansion. Ms. O'Brien conducted the surveys, which involved deployment and retrieval of acoustic detectors, habitat analysis of detector sites, and reporting. Biologist.

Socha Companies at Hidden Oak, Hooksett, NH (2015). Normandeau provided delineation and natural resource survey work for a proposed apartment complex. Ms. O'Brien participated in Northern long-eared bat surveys, which involved the deployment and retrieval of acoustic detectors. Biologist.

Bat Monitoring, U.S. Fish & Wildlife Service, Umbagog National Wildlife Refuge, NH/ME (2011- 2013). Ms. O'Brien evaluated resident bat populations adjacent to Lake Umbagog. Monitoring activities included conducting maternity roost emergence surveys and acoustic driving transect surveys. Coordinating volunteer efforts, completing required documentation following each survey, maintaining and preserving accurate records, and updating database records was also practiced. Biological Technician.

EMMA J. DUGUAY
Biologist

Ms. Duguay is a Biologist with water quality and natural resource experience. Her field work experience includes: surface water and groundwater quality monitoring, landfill gas monitoring, bat habitat assessments and acoustic surveys, and dredge fisheries monitoring. She also has experience assisting in vernal pool surveys, vegetation plots, and wetland surveys. Ms. Duguay has proficiency in GIS, Phase 1 Environmental Site Assessment, environmental data analysis, and reporting. In addition, Ms. Duguay has laboratory experience in processing bivalve larvae, Ichthyoplankton, and benthos samples as well as taxonomic identification of benthic species.

EDUCATION

B.S., Biology, Plymouth State University, (*Cum Loude).* Minor in Chemistry.

PROFESSIONAL EXPERIENCE

2019-Present Normandeau Associates

PROFESSIONAL AFFILIATIONS

- New Hampshire Association of Natural Resource Scientists

REPRESENTATIVE PROJECT EXPERIENCE

Massachusetts Statewide Northern Long-eared Bat Surveys, MassDOT, MA (2020-Present). Normandeau conducted USFWS compliant acoustic bat surveys and habitat assessments targeting the state and federally threatened northern long-eared bat, for MassDOT roadway projects throughout Massachusetts. Tasks include evaluating project areas for habitat suitability per USFWS guidance, survey design and planning, data collection, data QA/QC, manual call vetting as required by USFWS guidance, and managing the reporting effort. Ms. Duguay conducted Northern long-eared bat surveys, which involve deployment and retrieval of acoustic detectors, weather recording, habitat characterization, and reporting. Project Scientist.

Errol Dam Relicensing, Brookfield White Pine Hydro, NH-ME (2020-Present). Brookfield is relicensing this 2 MW hydroelectric project through FERC's Integrated Licensing Process. Normandeau is providing terrestrial services for wetland mapping, rare and invasive plant species surveys, bats, odonates (dragonflies), mussels and incidental wildlife observations on project-affected lands surrounding Lake Umbagog, its tributaries and the tailwaters in the Androscoggin River. A quantitative vegetation survey will compare existing conditions to a long-term data set at two fens/floating bogs. Ms. Duguay conducted bat surveys and reporting in accordance with USFWS guidance. Project Scientist.

Centredale Manor Wetland/Terrestrial Task, Centerdale, RI (2020-Present). Normandeau has been conducting six tasks to characterize wetland baseline conditions for the pre-design investigation at the Centredale Manor Superfund Site in 2019. These tasks include vernal pool surveys, wetland delineation, soil and hydrology survey, wetland functions, values and condition assessment, and terrestrial and aquatic vegetation surveys. A final report will be provided. Ms. Duguay assisted with field assessments.

Crossroads Landfill Expansion Phase 14, Waste Disposal Services of Maine, Norridgewock, ME (2020-Present). Normandeau has been providing natural resource services at Waste Management's Crossroads facility, a secure special waste landfill in Norridgewock, Maine since 1990. Normandeau continues to provide natural resource consulting services for Crossroads, including; wetland delineation, vernal pool identification, wildlife management advice, invasive species control, and natural resource services for expansion and mitigation. Ms. Duguay assisted with vernal pool monitoring and wetland delineation, and conducted a Phase I Environmental Site Assessment (Phase I ESA) of a 1000-acre parcel as possible mitigation. Project Scientist.

