COMMONWEALTH OF MASSACHUSETTS

CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	614096-130500
P.V. =	$5,875,120
PLANS	YES

FY 2026 CAPITAL IMPROVEMENT PROGRAM

CAPE MAIN IMPROVEMENTS AT MP 44.27, 44.29, 68.00, AND 71.66

PROJECT

in the Towns of

Rochester and Barnstable, MA

In accordance with the 2025 MassDOT Highway Division Standard Specifications for Highways and Bridges Division I: General Requirements and Covenants, as amended herein, certain subsections of Divisions II: Construction Details and III: Materials Specifications referenced herein, Supplemental Specifications thereto (March 31, 2025), MassDOT's Material Workbook, MassDOT Rail MW-1, MBTA Commuter Rail and Keolis Specifications, and the latest edition of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

This Proposal to be opened and read: Thursday February 19, 2026 at 2:00 pm

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT 00010

TABLE OF CONTENTS

DOCUMENT 00010
TABLE OF CONTENTS ..... 00010-1 through 2

DOCUMENT 00102
NOTICE TO CONTRACTORS ..... 00102- 1 through 4

DOCUMENT 00210
REQUIREMENTS OF MASSACHUSETTS GENERAL
LAWS CHAPTER 30 SECTION 39R; CHAPTER 30, SECTION 39O ..... 00210-1 through 4

DOCUMENT 00331
LOCUS MAP ..... 00331-1 through 2

DOCUMENT 00439
CONTRACTOR PROJECT EVALUATION FORM ..... 00439-1 through 8

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS ..... 00710-1 through 2

DOCUMENT 00718
SPECIAL PROVISION FOR PARTICIPATION BY MINORITY OR WOMEN'S
BUSINESS ENTERPRISES AND SERVICE- DISABLED VETERAN- OWNED
BUSINESS ENTERPRISES ..... 00718-1 through 10

DOCUMENT 00761
SPECIAL PROVISIONS FOR CERTIFICATION REGARDING DEBARMENT,
SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION ..... 00761-1 through 4

DOCUMENT 00820
THE COMMONWEALTH OF MASSACHUSETTS
SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY,
NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM ..... 00820-1 through 6

DOCUMENT 00821
ELECTRONIC REPORTING REQUIREMENTS
CIVIL RIGHTS PROGRAM AND CERTIFIED PAYROLL ..... 00821-1 through 2

DOCUMENT 00859
CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM ..... 00859-1 through 2

DOCUMENT 00860
COMMONWEALTH OF MASSACHUSETTS
PUBLIC EMPLOYMENT LAWS ..... 00860-1 through 2

DOCUMENT 00861
STATE PREVAILING WAGE RATES ..... 00861-1 through 36

DOCUMENT A00801
SPECIAL PROVISIONS ..... A00801-1 through 114

DOCUMENT A00820
REQUEST FOR RELEASE OF MASSDOT
AUTOCAD FILES FORM ..... A00820-1 through 2

TABLE OF CONTENTS (Continued)

DOCUMENT A00830
PERMIT APPLICATIONS ..... A00830-1 through 70

DOCUMENT A00831
ARMY CORPS OF ENGINEERS VERIFICATION AND GENERAL PERMIT..... A00831-1 through 120

DOCUMENT A00896
MASSDOT MW-1……..A00896-1 through 294

DOCUMENT A00900
RAILROAD PROCEDURES FOR THE INSTALLATION, ADJUSTMENT, MAINTENANCE AND INSPECTION OF CWR AS REQUIRED BY 49 CFR 213.118 ..... A00900-1 through 58

DOCUMENT A00901
MASSACHUSESTTS COASTAL RAILROAD
ON-TRACK SAFETY MANUAL ..... A00901-1 through 36

DOCUMENT A00902
MASSACHUSETTS COASTAL RAILROAD TIMETABLE AND OPERATIONS SCHEDULE
..... A00902-1 through 94

DOCUMENT A00903
GEOTECHNICAL REPORTS ..... A00903-1 through 140

DOCUMENT B00420
PROPOSAL.....B00420-1 through 26

DOCUMENT B00421
DOCUMENTS TO BE SUBMITTED BY
SUCCESSFUL BIDDER .....B00421-1 through 14

DOCUMENT B00842
SCHEDULE OF PARTICIPATION BY MINORITY OR WOMEN BUSINESS
ENTERPRISE (M/WBE) .....B00842-1 through 2

DOCUMENT B00843
MINORITY OR WOMENS BUSINESS ENTERPRISE PARTICIPATION
LETTER OF INTENT.....B00843-1 through 2

DOCUMENT B00846
M/WBE OR SDVOBE JOINT CHECK ARRANGEMENT
APPROVAL FORM.....B00846-1 through 2

DOCUMENT B00847
JOINT VENTURE AFFIDAVIT .....B00847-1 through 4

*** END OF DOCUMENT***

DOCUMENT 00102

NOTICE TO CONTRACTORS

Electronic proposals for the following project will be received through the internet on www.commbuys.com ("COMMBUYS") until the date and time stated below. No paper copies of bids will be accepted. Bid results will be posted on www.commbuys.com forthwith after the bid submission deadline.

Bidders must be registered with COMMBUYS in order to bid on this project. If Bidders are not currently registered with COMMBUYS, it is recommended that bidders register with COMMBUYS at least seven days prior to the scheduled bid opening date. COMMBUYS provides Seller registration functionality at no charge. To register, go to www.COMMBUYS.com and click on the "Register" link on the home or landing page.

FEBRUARY 19, 2026 at 2:00 P.M.

Rochester and Barnstable, MA
Cape Main Improvements at MP 44.27, 44.29, 68.00, and 71.66

PROJECT VALUE = $5,875,120

The Massachusetts Department of Transportation Rail and Transit Division (MassDOT or Owner) is seeking Contractors to submit a sealed Bid for the following Cape Main Improvements at MP 44.27, 44.29, 68.00, and 71.66 Project:

- **A.** Replacement of two culverts
- **B.** Construction of sheet pile retaining wall
- **C.** Retirement of two cattle passes
- **D.** All other work associated with the Cape Main Improvements at MP 44.27, 44.29, 68.00, and 71.66 Project (Project) as described in the Contract Documents.

It is highly recommended that bidders attend the Pre-Bid Meeting/Pre-Bid Site Walk which will be held at 10:00 AM on WEDNESDAY JANUARY 28, 2026 at SANDWICH STATION PARKING LOT between JARVES ST and LIBERTY ST in Sandwich MA. It is strongly suggested that prospective Bidders have a representative attend this meeting/site walk. The purpose of this meeting/site walk is to discuss any outstanding questions relating to the proposed work, the bidding procedures, or the required contract provisions. Prospective bidders shall bring with them all personal protective equipment which must be worn to access the project site.

1) MBTA Prequalification. Bidders must be prequalified in MBTA Class 1 – General Transit Construction (>$3,000,000 for Maximum Single Project Rating) **and** in MBTA Class 3 – Trackwork (>$3,000,000 for Maximum Single Project Rating) to bid on the above project. An award will not be made to a Contractor who is not pre-qualified by the MBTA prior to the opening of Proposals.

Go to the MBTA website below to find MBTA Prequalification Procedures.
https://bc.mbta.com/uploadedfiles/Business_Center/Bidding_and_Solicitations/Design_and_Construction/Contractor%20Prequalification%20Application%202022.pdf

Bidders must submit MBTA-issued certificates showing that they are prequalified in the required classes of work for the project.

2) MassDOT Rail & Transit Prequalification. Bidders must be prequalified in the following classes of work: General Rail Construction on or Around Active Rail Lines, and Track Work.

The definitions of the MassDOT Rail & Transit Division classes of work identified above and the MassDOT Rail & Transit Division Prequalification Procedures are set forth in the Special Provisions of the contract.

All prospective bidders who intend to bid on this project must submit MBTA certificates showing prequalification in the required classes of work, as well as all documentation required to apply for MassDOT Rail & Transit Division prequalification in the required classes of work, to Kevin McGrath at the MassDOT Rail and Transit Division by email at Kevin.Mcgrath@dot.state.ma.us before 5:00 P.M. seven (7) calendar days prior to the bid opening date. The Project Proposal No. should be placed in the subject line. If the prequalification information is submitted late, there is no guarantee that the Rail & Transit Division will be able to complete its evaluation of the information and determine whether a bidder is prequalified to bid on the project. An award will not be made to a contractor who is not prequalified by the MassDOT Rail & Transit Division prior to the opening of Proposals.

Proposal documents, including the Contract Documents, Special Provisions, and Plans, will be posted on the COMMBUYS website on or about JANUARY 22, 2026 after 2:00 PM EST.

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

All bids shall be accompanied by a bid deposit in the amount of 5% of the value of the bid.

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.

The Project has an M/WBE participation goal of [10%].

All Contractors and Subcontractors working on the Project and/or MassCoastal Railroad (MCRR or Railroad) Right-of-Way ("ROW") must have an approved Drug and Alcohol testing plan in compliance with all statutes and regulations administered by the Federal Railroad Administration ("FRA") in implementing the required 49 CFR Part 219 Drug and Alcohol Program. Contractors are required to submit their approved Drug and Alcohol Testing Program along with their bids.

Bidders must also insert where indicated in the bid form a list of at least three (3) rail projects that the bidder performed in the field (rather than managed) and completed within the last five (5) years, each with a project value of at least $3,000,000 and each with the following scope of work: complete track construction including jointed rail and turnout installation on active rail or adjacent to live rail. In addition, bidder is required to insert where indicated in the bid form the names of the skilled labor and supervisors that will work on this project. Any subcontractors used on this project are to be submitted to MassDOT for approval.

Contractor questions concerning the Bid Package are due by 4:00 PM FRIDAY FEBRUARY 6, 2026. Contractor questions must be submitted through Contractor portal on COMMBUYS www.commbuys.com for this project. MassDOT and Owner's consultants will provide answers to questions by 4:00 PM TUESDAY FEBRUARY 10, 2026 and any plan Amendments by 4:00PM THURSDAY FEBRUARY 12, 2026.

The apparent successful bidder will receive notification of their status on THURSDAY FEBRUARY 19, 2026 and pending approval by Owner, Contract Award / Notice to Proceed (NTP) would be anticipated by FRIDAY FEBRUARY 27, 2026.

The Cape Main Improvements at MP 44.27, 44.29, 68.00, and 71.66 Project must be substantially complete by **Friday, May 22, 2026,** and all Project work fully complete by **Tuesday June 30, 2026**.

Please note that Contract work includes work on an active freight rail corridor. Train Operations are dictated by MassDOT and MassCoastal Railroad (MCRR or Railroad). Contractor work hours and Railroad coordination provisions are set forth in the Contract Documents and Special Provisions.

Please note the production and equipment requirements specified in the Special Provisions as these have a direct effect on meeting the project schedule.

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: Phil Eng, Interim Secretary and CEO, MassDOT
Meredith Slesinger, Administrator, MassDOT Rail and Transit Division

*** END OF DOCUMENT***

THIS PAGE INTENTIONALLY LEFT BLANK

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.

*** END OF DOCUMENT***

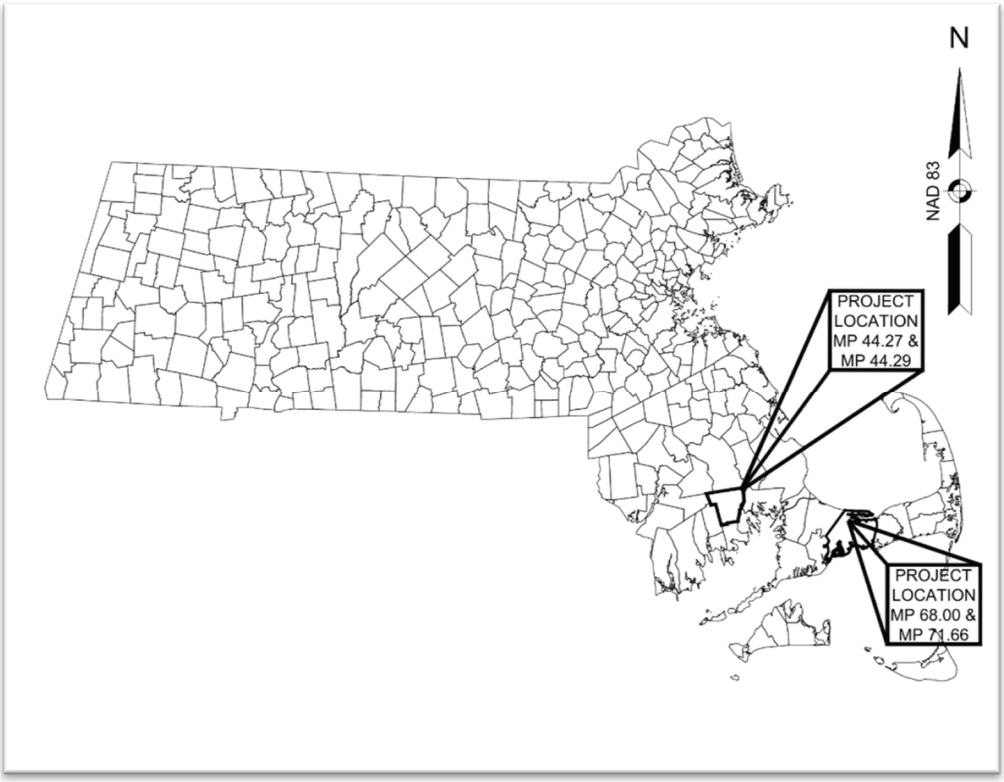
THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT 00331

LOCUS MAP

CAPE MAIN IMPROVEMENTS AT MP 44.27, 44.29, 68.00 & 71.66 PROJECT

ROCHESTER AND BARNSTABLE, MA



*** END OF DOCUMENT***

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT 00439

CONTRACTOR PROJECT PERFORMANCE EVALUATION FORM

CONTRACTOR PROJECT PERFORMANCE EVALUATION FORM

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION (MASSDOT)									
CONTRACTOR PROJECT PERFORMANCE EVALUATION RECORD									
DATE:	MM/DD/YYYY			INTERIM REPORT NO.: (PROJECT MANAGER ASSIGNS)					
MASSDOT CONTRACT#:				FINAL REPORT NO.: (PROJECT MANAGER ASSIGNS)					
PROJECT NAME:									
RAIL & TRANSIT PROJECT MANAGER:				GENERAL ENGINEERING CONSULTANT (IF APPLICABLE):					
GENERAL CONTRACTOR:				GENERAL CONTRACTOR PROJECT MANAGER:					
CONTRACT AWARD AMOUNT:				CONTRACT AMENDMENT ADJUSTED VALUE AMOUNT:			$	-	
	$ -								
	PERCENT OF PROJECT COMPLETE TO DATE:	%		WORK PERFORMED BY PRIME CONTRACTOR - PERCENTAGE OF PROJECT SCHEDULE COMPLETED - MUST BE MINIMUM OF 50%					%
Partial Instructions (See Contractor Performance Evaluation Reports SOP for full instruction)									