Dover-Rochester Tolls Conversion, HNTB, Dover and Rochester, NH (2020). Normandeau provided environmental support for the conversion of the Dover and Rochester toll booths on the Spaulding Turnpike to total electronic tolling. Sound walls will also be installed. Normandeau tasks will include wetland delineation,

RTE and invasive species survey, and state and federal permitting. Ms. Duguay assisted with wetland delineation and reporting.

Dover Landfill Superfund Site Remediation, Dover landfill Remedial Trust, Dover, NH (2020-Present). Normandeau has been providing natural resource services for the 50-acre Dover Landfill Superfund Site required both sediment and groundwater remediation for arsenic and other contaminants. Ms. Duguay was responsible for monitoring groundwater depths in piezometers and shallow wells to determine the effects of long-term groundwater extraction on wetlands at the site and follow-up reporting of the results. Ms. Duguay also assisted with vegetation monitoring plots. Field Scientist.

Seacoast Reliability Project, Eversource Energy, Seacoast Region, NH (2019-Present). Normandeau is providing siting, permitting and environmental monitoring services to Eversource for a new 115kV line proposed between the Madbury and Sudbury substations. The line is approximately 13 miles, predominantly within existing ROW, but includes overhead, submarine and underground segments. Sensitive resources include a 1 mile water crossing through Little Bay, thus within the Great Bay NWR, several significant cultural resources, and the Pease Air Force Base. Normandeau and sub-contractors (Vicky Bunker, Inc; AHS, Inc; Landworks; and GEI) will provide field investigations of natural and cultural resources, State and Federal permitting, and SEC application preparation and testimony. Ms. Duguay assisted in water quality monitoring for event-based cross sectional water quality surveys. As well as, post construction invasive plant, and vegetation surveys within the ROW. Field Scientist.

K174 Line Structure Replacement Project, Eversource Energy, Sullivan County, NH (2020-Present). In support of Eversource K174 Line structure replacement in Sullivan County, NH Normandeau is providing wetland reflagging of previously delineated wetlands, weekly project environmental compliance support, and project close out. Ms. Duguay conducted environmental compliance oversight.

Water Quality Monitoring, Cheshire County Waste Water Treatment Facility, Cheshire County, NH (2020-Present). Normandeau has been conducting ongoing field sampling for water quality monitoring programs at the Cheshire County Waste Water Treatment Facility. The water quality program includes testing ground water monitoring wells associated with the Release Detection Permit (RDP). Ms. Duguay is responsible for performing all field activities, and reporting. Project Scientist.

Water Quality Monitoring, Mount Sunapee Wastewater Treatment Facility, Newbury, NH (2020-Present). Normandeau has been conducting an ongoing field sampling program to test groundwater wells for various water quality parameters of concern in accordance with the existing groundwater management permit. Ms. Duguay is responsible for performing all field activities. Project Scientist.

Water Quality and Post-Closure Monitoring Programs, Town of Plaistow Landfill, Plaistow, NH (2020-Present). Normandeau has been conducting ongoing field sampling for water quality and post-closure monitoring programs at the Town of Plaistow landfill. The water quality program includes testing groundwater wells and surface water sites. The post-closure monitoring program includes air quality monitoring at gas vents, vapor monitoring probes, and an on-site Highway Department garage. Ms. Duguay is responsible for conducting water quality, and vapor monitoring programs and reporting in accordance to NHDES GMP. Project Scientist.

Water Quality and Post-closure Monitoring Programs, Town of Troy Landfill, Troy, NH (2020-Present). Normandeau has been conducting ongoing field sampling for water quality and post-closure monitoring programs at the town of Troy landfill. The water quality program includes testing groundwater wells and surface water sites. The post-closure monitoring program includes air quality monitoring at vapor monitoring probes. Ms. Duguay is responsible for performing all field activities and reporting in accordance to NHDES GMP. Project Scientist.

JEFF CLERC
Senior Bat Ecologist

EDUCATION

Ph.D., Biological Sciences, Texas Tech University, Lubbock, TX

M.S., Biological Sciences, Humboldt State University, Arcata, CA

B.S., Wildlife Biology, Humboldt State University, Arcata, CA

A.S., Forestry and Natural Resources Management, College of the Redwoods, Eureka, CA

PROFESSIONAL EXPERIENCE

2020-Present	Normandeau Associates
2015-2019	Texas Tech University
2010-2013	Contract Biologist
2010	Dolphin Research Center
2009	Allegany State Park

PROFESSIONAL AFFILIATIONS

- North American Society of Bat Research
- American Society of Naturalists
- Ecological Society of America
- Bat Conservation International
- The Wildlife Society
- Data Visualization Society

Through his 7 years of experience working with bats he served as a project lead or team member on dozens of projects, throughout California, New Mexico, Texas, and Louisiana. He managed the bat acoustic data collection and analysis for a 2-year monitoring project studying bat activity in redwood forest canopies, he helped build the Southeastern Myotis call library for SonoBat acoustic software, and as the lead technician for the redwood hoary bat migration project (USFS) was responsible for collecting all hand-release echolocation data. Further, he has trained multiple researchers on bat acoustic analysis. Recently, Dr. Clerc was lead author and data scientist on a collaborative project analyzing 50 years of bat radio telemetry studies to be published in an anthology for the North American Society of Bat Research. He has secured funding through writing multiple grant proposals, managed spending, and supervised field technicians, to support collaborative field studies on bat migration. One such study, currently in the final phases of sample preparation, investigates the fatty acid composition of silver-haired bat facial secretions to understand the importance of olfaction as a potential social cue during migration.

Dr. Clerc has expertise in data science, using program R to translate large datasets into easily digested communications. With program R, he has built web applications for both scientific and non-scientific stakeholders that interactively visualize bat acoustic data by species. Dr. Clerc also trained many colleagues in R programming and continues to actively grow his skills through participation in workshops. From experimental design to research communication, Dr. Clerc has been involved in all aspects of the scientific process throughout his career. During his master's research he developed a novel geo-marker for migratory bats using fatty acid signatures and did rigorous field work applying the method to detect the number of unique summering silver-haired bat populations present at an important stopover site. Much of his dissertation research focused on building models to help managers better understand the mechanisms underlying patterns of migration that lead to conflicts with energy development. Dr. Clerc then tested these models by quantifying the energetics and foraging strategies of silver-haired and hoary bats migrating along the Rocky Mountains. He also developed a holistic framework for synthesizing seemingly disparate research on complex patterns of bat migration which he presented at the 2019 annual meeting of the North American Society for Bat Research.

REPRESENTATIVE PROJECT EXPERIENCE

Massachusetts Statewide Northern Long-eared Bat Surveys, MassDOT, MA (2020-present). Processing and vetting all acoustic data related to the Massachusetts Department of Transportation Northern Long-eared bat survey. Bat Biologist.

Digital Aerial Baseline Survey, New York State Energy Research and Development Authority (NYSERDA) (2020-Present). Responsible for generating final report density distribution outputs for all species of birds, marine mammals, turtles, sharks and rays and working with the state and Normandeau teams on final reporting.

Construction and Operations Plan, Atlantic Shores (2020). Author on the bat COP and avian appendix for construction operations plan associated with Atlantic Shores Wind Energy Lease Area. Co-author and Data Analyst.

Boat-Based Acoustic Monitoring, Atlantic Shores (2020). Responsible for data analysis and reporting of all boat-based bat acoustic survey data throughout the Atlantic Shores Wind Energy Lease Area. Data Analyst and Reporting.

Red Knot Satellite Tracking Study, Atlantic Shores (2020). Lead data analyst responsible for receiving, processing, and reporting on data associated with red-knots traveling across the Atlantic Ocean. Data analyst and reporting.

Buoy-based bird and bat acoustic monitoring, Ocean Tech Services (2020). Responsible for data analysis and project management and reporting of all buoy based acoustic survey data associated with a buoy deployment in the Lake Erie. Project Manager and Data Analyst.

Buoy-based bird and bat acoustic monitoring, New York State Energy Research and Development Authority (NYSERDA) (2020). Responsible for data analysis and project management and reporting of all buoy based acoustic survey data throughout the Atlantic Shores Wind Energy Lease Area. Project Manager and Data Analyst.

Digital Aerial Baseline Survey, New York State Energy Research and Development Authority (NYSERDA) (2020). Responsible for generating the final report on bony fishes and fish shoals from data collected during three years of Digital Aerial Baseline surveys within the offshore planning areas. Biologist.