1	The Project Manager (PM) and/or Assistant Project Manager (APM) will review criteria listed for each subcategory on the Ratings Tab [Green Tab] of this workbook. The PM or APM will use the attached guidelines in determining the rating for each subcategory. These guidelines provide overall guidance for ratings of 10, 8 and 4 specific to each category. Other whole number ratings may also be used if the description of the performance falls between the upper and lower ratings (10 and 4).
2	The PM or APM will select the most appropriate whole number grade from drop down for each subcategory in the Green Shaded Box at the right side of the table. If subcategory is not applicable at this time, select "0" and note N/A in comments. Ratings will be automatically adjusted on the summary tab.
3	When all of the lines for the subcategory have been completed, the overall average for that category will automatically calculate and be shown in the Yellow Shaded Box at the bottom of that category.
4	Explanations must be entered in the green comments box on the Ratings Tab or below in the Project Managers Explanation section of the Form. If any subcategory entry is 10, or if the average for any subcategory is below 8. Please include specific examples.
5	The PM will provide the evaluation to the Deputy Administrator for Rail for review and concurrence. If the Deputy Administrator disagrees with any portion of the evaluation, the Deputy Administrator will outline their rationale and recommended changes to the PM. Further discussions will be held between the PM, APM, Deputy Administrator, Other staff and consultants (e.g., General Consulting Engineers), if appropriate. The PM or APM shall document this meeting.
6	If the group cannot reach agreement, the Deputy Administrator for Rail shall bring the matter to the attention of the attention of the Rail & Transit Administrator.
7	If the General Contractor ratings are modified, the original rating and notes shall be preserved.
8	Once review is finalized, PM forwards to General Contractor for receipt and acknowledgement.
9	General Contractor is allowed 10 days to review. If not returned, process continues. Lack of response is noted in General Contractor Signature section DOES NOT change the rating or prevent the rating from being recorded by the MassDOT Rail & Transit Division for use as an evaluation tool in future construction procurements.
10	General Contractor may request a meeting with the PM and the Deputy Administrator for Rail to discuss the ratings.

		Excellent	Average	Poor	% Rating	% Rating without C	% Rating without E	% Rating w/out C & E	Weighted average (from scoring sheet)
		10	8	4					
A.	Safety				x 2.0=	x 2.0	x 2.0=	x 2.5=	#DIV/0!
B.	Overall Quality and Workmanship				x 2.0=	x 2.5	x 2.0=	x 2.5=	#DIV/0!
C.	Resolution of Construction Deficiencies				x 1.0=	0	x 1.0=	0	#DIV/0!
D.	Project Management				x 1.0=	x 1.5	x 1.5=	x 1.5=	#DIV/0!
E.	Change Orders				x 1.0=	x 1.0=	x 1.0=	x 1.0=	#DIV/0!
F.	Home Office Support				x 0.5=	x 0.5=	x 0.5=	x 0.5=	#DIV/0!
G.	Equipment				x 0.5=	x 0.5=	x 0.5=	x 0.5=	#DIV/0!
H.	On-Site Supervisory Personnel Rating				x 1.0=	x 0.5=	x 0.5=	x 0.5=	#DIV/0!
I.	General Compliance with Contract Requirements				x 1.0=	x 0.5=	x 1.0=	x 1.0=	#DIV/0!
					Overall Rating w/o Subs (Maximum Score = 100)				#DIV/0!
J.	Subcontractor Performance & Mgmt:				x 1.0=	x 1.0=	0	0	#DIV/0!
					Add'l Rating w/Subs Only (Included if applicable by PM)				#DIV/0!

CONTRACTOR PROJECT PERFORMANCE EVALUATION FORM

	Project Manager's Signature/Date:						**DATE:**	
	Deputy Administrator for Rail Signature/Date:						**DATE:**	
	General Contractor Acknowledging Report/Date:						**DATE:**	
	General Contractor Requests Meeting - Please Enter **YES** or **NO:**							
	Contractor's Comments/Meeting Notes:							
INFORMATION FOR RAIL DIVISION RELATING TO FUTURE PROCUREMENTS								
- The Rail Division has calculated Maximum, Average & Minimum Scores that apply to the Contractor Performance Evaluation Form.								
- The Maximum Score is 100, The Average Score is 80. The Minimum acceptable Score for any Contractor is 70 for Categories A. through I.								
- A deduction **shall** be recommended for unsatisfactory performance if the "Overall Rating" Score is under 70. This may impact the Contractor on the next Procurement.								
- A deduction **may** be recommended for this project, if the Contractor completes this project late.								
RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR								
Recommend a deduction for Contractor's unstatisfactory performance - Please Enter **YES** or **NO:**								
Recommend a deduction for Project Completed Late - Please Enter **YES** or **NO:**								
	Deputy Administrator for Rail Signature/Date:							
PROJECT MANAGERS EXPLANATION - RATINGS NO. 1 - NO. 10 ABOVE: (extra sheets may be appended to this form, if needed):								

Excellent	Average	Fair
10	8	6

Score each sub category in whole numbers in the range between 10 and 4, with 10 = Excellent, 8= Average, and 4 = Poor. Overall score for each category will be the average of all questions rated below. The weights for each category on the Summary Tab set the final score.

A. Safety			
A) Using the Rating Scale noted above, please rate the Contractor's Safety on this project. Please note if there were any OSHA violations or serious safety accidents. Did the Contractor have a culture of Safety on this project? Provide specific examples to support your rating.			
10	8	4	Score
Full FRA, MassDOT, and Railroad compliance (based on results of safety requirements).	General FRA, MassDOT, and Railroad compliance (minor infractions found during safety requirements and review).	Disregard for FRA, MassDOT, and Railroad requirements (documented safety infractions).	
Full time safety manager on-site, all shifts.	Full time safety manager on-site, at least one shift.	Safety manager rarely on-site.	
Active safety program including: regular toolbox meetings, housekeeping, full fall protection.	Adequate housekeeping.	Poor onsite safety procedures.	
Regularly scheduled safety meetings.	Periodic safety meetings.	Deficient, on site safety procedures.5	
Worker injuries rare.	Occasional, minor injuries.	Frequent worker injuries or at least one serious injury.	
Workers fully engaged in safety issues.	Workers generally aware of safety issues.	Workers are unable to speak up about safety issues.	
Actively notifies MassDOT Rail Division of a safety incident onsite ASAP.	Notifies MassDOT Rail Division of a safety incident within 24 hrs.	Lack of notification to MassDOT Rail Division when safety incident occurs.	
Performs monthly safety walks with MassDOT Rail Division Project Manager.	MassDOT Rail Division occasionally (less than 20% of the time) has to remind contractor to perform monthly safety walks with MassDOT Project Manager.	No monthly safety walks with MassDOT Project Manager.	
Maintains an updated database of all required ROW and other Trainings and Certifications.	MassDOT Project Manager occasionally has to remind contractor of the required ROW Training and Certifications.	Contractor personal accessing site without the proper training and certifications.	
			Average

Excellent	Average	Fair	
10	8	6	
B. Overall Quality and Workmanship			
B) Using the Rating Scale noted above, please rate Contractor's Overall Quality and Workmanship. Were there quality or workmanship problems? Was there a culture of quality on this project: Please provide specific examples to support your rating:			
10	8	4	Score
Full compliance with the contract specifications, plans and approved quality control plan.	General conformance with the contract specifications and plans.	Substantial deviations from the contract plans and specifications.	
Quality Control Manager (QCM) on-site full time and focused exclusively on QC.	QCM on-site full time but occasionally performing non-QC related duties.	QCM frequently not on-site, or frequently not performing QC related tasks.	
QCM initiates inspections/testing without need for MassDOT staff intervention.	The Resident Engineer or staff is occasionally required to remind QCM to initiate inspections.	Requires constant oversight by the resident Engineer and Field Inspector.	
Testing/inspection performed at a greater frequent than specified ensuring higher level of quality.	Performing only minimum required testing/inspection.	Performing less than specified minimum testing and/or not fully supervising independent testing agencies.	
			Average

C. Resolution of Construction Deficiencies			
C) Using the Rating Scale noted above, please rate the rate the Contractor's ability to resolve quality issues (e.g., Construction Deficiencies). Note if Contractor identified problems independently or if MassDOT Rail & Transit Division was required to issue a Non-Conformance Report (NCR). Please indicated if the Contractor proactively proposed resolution of any deficiencies.			
10	8	4	Score
Any deficiencies quickly identified by Contractor's Quality Control process. Items reworked or marked and documented within reasonable time frame.	Deficiencies noted and isolated but not reworked or documented within a week of identification.	Repeated, substantive corrective actions required on work performed.	
NCRs complete with proposed resolution and preventive action.	NCRs typically complete. Only occasionally incomplete (i.e. 20% or less do not include preventive action or lack sufficient detail of proposed resolution).	NCRs issued by engineer and NCR defect repeatedly occurred. After repeated reminders by MassDOT, NCRs rarely complete.	
			Average

Excellent	Average	Fair	
10	8	6	
D. Project Management:			
D) Using the Rating Scale noted above, please rate the rate this Contractor's performance with regard to adhering to contract schedules and milestones.			
10	8	4	Score
Closely adhered to contract schedules and milestones.	General adherence to contract schedules and milestones.	Monthly updates are late each month and 3 week look ahead does not reflect actual work in the field.	
Provided accurate schedule updates at frequency specified (i.e.. 3 week look ahead, monthly updates, recovery).	Typically submitted schedule updates (80%+) but occasionally needed to be prompted.	Rarely revised schedule (50% or less) even when prompted or when current schedule did not reflect actual work performed.	
Contractor continued to meet schedule even when origin of delay was outside of the contractor's control.	General adherence to revised schedule with only occasional difficulty adjusting to items outside of their control.	Unable to adjust to any change in schedule regardless of cause or impact.	
			Average

E. Change Orders			
E) Using the Rating Scale noted above, please rate the Contractor's Change Order submissions (e.g., identification, scope, detail) and process. Please provide specific examples to support the rating.			
10	8	4	Score
Change Orders (COs) identified and submitted within 1 month of identification.	Some Potential Change Orders (PCOs) submissions delayed up to 5 months.	General Contractor submissions of PCOs six or more months late.	
Proposed value is essentially equal to independent cost and time estimate.	Proposed value is above independent cost and time estimate rates but willing to negotiate.	Proposed value is double or greater than estimated rates and resistance to negotiating.	
Contractor willing and able reach resolution during initial negotiations.	Some negotiations require more than two rounds of negotiations but 80% or greater do not.	All COs require three or more rounds of negotiations.	
Willing to continue work under work directive, while actively preparing CO in a short period of time. No impact to project schedule.	Willing to continue work under work directive, but CO proposals take more time than usual. No impact to project schedule.	Not willing to start the work with a work directive in place, requires CO processed. Causing schedule delay.	
			Average

Excellent	Average	Fair	
10	8	6	
F. Home Office Support			
F) Using the Rating Scale noted above, please rate the rate the Contractor's overall ability to support the fieldwork. Please provide specific examples to support rating.			
10	8	4	Score
Submittals at least 30 days in advance of the work.	Majority of submittals (90%) produced prior to scheduled work.	Majority of submittals forwarded for review less than 30 days prior to work.	
RFIs submitted once issue is recognized.	Majority of RFIs are submitted in a timely fashion, but some delay has potential to impact schedule.	RFIs not submitted in a timely fashion and contractor proceeds at their own risk without formal response.	
Paperwork includes all required information including backup.	Majority of paperwork includes required information. Any resubmissions are complete.	Paperwork consistently contains errors or missing information. Resubmissions require additional revisions.	
Submitted complete, accurate invoices each month during the last 6 months.	Submitted complete, accurate invoices during 5 of the last 6 months.	All other situations.	
No delay in acquiring materials and equipment when needed.	Occasional delay in acquiring material or equipment but not a frequent pattern.	Consistent delay in obtaining material or equipment negatively influencing schedule.	
			Average

G. Equipment			
G) Using the Rating Scale noted above, please rate the rate this Contractor's ability to provide functioning, appropriate equipment along with skilled operators. Sub-contractors equipment/operators are included in this rating.			
10	8	4	Score
Equipment available and appropriate for the task whenever needed.	Occasional delay in obtaining appropriate equipment (such as high-rail, or special track equipment) but minimal impact to planned work.	Frequent delay in obtaining proper equipment. Work plan must be changed an average of once a week due to lack of appropriate equipment.	
Equipment well maintained. Appropriate measures taken to ensure operation in extreme conditions.	Under normal conditions equipment runs properly more than 90% of time.	Frequent equipment breakdowns.	
Equipment operators are highly skilled and proficient.	Operators are proficient.	Efficiency of work impacted due to equipment limitations or not functioning more than 10% of time. Operator actions result in damage to property or "near miss" incidents.	
All required equipment submitted for inspection prior to use on MassDOT property (i.e. Hi-rail equipment inspected by MOW prior to use on rail).	All equipment submitted and in good working condition. (i.e. no oil leaks, proper safety guards in place, etc.).	Equipment not submitted for inspection by MassDOT prior to use on property.	
Specialized Equipment is as specified in the contract documents.	Specialized Equipment is in close conformance with the specified limits in the contract documents.	Specialized Equipment is not in conformance with the specified limits in the contract documents.	
			Average