Florida Bonneted Bat Surveys, Fort Lauderdale, O'Brien & Gere (2020). Conducted acoustic, roost, and emergence surveys for at three potential building sites in Ft. Lauderdale, Broward County. Bat Biologist.

Fairbanks Gopher Tortoise Permit/Relocation, WG Johnson (2020). Conducted Gopher Tortoise relocation including identifying and assessing burrows, excavating burrows, and translocating captured tortoises to conservation areas. Field Biologist.

Digital Aerial Baseline Survey, New York State Energy Research and Development Authority (NYSERDA) (2020). Responsible for generating the final report on bony fishes and fish shoals from data collected during three years of Digital Aerial Baseline surveys within the offshore planning areas. Biologist.

REPRESENTATIVE PEER-REVIEWED ARTICLES AND PUBLICATIONS

Clerc, J. & McGuire, L. P. (Abstract Accepted). Testing Predictions of Optimal Migration Theory: The Importance of Torpor, Foraging, and Digestive Capacity in a System of Migratory Bats. Abstract Accepted for inclusion in Frontiers in Ecology and Evolution special edition on Migration and Physiology, March 2021.

Clerc, J., Rogers, E. J. & Fuller, N. W. (In Prep). An Observation of Spring Mating in Silver-Haired Bats (Lasionycteris noctivagans). Submitting to Western North American Naturalist, December 2020.

Clerc, J. & McGuire, L. P. (Submitted). Considerations of Varied Thermoregulatory Expressions in Migration Theory. Submitted to Oikos, November 2020.

Clerc, J., McGuire, L. P., Boyles, J. G., & Brigham, M. (2021). How Radio-Telemetry has Driven Knowledge about Movement, Space Use, and Physiology of Bats. in "50 years of the North American Society of Bat Research". Editors: Lim et al.

McGuire, L. P., Kelly, L. A., Baloun, D. E., Boyle, W. A., Cheng, T. L., Clerc, J., … & Guglielmo, C. G. (2018). Common condition indices are no more effective than body mass for estimating fat stores in insectivorous bats. Journal of Mammalogy, 99(5), 1065–1071.

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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

CHARLEMONT

For: **Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook**

COMMONWEALTH OF MASSACHUSETTS

LOCATION

The work referred to herein is in the Town of CHARLEMONT in Franklin 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:

Bridge C-05-042 on East Oxbow Road

Beginning – Station 11+50.00 +/-
Ending –Station 16+50.00 +/-

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 **960 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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massDOT Massachusetts Department of Transportation Highway Division

CMS Contract Management System

Project # 608858 **Contract # 125266**

Location : CHARLEMONT

Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook

ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
100.	1	SCHEDULE OF OPERATIONS - FIXED PRICE $29500 AT Twenty Nine Thousand Five Hundred Dollars LUMP SUM	$29,500.00	$29,500.00
101.	0.3	CLEARING AND GRUBBING AT _____ PER ACRE		
102.	0.2	SELECTIVE CLEARING AND THINNING AT _____ PER ACRE		
102.1	710	TREE TRIMMING AT _____ PER FOOT		
114.1	1	DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. C-05-042 (0G1) AT _____ LUMP SUM		
120.	950	EARTH EXCAVATION AT _____ PER CUBIC YARD		
127.1	35	REINFORCED CONCRETE EXCAVATION AT _____ PER CUBIC YARD		
140.	130	BRIDGE EXCAVATION AT _____ PER CUBIC YARD		
141.	80	CLASS A TRENCH EXCAVATION AT _____ PER CUBIC YARD		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
141.1	14	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		
144.	12	CLASS B ROCK EXCAVATION AT _____ PER CUBIC YARD		
150.	100	ORDINARY BORROW AT _____ PER CUBIC YARD		
151.01	500	GRAVEL BORROW - TYPE C AT _____ PER CUBIC YARD		
151.1	230	GRAVEL BORROW FOR BRIDGE FOUNDATION AT _____ PER CUBIC YARD		
153.1	2	CONTROLLED DENSITY FILL - NON-EXCAVATABLE AT _____ PER CUBIC YARD		
156.	130	CRUSHED STONE AT _____ PER TON		
156.1	30	CRUSHED STONE FOR BRIDGE FOUNDATIONS AT _____ PER TON		
157.	10	STONE FOR DRAINAGE END AT _____ PER SQUARE YARD		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
170.	1,200	FINE GRADING AND COMPACTING - SUBGRADE AREA AT _____ PER SQUARE YARD		
170.001	1	GRADING AND COMPACTING FOR DETOUR AT _____ LUMP SUM		
180.01	1	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM AT _____ LUMP SUM		
180.02	140	PERSONAL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
180.03	80	LICENSED SITE PROFESSIONAL SERVICES AT _____ PER HOUR		
181.11	1,620	DISPOSAL OF UNREGULATED SOIL AT _____ PER TON		
181.12	20	DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY AT _____ PER TON		
181.13	20	DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY AT _____ PER TON		
181.14	20	DISPOSAL OF HAZARDOUS WASTE AT _____ PER TON		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
402.	100	DENSE GRADED CRUSHED STONE FOR SUB-BASE AT _____ PER CUBIC YARD		
415.3	260	PAVEMENT MICRO MILLING AT _____ PER SQUARE YARD		
440.	1,775	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL AT _____ PER POUND		
443.	1.2	WATER FOR ROADWAY DUST CONTROL AT _____ PER 1000 GALLONS		
450.23	40	SUPERPAVE SURFACE COURSE - 12.5 (SSC - 12.5) AT _____ PER TON		
450.31	125	SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC -12.5) AT _____ PER TON		
450.32	45	SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0) AT _____ PER TON		
450.42	220	SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) AT _____ PER TON		
450.60	118	SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B - 9.5) AT _____ PER TON		

Project # 608858	Contract # 125266			
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
450.70	18	SUPERPAVE BRIDGE PROTECTIVE COURSE - 9.5 (SPC-B - 9.5) AT _____ PER TON		
450.71	4	SUPERPAVE BRIDGE PROTECTIVE COURSE – 12.5 (SPC-B - 12.5) AT _____ PER TON		
451.	10	HMA FOR PATCHING AT _____ PER TON		
452.	220	ASPHALT EMULSION FOR TACK COAT AT _____ PER GALLON		
453.	750	HMA JOINT ADHESIVE AT _____ PER FOOT		
472.	5	TEMPORARY ASPHALT PATCHING AT _____ PER TON		
504.	60	GRANITE CURB TYPE VA4 - STRAIGHT AT _____ PER FOOT		
509.	40	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - STRAIGHT AT _____ PER FOOT		
620.12	100	GUARDRAIL, TL-2 (SINGLE FACED) AT _____ PER FOOT		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
620.13	75	GUARDRAIL, TL-3 (SINGLE FACED) AT _____ PER FOOT		
620.131	50	GUARDRAIL, DEEP POST (SINGLE FACED) AT _____ PER FOOT		
627.1	2	TRAILING ANCHORAGE AT _____ EACH		
627.82	2	GUARDRAIL TANGENT END TREATMENT, TL-2 AT _____ EACH		
628.24	4	TRANSITION TO BRIDGE RAIL AT _____ EACH		
628.304	4	TEMPORARY IMPACT ATTENUATOR, NON-REDIRECTIVE, TL-2 AT _____ EACH		
630.2	280	HIGHWAY GUARD REMOVED AND DISCARDED AT _____ PER FOOT		
657.	60	TEMPORARY FENCE AT _____ PER FOOT		
698.3	250	GEOTEXTILE FABRIC FOR SEPARATION AT _____ PER SQUARE YARD		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
698.4	130	GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL AT _____ PER SQUARE YARD		
740.	32	ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) AT _____ PER MONTH		
748.	1	MOBILIZATION AT _____ LUMP SUM		
751.	100	LOAM FOR ROADSIDES AT _____ PER CUBIC YARD		
751.7	30	COMPOST BLANKET AT _____ PER CUBIC YARD		
765.	660	SEEDING AT _____ PER SQUARE YARD		
765.451	5	SEEDING - PART SHADE ROADSIDE MIX AT _____ PER POUND		
767.121	2,300	SEDIMENT CONTROL BARRIER AT _____ PER FOOT		
767.9	660	JUTE MESH AT _____ PER SQUARE YARD		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
769.	460	PAVEMENT MILLING MULCH UNDER GUARD RAIL AT _____ PER FOOT		
813.80	1	SERVICE CONNECTION (OVERHEAD) AT _____ LUMP SUM		
816.81	1	TEMPORARY TRAFFIC CONTROL SIGNAL AT _____ LUMP SUM		
832.	10	WARNING-REGULATORY AND ROUTE MARKER - ALUMINUM PANEL (TYPE A) AT _____ PER SQUARE FOOT		
833.7	4	DELINEATION FOR GUARD RAIL TERMINI AT _____ EACH		
847.1	1	SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL AT _____ EACH		
848.1	1	SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES-STEEL AT _____ EACH		
850.41	100	ROADWAY FLAGGER AT _____ PER HOUR		
852.	390	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
853.1	4	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ EACH		
853.2	40	TEMPORARY BARRIER (TL-2) AT _____ PER FOOT		
853.33	480	TEMPORARY BARRIER - LIMITED DEFLECTION (TL-3) AT _____ PER FOOT		
854.016	200	TEMPORARY PAVING MARKINGS - 6 INCH (PAINTED) AT _____ PER FOOT		
856.12	240	PORTABLE CHANGEABLE MESSAGE SIGN AT _____ PER DAY		
859.	10,000	REFLECTORIZED DRUM AT _____ PER DAY		
860.112	20	12 INCH REFLECTORIZED WHITE LINE (PAINTED) AT _____ PER FOOT		
874.	2	STREET NAME SIGN AT _____ EACH		
874.7	4	MISCELLANEOUS SIGNS REMOVED AND STACKED AT _____ EACH		