Excellent	Average	Fair	
10	8	6	
H. On-Site Supervisory Personnel Rating			
H) Using the Rating Scale noted above, please rate the rate the general performance of the Contractor's on-site supervisory personnel. Please provide specific examples to support rating.			
10	8	4	Score
Demonstrates full knowledge of contract requirements and revisions.	Reasonable knowledge of contract requirements.	Does not demonstrate working knowledge of contract requirements.	
Fully cooperates with all reasonable requests.	Generally cooperates with reasonable requests.	Refuses to cooperate with reasonable requests.	
Effectively manages workforce.	Generally capable of managing workforce.	Unable to properly manage workforce.	
Fully authorized and capable of making jobsite decisions.	Able to make jobsite decisions.	Not authorized to make jobsite decisions.	
Onsite personnel have required licenses and are trained above contract requirements, i.e. superintendent's license, safety Rep has OSHA certifications in multiple disciplines, QCM has NETTCP, AWS, NACE certifications.	Onsite personnel have required licenses and certifications i.e. superintendent's license, safety Rep is familiar with OSHA regulations, but not certified, QCM has field experience, but not certified in any fields.	Onsite personnel lack field experience and/or required licenses.	
			Average

I. General Compliance with Contract Requirements			
I) Using the Rating Scale noted above, please rate the rate Contractor's general compliance with overall contract requirements. This includes ability to work well with MassDOT stakeholders, designer, municipalities and Authority Having Jurisdiction. For final payment, score should summarize ability to close out project (warranty, as-built documentation, etc.),			
10	8	4	Score
Required documentation not directly tied to work is submitted without prompting (certified payroll, as-built plan updates, material certifications, etc.).	Generally complies with administrative requirements (90%+). If information missing or error found, corrected on subsequent submission.	Administrative submittals rarely complete or accurate (less than 20% of time). Similar errors occur repeatedly.	
Good working relationship with all outside parties (MassDOT, Utilities and/or Other Authorities having Jurisdiction).	Good working relationship with majority of outside parties (MassDOT, Utilities or Other Authorities having Jurisdiction). Occasional difficulty in dealing with outside entities (less than 20% of the time).	Confrontational relationship with multiple outside parties (MassDOT Departments, Utilities and/or Other Authorities having Jurisdiction).	
Fully understands and complies with (MassDOT and Utility) requirements.	Require only occasional guidance from MassDOT regarding project requirements.	Lacks understanding of the required documents for MassDOT acceptance.	
			Average

Excellent	Average	Fair	
10	8	6	
J. Subcontractor Performance & Management:			
J) Using the Rating Scale noted above, please rate the rate this Contractor's ability, effort, and success in managing, administering, and coordinating subcontractors (if no subcontractors, rate this contractor's overall project management). Please			
10	8	4	Score
Subcontractor(s) in full compliance with requirements for safety, quality, and schedule as defined in other portions of this evaluation.	Subcontractor(s) in general compliance with requirements as defined in other portions of this evaluation.	Subcontractor(s) not complying with requirements as defined in other portions of this evaluation.	
General Contractor is actively assisting subcontractor meet requirements.	General Contractor usually (90%+) assisting subcontractor meet requirements.	No evidence the General Contractor has is actively managing the subcontractor.	
Subcontractor acceptance request submitted 30 days prior to scheduled activity.	Subcontractor acceptance submitted and approved less than 30 days but prior to scheduled activity.	Subcontractor acceptance not always submitted, before arriving onsite.	
Certified payrolls submitted in accordance with contract documents.	Certified payrolls submitted infrequently.	Constantly reminding contractor to submit certified payrolls.	Select
Using the Contractually provided information, provide below the Contractor's current DBE goal and DBE Paid Through Last percentage achieved by the Contractor. If the current DBE Paid through last is below the DBE goal, please request the Contractor to explain how they plans to achieve the DBE goal.			
		Project DBE Goal (From CMS): %	
		Current DBE Paid Through Last % (From CMS): %	
			Average

*** END OF DOCUMENT***

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 03-21-25

NOTICE OF AVAILABILITY

The 2025 MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DIVISION I: GENERAL REQUIREMENTS AND COVENANTS, as amended herein, certain subsections of DIVISIONS II: CONSTRUCTION DETAILS AND III: MATERIALS SPECIFICIATONS referenced herein, the SUPPLEMENTAL SPECIFICATIONS thereto (03/31/2025), and the American Railway Engineering and Maintenance-of-Way Association ("AREMA") Manual for Railway Engineering dated 2024 are incorporated into this contract.

The 2025 MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES and SUPPLEMENTAL SPECIFICATIONS (03/31/2025) are available online at https://www.mass.gov/massdot-highway-division-manuals-and-publications

MassDOT Rail MW-1 is included in this Bid Package as an Addendum.

MBTA Commuter Rail and Keolis Specifications are available on-line.

The American Railway Engineering and Maintenance-of-Way Association ("AREMA") Manual for Railway Engineering dated 2024, incorporated by reference herein, is available for purchase at MRE.

AMENDMENTS to the 2025 MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DIVISION I: GENERAL REQUIREMENTS AND COVENANTS

Amendments to the 2025 Massachusetts Department of Transportation Highway Division Standard Specifications for Highways and Bridges Division I: General Requirements and Covenants are set forth in Document A00801 Special Provisions, and in this Document 00710 General Contract Provisions, as follows.

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

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

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

1. Deliver to the Department, prior to the start of any work under this contract, copies of MSDS for all MSL substances to be used, stored, processed or manufactured at the worksite by the Contractor.
2. Train employees of the Department, who may be exposed to MSL substances as a result of the Contractor's work under this contract, with regard to those specific substances in accordance with requirements of the Right- To-Know Act.
3. Observe all safety precautions recommended on the MSDS for any MSL substance to be used, stored, processed, or manufactured at the worksite by the Contractor.
4. Inform the Department in writing regarding specific protective equipment recommended in the MSDS for MSL substances to which employees of the Department may be exposed as a result of the Contractor's work under this contract.

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

requirements of the Right-To-Know Act.

ALTERNATIVE DISPUTE RESOLUTION

Forum, Choice of Law and Mediations:

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

*** END OF DOCUMENT **

DOCUMENT 00718

SPECIAL PROVISION FOR PARTICIPATION BY MINORITY OR WOMEN'S BUSINESS ENTERPRISES AND SERVICE- DISABLED VETERAN- OWNED BUSINESS ENTERPRISES
(Implementing Chapter 102, Section 24 and
Chapter 273, Section 124, of the Acts of 1994 and Chapter 56, Sections 1 to 5 of the Acts of 2010
and subsequent Acts)
Revised: September 27, 2021

I. PARTICIPATION

M/WBE PARTICIPATION GOAL
On this Contract, the Massachusetts Department of Transportation (MassDOT) has established a goal for participation by Minority or Women Business Enterprise(s) (M/WBE). One half of the goal shall be met in the form of contractor activity. This goal shall remain in effect throughout the life of the Contract.

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

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

SDVOBE PARTICIPATION BENCHMARK
On this Contract, the Massachusetts Department of Transportation (MassDOT) has established a goal for participation by Service- Disabled Veteran- Owned Business Enterprise(s) (SDVOBE). This goal shall remain in effect throughout the life of the Contract.

☐ Design-Bid-Build Projects: SDVOBE Participation Goal **____%**

☐ Design-Build Projects: SDVOBE Design Participation Goal **___%** and SDVOBE Construction Participation Goal **___%**

II. POLICY

It is the policy of the MassDOT that Minority, Women Business Enterprises (M/WBEs) and Service- Disabled Veteran- Owned Business Enterprises (SDVOBEs) have equal opportunity to receive and participate in the performance of its state funded Contracts.

III. M/WBE and SDVOBE OBLIGATION

The Contractor agrees to take all necessary and reasonable steps to ensure that MBE, WBE, and SDVOBEs have the maximum opportunity to compete for, and to perform, Department Contracts.

IV. FAILURE TO COMPLY WITH M/WBE OR SDVOBE REQUIREMENTS

All Contractors and Subcontractors are hereby advised that failure to carry out the requirements of these Provisions constitutes a breach of Contract which may result in termination of the Contract, a determination that the Contractor or Subcontractor be barred from bidding on Department Contracts for up to three (3) years, or any other remedy as the Department may impose under Section XIV of these Special Provisions.

V. REQUIRED SUBCONTRACT PROVISIONS

The Prime Contractor shall include the Provisions of Sections II, III, and IV above in every subcontract making those provisions binding on each subcontractor, supplier, manufacturer, consultant or service provider.

VI. DEFINITIONS

For the purpose of these Special Provisions, the terms listed below are defined as follows:

Minority Business Enterprise or MBE means any individual, business organization, or non-profit corporation certified as a MBE by the Supplier Diversity Office (SDO), formerly known as the State Office of Minority and Women Business Assistance (SOMWBA), or by the Department for the purposes of a particular bid or proposal to be submitted to the Department.

Women Business Enterprise or WBE means any individual, business or organization, or non-profit corporation certified as a WBE by SDO, or by the Department for the purposes of a particular bid or proposal to be submitted to the Department.

Service- Disabled Veterans- Owned Businesses or SDVOBE means a business not less than 51 percent of which is owned by one or more service- disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and the management and daily business operations of which are controlled by one or more service- disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

"Contractor activity" means any work, including but not limited to, construction, demolition, renovation, survey, test boring services, or maintenance work performed under the Contract.

"Approved Joint Venture" means a joint venture between M/WBEs and non-M/WBEs, or SDVOBEs and non-SDVOBEs, which has been established for the purpose of participation on a particular contract, where:

1. The M/WBE or SDVOBE partner(s) shares in the ownership, control, management responsibilities, risks and profits of the joint venture; and

2. The Joint Venture has been approved by the Department for M/WBE or SDVOBE participation on the particular contract.

"Equipment Rental Firm" means a firm that owns equipment and assumes actual and contractual responsibility to rent said equipment to perform a useful function of the work of the contract consistent with normal industry practice.

"Material Supplier" means a vendor engaged in sales to the highway construction industry from an established place of business or source of supply, which:

(a) Manufactures goods from raw materials or substantially alters them before resale, or

(b) Provides and maintains a storage facility for materials used in the work, consistent with normal industry practice.

“Department” means the Massachusetts Department of Transportation (MassDOT).

"SDO" means the Massachusetts Supplier Diversity Office.

VII. ELIGIBILITY of M/WBEs

Only firms, *OTHER THAN THE PRIME CONTRACTOR*, which have been certified by SDO and/or the Department as eligible to participate on state funded contracts as MBEs or WBEs may be used on this contract for credit toward the toward the M/WBE participation goal.

1. SDO Directory of Certified M/WBEs: The Supplier Diversity Office publishes a Directory of certified MBE and WBEs. This Directory can be obtained from SDO at https://www.sdo.osd.state.ma.us/. This site lists those firms which have been certified as minority owned (MBEs) or women owned (WBEs) in accordance with the criteria of 425 CMR 2.00 et seq to participate as M/WBEs on state funded contracts. It also lists the kinds of work in which each firm engages but does not constitute an endorsement of the quality or performance of any business and does not represent Department subcontractor approval.

2. Application for Certification by the Department for a Particular Project: A firm which has (1) submitted a fully completed M/WBE application to SDO at least 30 days previously, (2) has provided in a timely manner, any additional information which may have been requested by SDO, and (3) can provide evidence, satisfactory to the Department, of a bidder's conditional commitment to subcontract with the firm, if certified, may apply directly to the MassDOT Office of Civil Rights to be certified for participation on the particular contract.

3. Joint Venture Approval: To obtain recognition as an approved joint venture between M/WBEs and non-/M/WBEs, the Joint Venture must provide to the MassDOT Office of Civil Rights, at least 14 business days before the bid opening date, the Joint Venture Affidavit Document B00847, and a copy of the Joint Venture Agreement, which shall include a detailed breakdown of the following:

(a) Capital participation by the M/WBE,

(b) Specific equipment to be provided to the Joint Venture by the M/WBE,

(c) Specific responsibilities of the M/WBE in the management of the Joint Venture,

(d) Workforce and specific skills to be provided to the Joint Venture by the M/WBE, and

(e) Percentage distribution to the M/WBE of the projected profit or loss incurred by the Joint Venture.

(f) The Joint Venture shall provide all such additional information as may be requested by the Department for the purpose of determining joint venture eligibility.

VIII. ELIGIBILITY of SDVOBEs

Only firms, *OTHER THAN THE PRIME CONTRACTOR*, which have demonstrated that they are listed as a service-disabled veteran- owned small businesses within the VetBiz database may be used on this contract for credit toward the SDVOBE participation goal.

1. VetBiz Database: The website, located at www.VetBiz.gov, listing verified service- disabled veteran- owned businesses.

2. Joint Venture Approval: To obtain recognition as an approved joint venture between SDVOBEs and non-/SDVOBEs, the joint venture must provide to the MassDOT Office of Civil Rights, at least 14 business days before the bid opening date, an application for joint venture participation approval, and a copy of the Joint Venture Agreement, which shall include a detailed breakdown of the following:

(a) Capital participation by the SDVOBE,

(b) Specific equipment to be provided to the joint venture by the SDVOBE,

(c) Specific responsibilities of the SDVOBE in the management of the Joint Venture,

(d) Workforce and specific skills to be provided to the joint venture by the SDVOBE, and

(e) Percentage distribution to the SDVOBE of the projected profit or loss incurred by the Joint Venture.

(f) The Joint Venture shall provide all such additional information as may be requested by the Department for the purpose of determining joint venture eligibility.

IX. COUNTING M/WBE PARTICIPATION AND SDVOBE BENCHMARKS TOWARDS M/WBE AND SDVOBE GOALS

In order for M/WBE participation and SDVOBE benchmarks to count toward the Contract goal, the M/WBE and SDVOBE must have independently managed, supervised and performed the Contract work with its own workforce, equipment and resources. M/WBE and SDVOBE participation which fulfills these requirements shall be counted toward meeting the M/WBE and SDVOBE goals in accordance with the following rules:

1 If a firm has been determined to be an eligible MBE, WBE or SDVOBE, the total dollar value of the contract performed by the M/WBE or SDVOBE is counted toward the applicable goal as follows:

a. Except as provided below, in Section IX (1)(g), work performed by a M/WBE or a SDVOBE Prime Contractor shall not be counted toward the M/WBE or SDVOBE goal, and all Prime Contractors, including M/WBE or SDVOBE Prime Contractors, must comply with the M/WBE and SDVOBE requirements of this Contract.

b. For a M/WBE or SDVOBE material supplier, sixty percent (60%) of the amount to be paid for materials and supplies required under this Contract shall be credited toward the goal.

c. For a M/WBE or SDVOBE who provides a bonafide service such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials, or supplies required for performance of the contract, reasonable fees or commissions charged for the service shall be listed, but the cost of items themselves shall not be credited.

d. For a M/WBE or SDVOBE hauler, trucker, or delivery service, which is not also the manufacturer of or a regular dealer in the materials and supplies, reasonable fees charged for delivery of materials and supplies required on the job site shall be credited; the cost of the materials and supplies themselves shall not be credited.

e. For a M/WBE or SDVOBE who provides any bonds or insurance specifically required for the performance of the contract, reasonable fees or commissions charged for such service shall be listed, but the face amount or actual premium paid for the bond or insurance shall not be credited.

f. The Department shall determine if the fees or commissions listed in accordance with paragraphs (c), (d), and (e) are not excessive as compared with fees or commissions customarily allowed for similar services.

g. That portion of the contract total dollar value equal to the percentage of ownership and control of the M/WBE partner(s) or SDVOBE partner(s) in an approved Joint Venture shall be counted toward the Contract goal, except that credit for M/WBE and SDVOBE participation in an approved Prime Joint Venture shall not exceed one half of the Contract goal.

X. JOINT CHECK POLICY

1. 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 M/WBE or SDVOBE third party such as a regular dealer of material or supplies. The Prime Contractor issues the check as payor to the M/WBE or SDVOBE 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 M/WBE or SDVOBE. MassDOT has established criteria to ensure that M/WBEs or SDVOBEs are in fact performing a commercially useful function ("CUF") while using a joint check arrangement. Contractors and M/WBEs or SDVOBEs must meet and conform to these conditions and criteria governing the use of joint checks.

2. In the event that a Contractor, M/WBE or SDVOBE Subcontractor desires to a use joint check, MassDOT will require prior notice and will closely monitor the arrangement for compliance. MassDOT may allow a joint check arrangement and give credit to a Contractor for use of the M/WBE or SDVOBE 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 (M/WBEs, SDVOBE and non-M/WBEs or non-SDVOBEs); 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 M/WBE or SDVOBE (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.

3. Other factors MassDOT may consider:

   - Whether there is a requirement by the Prime Contractor that a M/WBE or SDVOBE should use a specific vendor or supplier to meet their Subcontractor specifications;
   - Whether there is a requirement that a M/WBE or SDVOBE use the Prime Contractor's negotiated price;
   - The independence of the M/WBE or SDVOBE;
   - 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 M/WBE or SDVOBE has made an effort to establish alternate arrangements for following periods (i.e., the M/WBE or SDVOBE 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 M/WBE or SDVOBE remain responsible for compliance with all other elements of the Special Provisions, and must still be able to prove that a commercially useful function is being performed for the Contractor.

XI. JOINT CHECK PROCEDURES

- The M/WBE or SDVOBE 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 B00846) and by notification on the M/WBE Letter of Intent (Document B00843) or SDVOBE Letter of Intent (Document B00845), 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 Contractor and M/WBE or SDVOBE must have:

  (a) a written agreement with the material supplier/vendor;
  (b) applied for credit with the subject material supplier and has supplied the vendor's response;

(c) shown that it will place all orders to the subject material supplier/vendor;
(d) made and retains all decision-making responsibilities concerning the materials; and
(e) provided a Joint Check Agreement that is acceptable to MassDOT;

- The MassDOT Office of Civil Rights will review the request and render a decision as part of the approval process for M/WBE or SDVOBE 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 M/WBE or SDVOBE 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 M/WBE or SDVOBE (i.e. if possible, funds or the joint check should be processed by the M/WBE or SDVOBE and sent by the M/WBE or SDVOBE 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 M/WBE or SDVOBE 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 M/WBE or SDVOBE Program policies and procedures as part of the Subcontractor approval process.

XII. AWARD DOCUMENTATION AND PROCEDURES

1. The two lowest bidders/the two bidders with the lowest price per quality score point, including any M/WBE bidder or SDVOBE bidder, shall submit, by the close of business on the third business day after the bid opening, a completed Schedule of M/WBE and SDVOBE participation, in the form attached, which shall list:

   a. The full company name, address and telephone number of each M/WBE or SDVOBE with whom the bidder intends to make a commitment;

   b. The Contract item(s), by number(s) and quantity(ies), if applicable, or specific description of other business activity to be performed by each M/WBE or SDVOBE 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 Section XII of these Special Provisions.

   c. The total dollar amount to be paid to each M/WBE or SDVOBE. (Bidders are cautioned that at least one half of the participation goal must be met with Contract work.)

   d. The total dollar amount to be paid to each M/WBE or SDVOBE which is eligible for credit toward the M/WBE or SDVOBE goal under the crediting rules set out in Section IX.

   e. The total creditable M/WBE or SDVOBE participation as a percentage of the total bid price.

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

3. The two lowest bidders/the two bidders with the lowest price per quality score point shall submit with their Schedules of Participation, fully completed, signed Letters of Intent from each of the M/WBEs or SDVOBEs listed on the Schedule. The Letters of Intent shall be in the form attached and shall identify specifically the contract activity the M/WBE or SDVOBE proposes to perform, expressed as contract item number, if applicable, description of the activity, 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.

4. Evidence of good faith efforts will be evaluated by the Department in the selection of the lowest responsible bidder/best value bidder. All information requested by the Department for the purpose of evaluating the bidder's efforts to achieve the goal must be provided within three calendar days and must be accurate and complete in every detail. The apparent low bidder's/best value bidder's attainment of the M/WBE or SDVOBE goal or a satisfactory demonstration of good faith efforts is a prerequisite for Award of the Contract.

5. 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 on the Schedule of Participation, and provide the required Letters of Intent for, M/WBE or SDVOBE 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 the Department, that good faith efforts were made to achieve the goal.

6. If the Department finds that the percentage of M/WBE or SDVOBE participation submitted by the bidder on its Schedule does not meet the Contract goal, or that the 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 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.

7. If, after administrative reconsideration, the Department 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.

8. Actions which constitute evidence of good faith efforts to meet the M/WBE or SDVOBE goals include, but are not limited to, all of the following examples:

   a. Efforts made to select portions of the work proposed to be performed by M/WBEs or SDVOBEs in order to increase the likelihood of achieving the stated goal, including, where appropriate, but not limited to, breaking down contracts into economically feasible units to facilitate M/WBE and SDVOBE participation. The value of such work is required to at least equal the M/WBE and SDVOBE goal.

   b. Reasonable written notification prior to the opening of bids soliciting individual M/WBEs or SDVOBEs interested in participation in the contract as subcontractors, regular dealers, manufacturers, consultants, or service providers and identifying the specific items or type of work being solicited.

   c. Written notification to M/WBE or SDVOBE economic development assistance agencies and organizations which provide assistance in recruitment and placement of M/WBEs and SDVOBEs, describing the type of work, supplies or services being considered for M/WBE or SDVOBE subcontracting on this contract.

   d. Efforts made to negotiate with M/WBEs or SDVOBEs for specific items of work including evidence of:
      (1) The names, addresses, telephone numbers of M/WBEs or SDVOBEs who were contacted, the dates of initial contact and whether initial solicitations of interest were followed up by contacts with M/WBEs or SDVOBEs to determine with certainty whether the M/WBEs or SDVOBEs were interested. Personal or phone contacts are expected.

      (2) A description of the information provided by the M/WBEs or SDVOBEs regarding the plans and specifications and estimated quantities for portions of the work to be performed.

      (3) A statement of why additional agreements with M/WBEs or SDVOBEs were not reached.

      (4) Documentation of each M/WBE or SDVOBE contacted but rejected and the reasons for the rejection.

   e. Absence of any agreements between the Contractor and the M/WBE or SDVOBE in which M/WBE or SDVOBE promises not to provide subcontracting quotations to other bidders.

   f. Efforts made to assist the M/WBEs or SDVOBEs that need assistance in obtaining bonding, insurance, or lines of credit required by the Contractor.

h. Documentation that qualified M/WBEs or SDVOBEs are not available, or are not interested.

i. Attendance at any meeting scheduled by the Department to encourage better Contractor-M/WBE or Contractor- SDVOBE relationships and/or to inform M/WBEs or SDVOBEs of forthcoming M/WBE or SDVOBE utilization opportunities.

j. Advertisement, in general circulation media, in trade association publications and in disadvantaged business enterprise-focused media, of interest in utilizing M/WBEs or SDVOBEs and the area of interest.

k. Efforts to effectively use the services of available minority community organizations; women organizations, veteran organizations, minority, women disadvantaged and veteran contractor's groups; local, state and federal disadvantaged business assistance offices; and other organizations that provide assistance in recruitment and placement of M/WBEs or SDVOBEs.

9. The demonstration of good faith efforts must establish that the Contractor has actively and aggressively sought out M/WBEs or SDVOBEs to participate in the project and has taken all actions which could be reasonably expected to achieve the goal. Examples of circumstances or actions not acceptable as reasons for failure to meet the M/WBE or SDVOBE goal, include, but are not limited to:

a. The M/WBE or SDVOBE was unable to provide performance and/or payment bonds.

b. The M/WBEs or SDVOBEs commercially reasonable bid was rejected based on price.

c. The M/WBE or SDVOBE would not agree to perform items of work at the unit bid price.

d. The Contractor does not want to subcontract a percentage of the work sufficient to meet the goal.

e. Solicitation by mail or fax only.

XIII. COMPLIANCE

1. All activity performed by a M/WBE or SDVOBE for credit toward the Contract goal must be performed, managed and supervised by the M/WBE or SDVOBE. Prime Contractor shall not enter into, or condone, any other arrangement.

2. The Prime Contractor shall not perform with its own organization, or assign to any other business, any activity designated for the M/WBEs or SDVOBEs named on the Schedule submitted by the Prime Contractor under Section IX, or under Section XII(6), without the approval of the Department in accordance with the requirements of Sections XIII(6) and XIII(10).

3. The Department may suspend payment for any activity which was not performed by the M/WBE or SDVOBE to whom the activity was committed on the approved Schedule of Participation, or which was not performed in accordance with the requirements of Section XIII(1).

4. The Department retains the right to approve or disapprove all subcontractors. Requests by the Prime Contractor for approval of participation by a M/WBE or SDVOBE subcontractor for credit toward the Contract goal must include, in addition to any other requirements for subcontractor approval, the following:

a. A copy of the proposed subcontract. The subcontract must be for at least the dollar amount, and for the work described, in the Prime Contractor's Schedule of Participation.

b. A resume stating the qualifications and experience of the M/WBE or SDVOBE 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.

c. A Schedule of Operations indicating when the M/WBE or SDVOBE is expected to perform the work.

d. A list of (1) equipment owned by the M/WBE or SDVOBE to be used on the Project, and (2) equipment to be leased by the M/WBE or SDVOBE for use on the Project.

e. A list of: (1) all projects (public and private) which the M/WBE or SDVOBE is currently performing, (2) all projects (public and private) to which the M/WBE or SDVOBE is committed, (3) all projects (public and private) to which the M/WBE or SDVOBE 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 M/WBEs or SDVOBEs work schedule for each project.

5. If, pursuant to the subcontractor approval process, the Department finds that a M/WBE or SDVOBE subcontractor does not have sufficient experience or resources to perform, manage and supervise work of the kind proposed in accordance with the requirements of Section XIII(1), approval of the M/WBE or SDVOBE subcontractor may be denied. In the event of such denial, the Prime Contractor shall proceed in accordance with the requirements of Sections XIII(6) and XIII(10).

6. If, for reasons beyond its control, the Prime Contractor cannot comply with its M/WBE or SDVOBE commitment in accordance with the Schedule of participation submitted under Section IX and the terms of these Special Provisions, the Prime Contractor shall submit to the Department the reasons for its inability to comply with its obligations under Section I and shall submit, and request approval for, a revised Schedule of Participation. If approved by the Department, the revised Schedule shall govern the Prime Contractor's performance in meeting its obligations under these special provisions.

7. A Prime Contractor's compliance with the participation goal in Section I shall be determined by reference to the required percentage of the total Contract price, including any additions and modifications thereto, provided, however, that no decrease in the dollar amount of a bidder's commitment to any M/WBE or SDVOBE shall be allowed without the approval of the Department.

8. If the Contract amount is increased, the Prime Contractor shall submit a revised Schedule of Participation in accordance with Sections XIII(6) and XIII(10).

9. In the event of the decertification of a M/WBE or SDVOBE participating or scheduled to participate on the contract for credit toward the goal, the Contractor shall proceed in accordance with Sections XIII(6) and XIII(10).

10. The Prime Contractor shall notify the Department immediately of any facts which come to its attention indicating that it may or will be unable to comply with any aspect of its M/WBE or SDVOBE obligation under this Contract.

11. Any notice required by these Special Provisions shall be given in writing to the Resident Engineer and the district designated Compliance Officer with a copy to the Director of Compliance, Office of Diversity and Civil Rights, 10 Park Plaza, Room 3170, Boston MA 02116.

12. The Prime Contractor and its subcontractors shall comply with the Department’s Electronic Reporting System Requirements (Contract Document 00821) and submit all information required by the Department related to the M/WBE Special Provisions and SDVOBE Special Provisions through the Equitable Business Opportunity Solution (EBO). The Department reserves the right to request reports in the format it deems necessary anytime during the performance of the Contract.

13. The Contractor shall pay each M/WBE or SDVOBE for satisfactory performance of its Contract no later than 10 days from receipt of payment for the work from the Department. Any delay or postponement of payment to the M/WBEs or SDVOBEs must be for good cause and only with the prior approval of the Department.

14. The Department may withhold the Contractor's next periodic payment if each M/WBE or SDVOBE is not paid in accordance with Section XIII(13).

15. The Department may require specific performance of the Prime Contractor's commitment under the Contract by requiring the Prime Contractor to subcontract with a M/WBE or SDVOBE for any contract or specialty item.

XIV. SANCTIONS

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

1. Retain, in connection with final acceptance and final payment, an amount determined by multiplying the total contract amount by the percentage in Section I, less the amount paid to approved M/WBEs or SDVOBEs for work performed under the Contract in accordance with the provisions of Section X. The Prime Contractor shall have the right to appeal such retention of funds in accordance with the provisions of M.G.L. c. 30A s.10.

2. 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.

3. 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 5.07.

4. Initiate debarment proceedings under M.G.L. c.29 §29F.

XV. FURTHER INFORMATION

Any proposed M/WBE, SDVOBE, bidder, Contractor or subcontractor shall provide such information as is necessary in the judgement of the Department to ascertain its compliance with the terms of this Special Provision.