Project # 608858 Contract # 125266				
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
945.10	200	DRILLED MICROPILES AT _____ PER FOOT		
948.60	2	MICROPILE VERIFICATION LOAD TEST AT _____ EACH		
948.61	2	MICROPILE PROOF LOAD TEST AT _____ EACH		
953.1	1	TEMPORARY SUPPORT OF EXCAVATION AT _____ LUMP SUM		
983.1	140	RIPRAP AT _____ PER TON		
983.101	35	STREAMBED RESTORATION AT _____ PER CUBIC YARD		
986.	110	MODIFIED ROCKFILL AT _____ PER TON		
991.1	1	CONTROL OF WATER - STRUCTURE NO. C-05-042 AT _____ LUMP SUM		
993.1	1	TEMPORARY BRIDGE NO. C-05-042T AT _____ LUMP SUM		

Project # 608858	Contract # 125266			
Location : CHARLEMONT				
Description : Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
994.01	1	TEMPORARY PROTECTIVE SHIELDING BRIDGE NO. C-05-042 (0G1) AT _____ LUMP SUM		
995.01	1	BRIDGE STRUCTURE, BRIDGE NO. C-05-042 (CBF) AT _____ LUMP SUM		
995.012	1	INSTRUMENTATION FOR BRIDGE NO. C-05-042 (CBF) AT _____ LUMP SUM		
Total Qty:	27,026.7			

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DOCUMENT B00853

SCHEDULE OF PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES (DBES)

PRIME BIDDER: _____

DATE OF BID OPENING: _____ PROJECT NO.: 608858

FEDERAL AID PROJECT NO. STP(BR-OFF)-003S(716)X

PROJECT LOCATION: CHARLEMONT

Name, Address, and Phone Number(s) of DBE	Name of Activity	(a)† DBE Contractor Activity Amount *Construction Work*	(b) DBE Other Business Amount *Services, Supplies, Material*	(c) Total amount eligible for credit under rules in Section 6 of Document 00719 - DBE Special Provisions
Total Bid Amount	TOTALS:	$	$	$
$	DBE Percentage of Total Bid:	%	%	%

†*Column (a) must be at least one-half of the DBE participation goal. Attach additional sheets as necessary.*

Is MassDOT Document B00855 (Joint Check Approval) being submitted for any of the above? ☐ Yes ☐ No ☐ Not Known at This Time

Will any of the contractors listed above be using a third party (i.e. manufacturer) to deliver materials or perform any portion of work by a third party? ☐ Yes ☐ No

CERTIFICATION: I HEREBY DECLARE, TO THE BEST OF MY KNOWLEDGE, THAT **I HAVE READ THE SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES - DOCUMENT 00719.** BOTH THIS SCHEDULE AND THE RELEVANT AND ACCOMPANYING LETTER(S) OF INTENT ARE IN FULL COMPLIANCE WITH THE PROVISIONS OF, AND IN ACCORDANCE WITH, TITLE 49 CODE OF FEDERAL REGULATIONS, PART 26 (49 CFR Part 26).