XVI. LIST OF ADDITIONAL DOCUMENTS

1. The following documents shall be completed and signed by the bidder and designated M/WBEs or SDVOBEs in accordance with Section XII - Award Documentation and Procedures. These documents must be returned by the bidder to MassDOT's Bid Document Distribution Center:

- □ Schedule of M/WBEs (Document B00842) or SDVOBE Participation (Document B00844)
- □ Letter of Intent: M/WBEs (Document B00843) or SDVOBE (Document B00845)
- □ M/WBEs or SDVOBE Joint Check Arrangement Approval Form (Document B00846), if Contractor and M/WBE or SDVOBE plan, or if M/WBE or SDVOBE is required to use a Joint Check (when applicable)

2. The following document shall be signed and returned by Contractor and Subcontractors/M/WBEs or SDVOBEs 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 (M/WBEs or SDVOBEs and non-M/WBEs or SDVOBEs alike)).

3. 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:

- □ Joint Venture Affidavit of M/WBE or SDVOBE/Non-M/WBE or Non-SDVOBE (Document B00847)

4. The following document shall be provided to MassDOT's District Office of Civil Rights within 30 calendar days after the work of the M/WBE is completed, or no later than 30 calendar days after the work of the M/WBE 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/WBE) (Form No. CSD-100)

** END OF DOCUMENT **

DOCUMENT 00761

SPECIAL PROVISIONS FOR CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION
Revised: 02/09/16

1. Instructions for Certification - Primary Covered Transactions:

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

1. 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 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 MassDOT's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

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

3. The prospective primary participant shall provide immediate written notice to the MassDOT if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the MassDOT for assistance in obtaining a copy of those regulations.

5. The prospective primary 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 MassDOT.

6. The prospective primary 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 Transaction," provided by the MassDOT, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. 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 may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration and the Debarment Lists compiled by both the Massachusetts Office of the Attorney General and the Department of Capital Asset Management and Maintenance (DCAMM) and published separately in the Central Register.

8. 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.

9. Except for transactions authorized under paragraph 5 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, the MassDOT may terminate this transaction for cause or default.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Primary Covered Transactions

The prospective primary 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 covered transactions by any Federal, State or local department or agency;

2. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement 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;

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 2 of this certification; and

4. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

11. **Instructions for Certification - Lower Tier Covered Transactions:**

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

1. 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 the MassDOT may pursue available remedies, including suspension and/or debarment.

2. 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.

3. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the MassDOT for assistance in obtaining a copy of those regulations.

4. 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 MassDOT.

5. 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.

6. 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 may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List and the Debarment Lists.

7. 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.

8. Except for transactions authorized under paragraph 4 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, the MassDOT may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions

The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal, State or local department or agency.

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

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

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

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

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 (MBE/WBE) 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 ***

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT 00859

CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM ‡

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

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

_____**(Subcontractor)** ☐ Rail & Transit Approved Subcontractor

Contract No: 130500 **Project No.** 614096 **Federal Aid No.:** N/A

Location: Rochester and Barnstable, MA

Project Description: Cape Main Improvements at MP 44.27, 44.29, 68.00, and 71.66

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

☐ 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.
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. 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 than two weeks 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

THIS PAGE INTENTIONALLY LEFT BLANK

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

MAURA HEALY
Governor
KIM DRISCOLL
Lt. Governor

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

LAUREN JONES
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority:	Department of Transportation	**City/Town:**	ROCHESTER
Contract Number:	130500		
Description of Work:	Replacement of two (2) existing culverts at MP 44.27 and MP 44.29 with new 48" Class V RCP pipe with associated headwalls & wingwalls; existing two (2) stone box culvert will be abandon and filled in place,		
Job Location:	Rochester, MA		

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

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

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$40.95	$15.57	$21.78	$0.00	$0.00	$78.30
	1/1/2026	$40.95	$16.17	$21.78	$0.00	$0.00	$78.90
	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.02	$15.57	$21.78	$0.00	$0.00	$78.37
	1/1/2026	$41.02	$16.17	$21.78	$0.00	$0.00	$78.97
	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.14	$15.57	$21.78	$0.00	$0.00	$78.49
	1/1/2026	$41.14	$16.17	$21.78	$0.00	$0.00	$79.09
	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	1/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
For apprentice rates see "Apprentice- PILE DRIVER"							
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$41.97	$10.15	$9.50	$9.11	$0.00	$70.73
	6/1/2026	$43.41	$10.15	$9.50	$9.11	$0.00	$72.17
	12/1/2026	$44.85	$10.15	$9.50	$9.11	$0.00	$73.61
	6/1/2027	$46.30	$10.15	$9.50	$9.11	$0.00	$75.06
	12/1/2027	$47.75	$10.15	$9.50	$9.11	$0.00	$76.51
	6/1/2028	$49.25	$10.15	$9.50	$9.11	$0.00	$78.01
	12/1/2028	$50.75	$10.15	$9.50	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.97	$10.15	$9.50	$9.21	$0.00	$70.83
	6/1/2026	$43.41	$10.15	$9.50	$9.21	$0.00	$72.27
	12/1/2026	$44.85	$10.15	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)	12/1/2025	$44.80	$14.50	$4.30	$6.75	$0.00	$70.35
ASPHALT RAKER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BACKHOE/FRONT-END LOADER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BARCO-TYPE JUMPING TAMPER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER LABORERS LABORERS - ZONE 2	12/1/2025	$41.97	$10.15	$9.50	$9.11	$0.00	$70.73
	6/1/2026	$43.41	$10.15	$9.50	$9.11	$0.00	$72.17
	12/1/2026	$44.85	$10.15	$9.50	$9.11	$0.00	$73.61
	6/1/2027	$46.30	$10.15	$9.50	$9.11	$0.00	$75.06
	12/1/2027	$47.75	$10.15	$9.50	$9.11	$0.00	$76.51
	6/1/2028	$49.25	$10.15	$9.50	$9.11	$0.00	$78.01
	12/1/2028	$50.75	$10.15	$9.50	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.97	$10.15	$9.50	$9.21	$0.00	$70.83
	6/1/2026	$43.41	$10.15	$9.50	$9.21	$0.00	$72.27
	12/1/2026	$44.85	$10.15	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
BOILER MAKER BOILERMAKERS LOCAL 29 BOILERMAKERS LOCAL 29	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: BOILER MAKER							
Effective Date: 1/1/2024							
Step / Percent		**Apprentice Base Wage**					
4 / 75.00		$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5 / 80.00		$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6 / 85.00		$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7 / 90.00		$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8 / 95.00		$45.71	$7.07	$13.62	$5.70	$0.00	$72.10
Apprentice to Journeyworker Ratio: 1:4							
BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (NEW BEDFORD)	8/1/2025	$67.95	$11.49	$15.57	$8.02	$0.00	$103.03
	2/1/2026	$69.30	$11.49	$15.57	$8.02	$0.00	$104.38
	8/1/2026	$71.50	$11.49	$15.57	$8.02	$0.00	$106.58
	2/1/2027	$72.90	$11.49	$15.57	$8.02	$0.00	$107.98
Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)							
Effective Date: 8/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$33.98	$11.49	$15.57	$8.02	$0.00	$69.06
2 / 60.00		$40.77	$11.49	$15.57	$8.02	$0.00	$75.85
3 / 70.00		$47.57	$11.49	$15.57	$8.02	$0.00	$82.65
4 / 80.00		$54.36	$11.49	$15.57	$8.02	$0.00	$89.44
5 / 90.00		$61.16	$11.49	$15.57	$8.02	$0.00	$96.24
Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)							
Effective Date: 2/1/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$34.65	$11.49	$15.57	$8.02	$0.00	$69.73
2 / 60.00		$41.58	$11.49	$15.57	$8.02	$0.00	$76.66
3 / 70.00		$48.51	$11.49	$15.57	$8.02	$0.00	$83.59
4 / 80.00		$55.44	$11.49	$15.57	$8.02	$0.00	$90.52
5 / 90.00		$62.37	$11.49	$15.57	$8.02	$0.00	$97.45
Apprentice to Journeyworker Ratio: 1:5							
BULLDOZER/GRADER/SCRAPER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2025	$49.85	$10.15	$9.50	$9.80	$0.00	$79.30
	6/1/2026	$51.40	$10.15	$9.50	$9.80	$0.00	$80.85
	12/1/2026	$52.90	$10.15	$9.50	$9.80	$0.00	$82.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER	12/1/2025	$48.70	$10.15	$9.50	$9.80	$0.00	$78.15
LABORERS	6/1/2026	$50.25	$10.15	$9.50	$9.80	$0.00	$79.70
LABORERS - FOUNDATION AND MARINE	12/1/2026	$51.75	$10.15	$9.50	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN	12/1/2025	$49.03	$10.15	$9.50	$9.80	$0.00	$78.48
LABORERS	6/1/2026	$50.58	$10.15	$9.50	$9.80	$0.00	$80.03
LABORERS - FOUNDATION AND MARINE	12/1/2026	$52.08	$10.15	$9.50	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
CARPENTER	9/1/2025	$50.35	$10.33	$11.47	$8.50	$0.00	$80.65
CARPENTERS	3/1/2026	$51.60	$10.33	$11.47	$8.50	$0.00	$81.90
CARPENTERS -ZONE 2 (Eastern Massachusetts)	9/1/2026	$52.85	$10.33	$11.47	$8.50	$0.00	$83.15
	3/1/2027	$54.10	$10.33	$11.47	$8.50	$0.00	$84.40

Apprentice: CARPENTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.66	$10.33	$0.00	$1.73	$0.00	$34.72
2	45.00	$22.66	$10.33	$0.00	$1.73	$0.00	$34.72
3	55.00	$27.69	$10.33	$0.00	$3.40	$0.00	$41.42
4	55.00	$27.69	$10.33	$0.00	$3.40	$0.00	$41.42
5	70.00	$35.25	$10.33	$11.41	$5.10	$0.00	$62.09
6	70.00	$35.25	$10.33	$11.41	$5.10	$0.00	$62.09
7	80.00	$40.28	$10.33	$11.44	$6.80	$0.00	$68.85
8	80.00	$40.28	$10.33	$11.44	$6.80	$0.00	$68.85

Apprentice: CARPENTER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$23.22	$10.33	$0.00	$1.73	$0.00	$35.28
2	45.00	$23.22	$10.33	$0.00	$1.73	$0.00	$35.28
3	55.00	$28.38	$10.33	$0.00	$3.40	$0.00	$42.11
4	55.00	$28.38	$10.33	$0.00	$3.40	$0.00	$42.11

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME	10/1/2025	$27.75	$7.02	$3.80	$1.00	$0.00	$39.57
CARPENTERS	10/1/2026	$28.85	$7.02	$3.80	$1.00	$0.00	$40.67
CARPENTERS-ZONE 3 (Wood Frame)							

All Aspects of New Wood Frame Work

Apprentice: CARPENTER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	70.00	$36.12	$10.33	$11.41	$5.10	$0.00	$62.96
6	70.00	$36.12	$10.33	$11.41	$5.10	$0.00	$62.96
7	80.00	$41.28	$10.33	$11.44	$6.80	$0.00	$69.85
8	80.00	$41.28	$10.33	$11.44	$6.80	$0.00	$69.85

Apprentice to Journeyworker Ratio: 1:5

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
2	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
3	65.00	$18.04	$7.02	$0.00	$1.00	$0.00	$26.06
4	70.00	$19.43	$7.02	$0.00	$1.00	$0.00	$27.45
5	75.00	$20.81	$7.02	$3.80	$1.00	$0.00	$32.63
6	80.00	$22.20	$7.02	$3.80	$1.00	$0.00	$34.02
7	85.00	$23.59	$7.02	$3.80	$1.00	$0.00	$35.41
8	90.00	$24.98	$7.02	$3.80	$1.00	$0.00	$36.80

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$17.31	$7.02	$0.00	$0.00	$0.00	$24.33
2	60.00	$17.31	$7.02	$0.00	$0.00	$0.00	$24.33
3	65.00	$18.75	$7.02	$0.00	$1.00	$0.00	$26.77
4	70.00	$20.20	$7.02	$0.00	$1.00	$0.00	$28.22
5	75.00	$21.64	$7.02	$3.80	$1.00	$0.00	$33.46
6	80.00	$23.08	$7.02	$3.80	$1.00	$0.00	$34.90
7	85.00	$24.52	$7.02	$3.80	$1.00	$0.00	$36.34
8	90.00	$25.97	$7.02	$3.80	$1.00	$0.00	$37.79

Apprentice to Journeyworker Ratio: 1:5

CEMENT MASONRY/PLASTERING	7/1/2024	$49.19	$13.35	$16.43	$7.78	$1.80	$88.55
BRICKLAYERS LOCAL 3							
BRICKLAYERS LOCAL 3 (NEW BEDFORD)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: CEMENT MASONRY/PLASTERING							
Effective Date: 7/1/2024							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$24.60	$13.35	$16.43	$0.00	$0.00	$54.38
2 / 60.00		$29.51	$13.35	$16.43	$2.78	$1.80	$63.87
3 / 65.00		$31.97	$13.35	$16.43	$3.78	$1.80	$67.33
4 / 70.00		$34.43	$13.35	$16.43	$4.78	$1.80	$70.79
5 / 75.00		$36.89	$13.35	$16.43	$5.78	$1.80	$74.25
6 / 80.00		$39.35	$13.35	$16.43	$6.78	$1.80	$77.71
7 / 90.00		$44.27	$13.35	$16.43	$7.78	$1.80	$83.63
Apprentice to Journeyworker Ratio: 1:3							
CHAIN SAW OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$60.48	$16.05	$13.25	$3.25	$0.00	$93.03
	6/1/2026	$61.81	$16.05	$13.25	$3.25	$0.00	$94.36
	12/1/2026	$63.29	$16.05	$13.25	$3.25	$0.00	$95.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$37.97	$16.05	$13.25	$3.25	$0.00	$70.52
	6/1/2026	$38.83	$16.05	$13.25	$3.25	$0.00	$71.38
	12/1/2026	$39.78	$16.05	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$58.51	$10.30	$11.95	$12.50	$0.00	$93.26
	1/1/2026	$59.56	$10.35	$12.00	$12.60	$0.00	$94.51
Apprentice: DELEADER (BRIDGE)							
Effective Date: 7/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$29.26	$10.30	$0.00	$0.00	$0.00	$39.56
2 / 55.00		$32.18	$10.30	$0.00	$6.88	$0.00	$49.36
3 / 60.00		$35.11	$10.30	$0.00	$7.50	$0.00	$52.91
4 / 65.00		$38.03	$10.30	$0.00	$8.13	$0.00	$56.46
5 / 70.00		$40.96	$10.30	$11.95	$8.75	$0.00	$71.96
6 / 75.00		$43.88	$10.30	$11.95	$9.38	$0.00	$75.51

Construction

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

Apprentice: DELEADER (BRIDGE)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$46.81	$10.30	$11.95	$10.00	$0.00	$79.06
8	90.00	$52.66	$10.30	$11.95	$11.25	$0.00	$86.16

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2	55.00	$32.76	$10.35	$0.00	$6.93	$0.00	$50.04
3	60.00	$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4	65.00	$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5	70.00	$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6	75.00	$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7	80.00	$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8	90.00	$53.60	$10.35	$12.00	$11.34	$0.00	$87.29

Apprentice to Journeyworker Ratio: 1:1

DEMO: ADZEMAN LABORERS LABORERS - ZONE 2	12/1/2025	$48.75	$10.15	$9.50	$9.65	$0.00	$78.05
	6/1/2026	$50.30	$10.15	$9.50	$9.65	$0.00	$79.60
	12/7/2026	$51.80	$10.15	$9.50	$9.65	$0.00	$81.10
	6/7/2027	$53.40	$10.15	$9.50	$9.65	$0.00	$82.70
	12/6/2027	$55.00	$10.15	$9.50	$9.65	$0.00	$84.30
	6/5/2028	$56.68	$10.15	$9.50	$9.65	$0.00	$85.98
	12/4/2028	$58.35	$10.15	$9.50	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$49.75	$10.15	$9.50	$9.65	$0.00	$79.05
	6/1/2026	$51.30	$10.15	$9.50	$9.65	$0.00	$80.60
	12/7/2026	$52.80	$10.15	$9.50	$9.65	$0.00	$82.10
	6/7/2027	$54.40	$10.15	$9.50	$9.65	$0.00	$83.70
	12/6/2027	$56.00	$10.15	$9.50	$9.65	$0.00	$85.30
	6/5/2028	$57.68	$10.15	$9.50	$9.65	$0.00	$86.98
	12/4/2028	$59.35	$10.15	$9.50	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 2	12/1/2025	$49.50	$10.15	$9.50	$9.65	$0.00	$78.80
	6/1/2026	$51.05	$10.15	$9.50	$9.65	$0.00	$80.35
	12/7/2026	$52.55	$10.15	$9.50	$9.65	$0.00	$81.85
	6/7/2027	$54.15	$10.15	$9.50	$9.65	$0.00	$83.45
	12/6/2027	$55.75	$10.15	$9.50	$9.65	$0.00	$85.05
	6/5/2028	$57.43	$10.15	$9.50	$9.65	$0.00	$86.73
	12/4/2028	$59.10	$10.15	$9.50	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER	12/1/2025	$49.75	$10.15	$9.50	$9.65	$0.00	$79.05
LABORERS	6/1/2026	$51.30	$10.15	$9.50	$9.65	$0.00	$80.60
LABORERS - ZONE 2	12/7/2026	$52.80	$10.15	$9.50	$9.65	$0.00	$82.10
	6/7/2027	$54.40	$10.15	$9.50	$9.65	$0.00	$83.70
	12/6/2027	$56.00	$10.15	$9.50	$9.65	$0.00	$85.30
	6/5/2028	$57.68	$10.15	$9.50	$9.65	$0.00	$86.98
	12/4/2028	$59.35	$10.15	$9.50	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR	12/1/2025	$49.50	$10.15	$9.50	$9.65	$0.00	$78.80
LABORERS	6/1/2026	$51.05	$10.15	$9.50	$9.65	$0.00	$80.35
LABORERS - ZONE 2	12/7/2026	$52.55	$10.15	$9.50	$9.65	$0.00	$81.85
	6/7/2027	$54.15	$10.15	$9.50	$9.65	$0.00	$83.45
	12/6/2027	$55.75	$10.15	$9.50	$9.65	$0.00	$85.05
	6/5/2028	$57.43	$10.15	$9.50	$9.65	$0.00	$86.73
	12/4/2028	$59.10	$10.15	$9.50	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER	12/1/2025	$48.75	$10.15	$9.50	$9.65	$0.00	$78.05
LABORERS	6/1/2026	$50.30	$10.15	$9.50	$9.65	$0.00	$79.60
LABORERS - ZONE 2	12/7/2026	$51.80	$10.15	$9.50	$9.65	$0.00	$81.10
	6/7/2027	$53.40	$10.15	$9.50	$9.65	$0.00	$82.70
	12/6/2027	$55.00	$10.15	$9.50	$9.65	$0.00	$84.30
	6/5/2028	$56.68	$10.15	$9.50	$9.65	$0.00	$85.98
	12/4/2028	$58.35	$10.15	$9.50	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIRECTIONAL DRILL MACHINE OPERATOR	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DIVER	8/1/2024	$78.11	$10.08	$11.62	$10.04	$0.00	$109.85
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 1)							
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 1)							
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 1)							
For apprentice rates see "Apprentice- PILE DRIVER"							
DIVER/SLURRY (EFFLUENT)	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 1)							
For apprentice rates see "Apprentice- PILE DRIVER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888 DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53
ELECTRICIAN ELECTRICIANS LOCAL 223 ELECTRICIANS LOCAL 223	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11
	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78

Apprentice: ELECTRICIAN

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.90	$12.25	$0.63	$0.00	$0.00	$33.78
2	45.00	$23.51	$12.25	$0.71	$0.00	$0.00	$36.47
3	50.00	$26.13	$12.25	$0.78	$0.00	$0.00	$39.16
4	55.00	$28.74	$12.25	$6.61	$2.50	$0.00	$50.10
5	60.00	$31.35	$12.25	$7.21	$2.50	$0.00	$53.31
6	65.00	$33.96	$12.25	$7.82	$2.50	$0.00	$56.53
7	70.00	$36.58	$12.25	$8.41	$2.50	$0.00	$59.74
8	75.00	$39.19	$12.25	$9.02	$2.50	$0.00	$62.96

Apprentice: ELECTRICIAN

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$21.89	$12.50	$0.66	$0.00	$0.00	$35.05
2	45.00	$24.62	$12.50	$0.74	$0.00	$0.00	$37.86
3	50.00	$27.36	$12.50	$0.82	$0.00	$0.00	$40.68
4	55.00	$30.10	$12.50	$6.92	$2.75	$0.00	$52.27
5	60.00	$32.83	$12.50	$7.54	$2.75	$0.00	$55.62
6	65.00	$35.57	$12.50	$8.18	$2.75	$0.00	$59.00
7	70.00	$38.30	$12.50	$8.81	$2.75	$0.00	$62.36
8	75.00	$41.04	$12.50	$9.43	$2.75	$0.00	$65.72

Apprentice to Journeyworker Ratio: 2:3

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 4 ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2025	$74.17	$16.28	$10.96	$10.40	$0.00	$111.81
	1/1/2026	$77.26	$16.38	$11.06	$10.70	$0.00	$115.40
	1/1/2027	$80.55	$16.48	$11.16	$11.00	$0.00	$119.19

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$37.09	$0.00	$0.00	$0.00	$0.00	$37.09
2	55.00	$40.79	$16.28	$10.96	$10.40	$0.00	$78.43
3	65.00	$48.21	$16.28	$10.96	$10.40	$0.00	$85.85

Construction

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

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
4	70.00	$51.92	$16.28	$10.96	$10.40	$0.00	$89.56
5	80.00	$59.34	$16.28	$10.96	$10.40	$0.00	$96.98

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$38.63	$0.00	$0.00	$0.00	$0.00	$38.63
2	55.00	$42.49	$16.38	$11.06	$10.70	$0.00	$80.63
3	65.00	$50.22	$16.38	$11.06	$10.70	$0.00	$88.36
4	70.00	$54.08	$16.38	$11.06	$10.70	$0.00	$92.22
5	80.00	$61.81	$16.38	$11.06	$10.70	$0.00	$99.95

Apprentice to Journeyworker Ratio: 1:1

ELEVATOR CONSTRUCTOR HELPER	1/1/2025	$51.92	$16.28	$10.96	$10.40	$0.00	$89.56
ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2026	$54.08	$16.38	$11.06	$10.07	$0.00	$91.59
ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2027	$56.39	$16.48	$11.16	$11.00	$0.00	$95.03
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	11/1/2025	$53.56	$16.05	$13.25	$3.25	$0.00	$86.11
OPERATING ENGINEERS LOCAL 4	5/1/2026	$55.00	$16.05	$13.25	$3.25	$0.00	$87.55
OPERATING ENGINEERS LOCAL 4	11/1/2026	$56.29	$16.05	$13.25	$3.25	$0.00	$88.84
	5/1/2027	$57.72	$16.05	$13.25	$3.25	$0.00	$90.27
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	11/1/2025	$55.17	$16.05	$13.25	$3.25	$0.00	$87.72
OPERATING ENGINEERS LOCAL 4	5/1/2026	$56.62	$16.05	$13.25	$3.25	$0.00	$89.17
OPERATING ENGINEERS LOCAL 4	11/1/2026	$57.92	$16.05	$13.25	$3.25	$0.00	$90.47
	5/1/2027	$59.37	$16.05	$13.25	$3.25	$0.00	$91.92
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	11/1/2025	$26.03	$16.05	$13.25	$3.25	$0.00	$58.58
OPERATING ENGINEERS LOCAL 4	5/1/2026	$26.88	$16.05	$13.25	$3.25	$0.00	$59.43
OPERATING ENGINEERS LOCAL 4	11/1/2026	$27.64	$16.05	$13.25	$3.25	$0.00	$60.19
	5/1/2027	$28.49	$16.05	$13.25	$3.25	$0.00	$61.04
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIRE ALARM INSTALLER	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELECTRICIANS LOCAL 223 ELECTRICIANS LOCAL 223	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11
/ COMMISSIONING ELECTRICIANS LOCAL 223 ELECTRICIANS LOCAL 223	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN (ASST. ENGINEER)	12/1/2025	$47.69	$16.05	$13.25	$3.25	$0.00	$80.24
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$48.75	$16.05	$13.25	$3.25	$0.00	$81.30
	12/1/2026	$49.93	$16.05	$13.25	$3.25	$0.00	$82.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FLAGGER & SIGNALER (HEAVY & HIGHWAY)	12/1/2025	$28.09	$10.15	$9.50	$9.21	$0.00	$56.95
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$29.21	$10.15	$9.50	$9.21	$0.00	$58.07
	12/1/2026	$29.21	$10.15	$9.50	$9.21	$0.00	$58.07
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FLOORCOVERER	9/1/2025	$57.74	$10.33	$11.47	$8.80	$0.00	$88.34
FLOORCOVERERS LOCAL 2168 FLOORCOVERERS LOCAL 2168 ZONE I	3/1/2026	$59.24	$10.33	$11.47	$8.80	$0.00	$89.84
	9/1/2026	$60.74	$10.33	$11.47	$8.80	$0.00	$91.34
	3/1/2027	$62.24	$10.33	$11.47	$8.80	$0.00	$92.84

Apprentice: FLOORCOVERER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$25.98	$10.33	$0.00	$1.76	$0.00	$38.07
2	45.00	$25.98	$10.33	$0.00	$1.76	$0.00	$38.07
3	55.00	$31.76	$10.33	$0.00	$3.52	$0.00	$45.61
4	55.00	$31.76	$10.33	$0.00	$3.52	$0.00	$45.61
5	70.00	$40.42	$10.33	$11.47	$5.28	$0.00	$67.50
6	70.00	$40.42	$10.33	$11.47	$5.28	$0.00	$67.50
7	80.00	$46.19	$10.33	$11.47	$7.04	$0.00	$75.03
8	80.00	$46.19	$10.33	$11.47	$7.04	$0.00	$75.03

Apprentice: FLOORCOVERER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$26.66	$10.33	$0.00	$1.76	$0.00	$38.75
2	45.00	$26.66	$10.33	$0.00	$1.76	$0.00	$38.75
3	55.00	$32.58	$10.33	$0.00	$3.52	$0.00	$46.43
4	55.00	$32.58	$10.33	$0.00	$3.52	$0.00	$46.43
5	70.00	$41.47	$10.33	$11.47	$5.28	$0.00	$68.55
6	70.00	$41.47	$10.33	$11.47	$5.28	$0.00	$68.55

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GENERATOR/LIGHTING PLANT/HEATERS	12/1/2025	$37.97	$16.05	$13.25	$3.25	$0.00	$70.52
OPERATING ENGINEERS LOCAL 4	6/1/2026	$38.83	$16.05	$13.25	$3.25	$0.00	$71.38
OPERATING ENGINEERS LOCAL 4	12/1/2026	$39.78	$16.05	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	6/1/2025	$43.13	$10.80	$8.25	$5.50	$0.00	$67.68
GLAZIERS LOCAL 1333	6/1/2026	$44.73	$11.20	$8.40	$6.05	$0.00	$70.38
GLAZIERS LOCAL 1333	6/1/2027	$46.73	$11.60	$8.55	$6.60	$0.00	$73.48
	6/1/2028	$48.73	$12.00	$8.70	$7.20	$0.00	$76.63

Apprentice: FLOORCOVERER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$47.39	$10.33	$11.47	$7.04	$0.00	$76.23
8	80.00	$47.39	$10.33	$11.47	$7.04	$0.00	$76.23

Apprentice Notes

Steps are 750 hrs.