SIGNATURE:_____ DATE_____

NAME AND TITLE (*PRINT*):_____

EMAIL ADDRESS: _____TEL NO.:_____

*** END OF DOCUMENT ***

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DOCUMENT B00854

DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENT
(To be completed by the DBE – Page 1 of 2)

TO: _____ (Prime Bidder)

FROM: _____ (DBE Firm)

RE: PROJECT NO.: 608858 FEDERAL AID PROJECT NO.: STP(BR-OFF)-003S(716)X

PROJECT LOCATION: CHARLEMONT

DATE OF BID OPENING: _____

I, _____, authorized signatory of the above-referenced DBE firm hereby declare:
Print Name

1. My company is currently certified as a Disadvantaged Business Enterprise (DBE) by the Massachusetts Supplier Diversity Office ("SDO"), formerly known as the State Office of Minority and Women Business Assistance (SOMWBA), as a: (check all applicable, see Section 1 of the Special Provisions For Participation By Disadvantaged Business Enterprises, MassDOT Document 00719 additional guidance is available at Title 49, Code of Federal Regulations, Part 26.55 (49 CFR Part 26.55)):

   ( ) CONTRACTOR ( ) REGULAR DEALER ( ) BROKER
   ( ) MANUFACTURER ( ) TRUCKING OPERATIONS ( ) PROFESSIONAL SERVICES

2. My firm has the ability to manage, supervise and perform the activity described on page 2 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.

3. There have been no changes affecting the ownership, control or independence of my company since my last certification review on _____ ___, 20___. 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 Massachusetts Department of Transportation ("MassDOT") Office of Civil Rights and SDO.

4. I have read the MassDOT proposal for the Project which may be entitled "Project Contract Documents and Special Provisions" or the draft "Contract" which includes MassDOT Document 00719, and acknowledge that my company will comply with that document and the requirements of 49 CFR Part 26.

5. For the purpose of obtaining subcontractor approval from MassDOT, my firm will provide to you:

   A. ***The following construction work:***
      (i) a resume, stating the qualifications and experience, of the superintendent or foreperson who will supervise on site-work;
      (ii) a list of equipment owned or leased by my firm for use on this project; and
      (iii) a list of all projects (public or private) upon which my firm is currently performing, is committed to perform, or intends to make a commitment to perform. I shall also include, for each project: the name and telephone number of a contact person for the contracting authority, person, or organization; the dollar value of the work; a description of the work; and my firm's work schedule for the project.

   B. ***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;
      (ii) information concerning brokers fees and commissions for providing services or materials; and
      (iii) a statement concerning whether my firm intends or will be required to use a joint check arrangement; and any other documents that may be required by MassDOT.

_____ Date_____
DBE Company Authorized Signature

DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENT
(To be completed by the DBE – Page 2 of 2)

DATE OF BID OPENING: _____

PROJECT NUMBER: 608858

FEDERAL AID PROJECT NUMBER: STP(BR-OFF)-003S(716)X

PROJECT LOCATION: CHARLEMONT

PRIME BIDDER: _____

DBE COMPANY NAME: _____

Item number if applicable	NAICS Code	Description of Activity with notations such as Services, or Brokerage, Installation Only, Material Only, or Complete	Quantity	Unit Price	Amount
			TOTAL AMOUNT:		

Please give full explanations, attach additional sheets if necessary.

I HEREBY VERIFY THAT _____ WILL SOLELY
(DBE company name)
PERFORM THE WORK, OR PROVIDE THE SERVICES OR MATERIALS, AS DESCRIBED ABOVE.

DBE AUTHORIZED SIGNATURE: _____

NAME AND TITLE (PRINT):_____

TELEPHONE NUMBER: _____FAX NUMBER: _____

EMAIL ADDRESS: _____

Rev'd 9/20/19

*** END OF DOCUMENT ***

DOCUMENT B00855

DBE JOINT CHECK ARRANGEMENT APPROVAL FORM

(to be submitted by Prime Contractor)

Contract No: 125266 **Project No.** 608858 **Federal Aid No.:** STP(BR-OFF)-003S(716)X

Location: CHARLEMONT **Bid Opening Date:** _____

Project Description: Bridge Replacement, C-05-042, East Oxbow Road over Oxbow Brook

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 ***