Apprentice to Journeyworker Ratio: 1:1

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 6/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$21.57	$10.80	$8.25	$5.50	$0.00	$46.12
2	56.25	$24.26	$10.80	$8.25	$5.50	$0.00	$48.81
3	62.50	$26.96	$10.80	$8.25	$5.50	$0.00	$51.51
4	68.75	$29.65	$10.80	$8.25	$5.50	$0.00	$54.20
5	75.00	$32.35	$10.80	$8.25	$5.50	$0.00	$56.90
6	81.25	$35.04	$10.80	$8.25	$5.50	$0.00	$59.59
7	87.50	$37.74	$10.80	$8.25	$5.50	$0.00	$62.29
8	93.75	$40.43	$10.80	$8.25	$5.50	$0.00	$64.98

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.37	$11.20	$8.40	$6.05	$0.00	$48.02
2	56.25	$25.16	$11.20	$8.40	$6.05	$0.00	$50.81

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	62.50	$27.96	$11.20	$8.40	$6.05	$0.00	$53.61
4	68.75	$30.75	$11.20	$8.40	$6.05	$0.00	$56.40
5	75.00	$33.55	$11.20	$8.40	$6.05	$0.00	$59.20
6	81.25	$36.34	$11.20	$8.40	$6.05	$0.00	$61.99
7	87.50	$39.14	$11.20	$8.40	$6.05	$0.00	$64.79
8	93.75	$41.93	$11.20	$8.40	$6.05	$0.00	$67.58

Apprentice to Journeyworker Ratio: 3:1

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$32.88	$0.00	$0.00	$0.00	$0.00	$32.88
2	60.00	$35.87	$16.05	$13.25	$3.25	$0.00	$68.42
3	65.00	$38.86	$16.05	$13.25	$3.25	$0.00	$71.41
4	70.00	$41.85	$16.05	$13.25	$3.25	$0.00	$74.40
5	75.00	$44.84	$16.05	$13.25	$3.25	$0.00	$77.39
6	80.00	$47.82	$16.05	$13.25	$3.25	$0.00	$80.37
7	85.00	$50.81	$16.05	$13.25	$3.25	$0.00	$83.36
8	90.00	$53.80	$16.05	$13.25	$3.25	$0.00	$86.35

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$33.32	$0.00	$0.00	$0.00	$0.00	$33.32
2	60.00	$36.35	$16.05	$13.25	$3.25	$0.00	$68.90
3	65.00	$39.38	$16.05	$13.25	$3.25	$0.00	$71.93
4	70.00	$42.41	$16.50	$13.25	$3.25	$0.00	$75.41
5	75.00	$45.44	$16.50	$13.25	$3.25	$0.00	$78.44
6	80.00	$48.46	$16.50	$13.25	$3.25	$0.00	$81.46
7	85.00	$51.49	$16.50	$13.25	$3.25	$0.00	$84.49
8	90.00	$54.52	$16.50	$13.25	$3.25	$0.00	$87.52

Apprentice to Journeyworker Ratio: 1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - B	10/1/2025	$44.05	$14.91	$13.35	$6.15	$2.24	$80.70
	4/1/2026	$45.55	$14.91	$13.35	$6.15	$2.24	$82.20

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS)	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11
ELECTRICIANS LOCAL 223	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78
ELECTRICIANS LOCAL 223							
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR)	10/1/2025	$44.05	$14.91	$13.35	$6.15	$2.24	$80.70
SHEETMETAL WORKERS LOCAL 17	4/1/2026	$45.55	$14.91	$13.35	$6.15	$2.24	$82.20
SHEETMETAL WORKERS LOCAL 17 - B							
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER)	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
PLUMBERS & PIPEFITTERS LOCAL 51							
PLUMBERS & PIPEFITTERS LOCAL 51							
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
PLUMBERS & PIPEFITTERS LOCAL 51							
PLUMBERS & PIPEFITTERS LOCAL 51							
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS	12/1/2025	$41.97	$10.15	$9.50	$9.11	$0.00	$70.73
LABORERS	6/1/2026	$43.41	$10.15	$9.50	$9.11	$0.00	$72.17
LABORERS - ZONE 2	12/1/2026	$44.85	$10.15	$9.50	$9.11	$0.00	$73.61
	6/1/2027	$46.30	$10.15	$9.50	$9.11	$0.00	$75.06
	12/1/2027	$47.75	$10.15	$9.50	$9.11	$0.00	$76.51
	6/1/2028	$49.25	$10.15	$9.50	$9.11	$0.00	$78.01
	12/1/2028	$50.75	$10.15	$9.50	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY)	12/1/2025	$41.97	$10.15	$9.50	$9.21	$0.00	$70.83
LABORERS	6/1/2026	$43.41	$10.15	$9.50	$9.21	$0.00	$72.27
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.85	$10.15	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS)	9/1/2025	$54.31	$14.75	$9.52	$10.09	$0.00	$88.67
HEAT & FROST INSULATORS LOCAL 6	9/1/2026	$57.38	$14.75	$9.52	$10.09	$0.00	$91.74
HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)							

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.16	$14.75	$9.27	$5.05	$0.00	$56.23
2	60.00	$32.59	$14.75	$9.32	$6.05	$0.00	$62.71
3	70.00	$38.02	$14.75	$9.37	$7.06	$0.00	$69.20
4	80.00	$43.45	$14.75	$9.42	$8.07	$0.00	$75.69

Construction

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

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$28.69	$14.75	$9.27	$5.05	$0.00	$57.76
2	60.00	$34.43	$14.75	$9.32	$6.05	$0.00	$64.55
3	70.00	$40.17	$14.75	$9.37	$7.06	$0.00	$71.35
4	80.00	$45.90	$14.75	$9.42	$8.07	$0.00	$78.14

Apprentice to Journeyworker Ratio: 1:4

IRONWORKER/WELDER IRONWORKERS LOCAL 37 IRONWORKERS LOCAL 37	3/16/2021	$42.46	$7.70	$12.10	$5.00	$0.00	$67.26

Apprentice: IRONWORKER/WELDER

Effective Date: 3/16/2021

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	70.00	$29.72	$7.70	$12.10	$5.00	$0.00	$54.52
2	75.00	$31.85	$7.70	$12.10	$5.00	$0.00	$56.65
3	80.00	$33.97	$7.70	$12.10	$5.00	$0.00	$58.77
4	85.00	$36.09	$7.70	$12.10	$5.00	$0.00	$60.89
5	90.00	$38.21	$7.70	$12.10	$5.00	$0.00	$63.01
6	95.00	$40.34	$7.70	$12.10	$5.00	$0.00	$65.14

Apprentice to Journeyworker Ratio: 1:4

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS LABORERS - ZONE 2	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76

Construction

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

Apprentice: LABORER

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.03	$10.15	$9.50	$9.11	$0.00	$53.79
2	70.00	$29.20	$10.15	$9.50	$9.11	$0.00	$57.96
3	80.00	$33.38	$10.15	$9.50	$9.11	$0.00	$62.14
4	90.00	$37.55	$10.15	$9.50	$9.11	$0.00	$66.31

Apprentice: LABORER

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.60	$10.15	$9.50	$9.11	$0.00	$54.36
2	70.00	$29.86	$10.15	$9.50	$9.11	$0.00	$58.62
3	80.00	$34.13	$10.15	$9.50	$9.11	$0.00	$62.89
4	90.00	$38.39	$10.15	$9.50	$9.11	$0.00	$67.15

Apprentice to Journeyworker Ratio: 1:5

LABORER (HEAVY & HIGHWAY)	12/1/2025	$41.22	$10.15	$9.50	$9.21	$0.00	$70.08
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$42.66	$10.15	$9.50	$9.21	$0.00	$71.52
	12/1/2026	$44.10	$10.15	$9.50	$9.21	$0.00	$72.96

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.03	$10.15	$9.50	$9.21	$0.00	$53.89
2	70.00	$29.20	$10.15	$9.50	$9.21	$0.00	$58.06
3	80.00	$33.38	$10.15	$9.50	$9.21	$0.00	$62.24
4	90.00	$37.55	$10.15	$9.50	$9.21	$0.00	$66.41

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.60	$10.15	$9.50	$9.21	$0.00	$54.46
2	70.00	$29.86	$10.15	$9.50	$9.21	$0.00	$58.72
3	80.00	$34.13	$10.15	$9.50	$9.21	$0.00	$62.99
4	90.00	$38.39	$10.15	$9.50	$9.10	$0.00	$67.14

Apprentice to Journeyworker Ratio: 1:5

LABORER: CARPENTER TENDER	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 2	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER LABORERS LABORERS - ZONE 2	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS LABORERS - ZONE 2	12/1/2025	$41.31	$10.15	$9.50	$9.65	$0.00	$70.61
	6/1/2026	$42.75	$10.15	$9.50	$9.65	$0.00	$72.05
	12/7/2026	$44.19	$10.15	$9.50	$9.65	$0.00	$73.49
	6/7/2027	$45.64	$10.15	$9.50	$9.65	$0.00	$74.94
	12/6/2027	$47.09	$10.15	$9.50	$9.65	$0.00	$76.39
	6/5/2028	$48.59	$10.15	$9.50	$9.65	$0.00	$77.89
	12/4/2028	$50.09	$10.15	$9.50	$9.65	$0.00	$79.39
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
LABORER: MULTI-TRADE TENDER LABORERS LABORERS - ZONE 2	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 2	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76

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 LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01

For apprentice rates see "Apprentice- LABORER"

LASER BEAM OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21

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

MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2025	$52.08	$11.49	$15.57	$6.05	$0.00	$85.19
	2/1/2026	$53.16	$11.49	$15.57	$6.05	$0.00	$86.27
	8/1/2026	$54.92	$11.49	$15.57	$6.05	$0.00	$88.03
	2/1/2027	$56.04	$11.49	$15.57	$6.05	$0.00	$89.15

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.04	$11.49	$15.57	$6.05	$0.00	$59.15
2	60.00	$31.25	$11.49	$15.57	$6.05	$0.00	$64.36
3	70.00	$36.46	$11.49	$15.57	$6.05	$0.00	$69.57
4	80.00	$41.66	$11.49	$15.57	$6.05	$0.00	$74.77
5	90.00	$46.87	$11.49	$15.57	$6.05	$0.00	$79.98

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.58	$11.49	$15.57	$6.05	$0.00	$59.69
2	60.00	$31.90	$11.49	$15.57	$6.05	$0.00	$65.01
3	70.00	$37.21	$11.49	$15.57	$6.05	$0.00	$70.32
4	80.00	$42.53	$11.49	$15.57	$6.05	$0.00	$75.64
5	90.00	$47.84	$11.49	$15.57	$6.05	$0.00	$80.95

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice to Journeyworker Ratio: 1:5							
MARBLE MASONS,TILELAYERS & TERRAZZO MECH	8/1/2025	$67.97	$11.49	$15.57	$7.99	$0.00	$103.02
BRICKLAYERS LOCAL 3	2/1/2026	$69.32	$11.49	$15.57	$7.99	$0.00	$104.37
BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2026	$71.52	$11.49	$15.57	$7.99	$0.00	$106.57
	2/1/2027	$72.92	$11.49	$15.57	$7.99	$0.00	$107.97

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.99	$11.49	$15.57	$7.99	$0.00	$69.04
2	60.00	$40.78	$11.49	$15.57	$7.99	$0.00	$75.83
3	70.00	$47.58	$11.49	$15.57	$7.99	$0.00	$82.63
4	80.00	$54.38	$11.49	$15.57	$7.99	$0.00	$89.43
5	90.00	$61.17	$11.49	$15.57	$7.99	$0.00	$96.22

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$34.66	$11.49	$15.57	$7.99	$0.00	$69.71
2	60.00	$41.59	$11.49	$15.57	$7.99	$0.00	$76.64
3	70.00	$48.52	$11.49	$15.57	$7.99	$0.00	$83.57
4	80.00	$55.46	$11.49	$15.57	$7.99	$0.00	$90.51
5	90.00	$62.39	$11.49	$15.57	$7.99	$0.00	$97.44

Apprentice to Journeyworker Ratio: 1:5							
MECH. SWEEPER OPERATOR (ON CONST. SITES)	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MECHANICS MAINTENANCE	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MILLWRIGHT (Zone 2)	1/6/2025	$45.03	$10.08	$11.47	$10.00	$0.00	$76.58
MILLWRIGHTS LOCAL 1121	1/5/2026	$47.36	$10.08	$11.47	$10.00	$0.00	$78.91
MILLWRIGHTS LOCAL 1121 - Zone 2							

Apprentice: MILLWRIGHT (Zone 2)

Effective Date: 1/6/2025

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

Construction

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

Apprentice: MILLWRIGHT (Zone 2)

Effective Date: 1/6/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$24.77	$10.08	$0.00	$5.50	$0.00	$40.35
2	65.00	$29.27	$10.08	$0.00	$6.50	$0.00	$45.85
3	75.00	$33.77	$10.08	$11.47	$7.50	$0.00	$62.82
4	85.00	$38.28	$10.08	$11.47	$8.50	$0.00	$68.33

Apprentice: MILLWRIGHT (Zone 2)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$26.05	$10.08	$0.00	$5.50	$0.00	$41.63
2	65.00	$30.78	$10.08	$0.00	$6.50	$0.00	$47.36
3	75.00	$35.52	$10.08	$11.47	$7.50	$0.00	$64.57
4	85.00	$40.26	$10.08	$11.47	$8.50	$0.00	$70.31

Apprentice Notes

Step 1&2 Appr. indentured after 1/6/2020 receive no pension,

Apprentice to Journeyworker Ratio: 1:4

MORTAR MIXER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
OILER (OTHER THAN TRUCK CRANES,GRADALLS) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$25.68	$16.05	$13.25	$3.25	$0.00	$58.23
	6/1/2026	$26.27	$16.05	$13.25	$3.25	$0.00	$58.82
	12/1/2026	$26.94	$16.05	$13.25	$3.25	$0.00	$59.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OILER (TRUCK CRANES, GRADALLS) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$31.65	$16.05	$13.25	$3.25	$0.00	$64.20
	6/1/2026	$32.37	$16.05	$13.25	$3.25	$0.00	$64.92
	12/1/2026	$33.17	$16.05	$13.25	$3.25	$0.00	$65.72
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS II OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$58.51	$10.30	$11.95	$12.50	$0.00	$93.26
	1/1/2026	$59.56	$10.35	$12.00	$12.50	$0.00	$94.41

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.26	$10.30	$0.00	$0.00	$0.00	$39.56
2	55.00	$32.18	$10.30	$0.00	$6.88	$0.00	$49.36
3	60.00	$35.11	$10.30	$0.00	$7.50	$0.00	$52.91
4	65.00	$38.03	$10.30	$0.00	$8.13	$0.00	$56.46
5	70.00	$40.96	$10.30	$11.95	$8.75	$0.00	$71.96
6	75.00	$43.88	$10.30	$11.95	$9.38	$0.00	$75.51
7	80.00	$46.81	$10.30	$11.95	$10.00	$0.00	$79.06
8	90.00	$52.66	$10.30	$11.95	$11.25	$0.00	$86.16

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2	55.00	$32.76	$10.35	$0.00	$6.93	$0.00	$50.04
3	60.00	$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4	65.00	$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5	70.00	$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6	75.00	$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7	80.00	$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8	90.00	$53.60	$10.35	$12.00	$11.34	$0.00	$87.29

Apprentice to Journeyworker Ratio: 1:1

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$49.41	$10.30	$11.95	$12.50	$0.00	$84.16
	1/1/2026	$50.46	$10.35	$12.00	$12.60	$0.00	$85.41

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.71	$10.30	$0.00	$0.00	$0.00	$35.01
2	55.00	$27.18	$10.30	$0.00	$6.88	$0.00	$44.36
3	60.00	$29.65	$10.30	$0.00	$7.50	$0.00	$47.45
4	65.00	$32.12	$10.30	$0.00	$8.13	$0.00	$50.55
5	70.00	$34.59	$10.30	$11.95	$8.75	$0.00	$65.59
6	75.00	$37.06	$10.30	$11.95	$9.38	$0.00	$68.69

Construction

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

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$39.53	$10.30	$11.95	$10.00	$0.00	$71.78
8	90.00	$44.47	$10.30	$11.95	$11.25	$0.00	$77.97

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$25.23	$10.35	$0.00	$0.00	$0.00	$35.58
2	55.00	$27.75	$10.35	$0.00	$6.93	$0.00	$45.03
3	60.00	$30.28	$10.35	$0.00	$7.56	$0.00	$48.19
4	65.00	$32.80	$10.35	$0.00	$8.19	$0.00	$51.34
5	70.00	$35.32	$10.35	$12.00	$8.82	$0.00	$66.49
6	75.00	$37.85	$10.35	$12.00	$9.45	$0.00	$69.65
7	80.00	$40.37	$10.35	$12.00	$10.08	$0.00	$72.80
8	90.00	$45.41	$10.35	$12.00	$11.34	$0.00	$79.10

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$47.47	$10.30	$11.95	$12.50	$0.00	$82.22
	1/1/2026	$48.52	$10.35	$12.00	$12.60	$0.00	$83.47

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.74	$10.30	$0.00	$0.00	$0.00	$34.04
2	55.00	$26.11	$10.30	$0.00	$6.88	$0.00	$43.29
3	60.00	$28.48	$10.30	$0.00	$7.50	$0.00	$46.28
4	65.00	$30.86	$10.30	$0.00	$8.13	$0.00	$49.29
5	70.00	$33.23	$10.30	$11.95	$8.75	$0.00	$64.23
6	75.00	$35.60	$10.30	$11.95	$9.38	$0.00	$67.23
7	80.00	$37.98	$10.30	$11.95	$10.00	$0.00	$70.23
8	90.00	$42.72	$10.30	$11.95	$11.25	$0.00	$76.22

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.26	$10.35	$0.00	$0.00	$0.00	$34.61
2	55.00	$26.69	$10.35	$0.00	$6.93	$0.00	$43.97

Construction

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

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	60.00	$29.11	$10.35	$0.00	$7.56	$0.00	$47.02
4	65.00	$31.54	$10.35	$0.00	$8.19	$0.00	$50.08
5	70.00	$33.96	$10.35	$12.00	$8.82	$0.00	$65.13
6	75.00	$36.39	$10.35	$12.00	$9.45	$0.00	$68.19
7	80.00	$38.82	$10.35	$12.00	$10.08	$0.00	$71.25
8	90.00	$43.67	$10.35	$12.00	$11.34	$0.00	$77.36

Apprentice to Journeyworker Ratio: 1:1

PAINTER / TAPER (BRUSH, NEW) *	7/1/2025	$48.01	$10.30	$11.95	$12.50	$0.00	$82.76
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.	1/1/2026	$49.06	$10.35	$12.00	$12.60	$0.00	$84.01
PAINTERS LOCAL 35							
PAINTERS LOCAL 35 - ZONE 2							

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.01	$10.30	$0.00	$0.00	$0.00	$34.31
2	55.00	$26.41	$10.30	$0.00	$6.88	$0.00	$43.59
3	60.00	$28.81	$10.30	$0.00	$7.50	$0.00	$46.61
4	65.00	$31.21	$10.30	$0.00	$8.13	$0.00	$49.64
5	70.00	$33.61	$10.30	$11.95	$8.75	$0.00	$64.61
6	75.00	$36.01	$10.30	$11.95	$9.38	$0.00	$67.64
7	80.00	$38.41	$10.30	$11.95	$10.00	$0.00	$70.66
8	90.00	$43.21	$10.30	$11.95	$11.25	$0.00	$76.71

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.53	$10.35	$0.00	$0.00	$0.00	$34.88
2	55.00	$26.98	$10.35	$0.00	$6.93	$0.00	$44.26
3	60.00	$29.44	$10.35	$0.00	$7.56	$0.00	$47.35
4	65.00	$31.89	$10.35	$0.00	$8.19	$0.00	$50.43
5	70.00	$34.34	$10.35	$12.00	$8.82	$0.00	$65.51
6	75.00	$36.80	$10.35	$12.00	$9.45	$0.00	$68.60
7	80.00	$39.25	$10.35	$12.00	$10.08	$0.00	$71.68
8	90.00	$44.15	$10.35	$12.00	$11.34	$0.00	$77.84

Apprentice to Journeyworker Ratio: 1:1

PAINTER / TAPER (BRUSH, REPAINT)	7/1/2025	$46.07	$10.30	$11.95	$12.50	$0.00	$80.82

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2026	$47.12	$10.35	$12.00	$12.60	$0.00	$82.07

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.04	$10.30	$0.00	$0.00	$0.00	$33.34
2	55.00	$25.34	$10.30	$0.00	$6.88	$0.00	$42.52
3	60.00	$27.64	$10.30	$0.00	$7.50	$0.00	$45.44
4	65.00	$29.95	$10.30	$0.00	$8.13	$0.00	$48.38
5	70.00	$32.25	$10.30	$11.95	$8.75	$0.00	$63.25
6	75.00	$34.55	$10.30	$11.95	$9.38	$0.00	$66.18
7	80.00	$36.86	$10.30	$11.95	$10.00	$0.00	$69.11
8	90.00	$41.46	$10.30	$11.95	$11.25	$0.00	$74.96

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.56	$10.35	$0.00	$0.00	$0.00	$33.91
2	55.00	$25.92	$10.35	$0.00	$6.93	$0.00	$43.20
3	60.00	$28.27	$10.35	$0.00	$7.56	$0.00	$46.18
4	65.00	$30.63	$10.35	$0.00	$8.19	$0.00	$49.17
5	70.00	$32.98	$10.35	$12.00	$8.82	$0.00	$64.15
6	75.00	$35.34	$10.35	$12.00	$9.45	$0.00	$67.14
7	80.00	$37.70	$10.35	$12.00	$10.08	$0.00	$70.13
8	90.00	$42.41	$10.35	$12.00	$11.34	$0.00	$76.10

Apprentice to Journeyworker Ratio: 1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	12/1/2025	$41.22	$10.15	$9.50	$9.21	$0.00	$70.08
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$42.66	$10.15	$9.50	$9.21	$0.00	$71.52
	12/1/2026	$44.10	$10.15	$9.50	$9.21	$0.00	$72.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER	12/1/2025	$40.78	$15.57	$21.78	$0.00	$0.00	$78.13
TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$40.78	$16.17	$21.78	$0.00	$0.00	$78.73
	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)							

Apprentice: PILE DRIVER

Effective Date: 8/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$25.11	$10.08	$0.00	$2.53	$0.00	$37.72
2	55.00	$30.68	$10.08	$0.00	$5.07	$0.00	$45.83
3	70.00	$39.05	$10.08	$11.62	$7.60	$0.00	$68.35
4	80.00	$44.63	$10.08	$11.62	$10.14	$0.00	$76.47

Apprentice to Journeyworker Ratio: 1:5

PIPELAYER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBER & PIPEFITTER PLUMBERS & PIPEFITTERS LOCAL 51 PLUMBERS & PIPEFITTERS LOCAL 51	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 8/25/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$22.10	$10.15	$2.50	$0.00	$0.00	$34.75
2	50.00	$27.62	$10.15	$2.50	$0.00	$0.00	$40.27
3	60.00	$33.14	$10.15	$8.40	$0.50	$0.00	$52.19
4	70.00	$38.67	$10.15	$13.44	$0.80	$0.00	$63.06
5	80.00	$44.19	$10.15	$16.80	$1.00	$0.00	$72.14

Apprentice to Journeyworker Ratio: 1:3

PNEUMATIC CONTROLS (TEMP.) PLUMBERS & PIPEFITTERS LOCAL 51 PLUMBERS & PIPEFITTERS LOCAL 51	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 2	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWDERMAN & BLASTER LABORERS LABORERS - ZONE 2	12/1/2025	$42.22	$10.15	$9.50	$9.11	$0.00	$70.98
	6/1/2026	$43.66	$10.15	$9.50	$9.11	$0.00	$72.42
	12/1/2026	$45.10	$10.15	$9.50	$9.11	$0.00	$73.86
	6/1/2027	$46.55	$10.15	$9.50	$9.11	$0.00	$75.31
	12/1/2027	$48.00	$10.15	$9.50	$9.11	$0.00	$76.76
	6/1/2028	$49.50	$10.15	$9.50	$9.11	$0.00	$78.26
	12/1/2028	$51.00	$10.15	$9.50	$9.11	$0.00	$79.76
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$42.22	$9.90	$9.50	$9.21	$0.00	$70.83
	6/1/2026	$43.66	$9.90	$9.50	$9.21	$0.00	$72.27
	12/1/2026	$45.10	$9.90	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWER SHOVEL/DERRICK/TRENCHING MACHINE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$37.97	$16.05	$13.25	$3.25	$0.00	$70.52
	6/1/2026	$38.83	$16.05	$13.25	$3.25	$0.00	$71.38
	12/1/2026	$39.78	$16.05	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER TEAMSTERS 653 TEAMSTERS 653 - Southeastern Concrete (Weymouth)	8/1/2023	$25.00	$13.91	$6.90	$0.00	$0.00	$45.81
RECLAIMERS OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
RIDE-ON MOTORIZED BUGGY OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS LABORERS - ZONE 2	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
ROLLER/SPREADER/MULCHING MACHINE	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)	8/1/2025	$53.53	$13.28	$12.67	$9.03	$0.00	$88.51
ROOFERS LOCAL 33 ROOFERS LOCAL 33	2/1/2026	$54.78	$13.28	$12.67	$9.03	$0.00	$89.76

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

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.77	$13.28	$6.52	$9.03	$0.00	$55.60
2	60.00	$32.12	$13.28	$12.67	$9.03	$0.00	$67.10
3	65.00	$34.79	$13.28	$12.67	$9.03	$0.00	$69.77
4	75.00	$40.15	$13.28	$12.67	$9.03	$0.00	$75.13
5	85.00	$45.50	$13.28	$12.67	$9.03	$0.00	$80.48

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

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.39	$13.28	$6.52	$9.03	$0.00	$56.22
2	60.00	$32.87	$13.28	$12.67	$9.03	$0.00	$67.85
3	65.00	$35.61	$13.28	$12.67	$9.03	$0.00	$70.59
4	75.00	$41.09	$13.28	$12.67	$9.03	$0.00	$76.07
5	85.00	$46.56	$13.28	$12.67	$9.03	$0.00	$81.54

Apprentice Notes

** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1

Apprentice to Journeyworker Ratio: 1:5

ROOFER SLATE / TILE / PRECAST CONCRETE	8/1/2025	$53.78	$13.28	$12.67	$9.03	$0.00	$88.76
ROOFERS LOCAL 33 ROOFERS LOCAL 33	2/1/2026	$55.03	$13.28	$12.67	$9.03	$0.00	$90.01
For apprentice rates see "Apprentice- ROOFER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
SHEETMETAL WORKER	10/1/2025	$44.05	$14.91	$13.35	$6.15	$2.24	$80.70
SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - B	4/1/2026	$45.55	$14.91	$13.35	$6.15	$2.24	$82.20

Apprentice: SHEETMETAL WORKER

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$17.62	$14.91	$4.27	$0.00	$1.09	$37.89
2	45.00	$19.82	$14.91	$4.80	$0.00	$1.17	$40.70
3	50.00	$22.03	$14.91	$12.28	$0.00	$1.45	$50.67
4	55.00	$24.23	$14.91	$12.28	$0.00	$1.52	$52.94
5	60.00	$26.43	$14.91	$12.28	$3.69	$1.64	$58.95
6	65.00	$28.63	$14.91	$12.28	$4.00	$1.71	$61.53
7	70.00	$30.84	$14.91	$12.28	$4.31	$1.78	$64.12
8	75.00	$33.04	$14.91	$12.28	$4.61	$1.86	$66.70
9	80.00	$35.24	$14.91	$12.28	$4.92	$1.93	$69.28
10	85.00	$37.44	$14.91	$12.28	$5.23	$2.00	$71.86

Apprentice: SHEETMETAL WORKER

Effective Date: 4/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$18.22	$14.91	$4.27	$0.00	$1.09	$38.49
2	45.00	$20.50	$14.91	$4.80	$0.00	$1.17	$41.38
3	50.00	$22.78	$14.91	$12.28	$0.00	$1.45	$51.42
4	55.00	$25.05	$14.91	$12.28	$0.00	$1.52	$53.76
5	60.00	$27.33	$14.91	$12.28	$3.69	$1.64	$59.85
6	65.00	$29.61	$14.91	$12.28	$4.00	$1.71	$62.51
7	70.00	$31.89	$14.91	$12.28	$4.31	$1.78	$65.17
8	75.00	$34.16	$14.91	$12.28	$4.61	$1.86	$67.82
9	80.00	$36.44	$14.91	$12.28	$4.92	$1.93	$70.48
10	85.00	$38.72	$14.91	$12.28	$5.23	$2.00	$73.14

Apprentice to Journeyworker Ratio: 1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.53	$15.57	$21.78	$0.00	$0.00	$78.88
	1/1/2026	$41.53	$16.17	$21.78	$0.00	$0.00	$79.48
	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
SPRINKLER FITTER	10/1/2025	$64.85	$12.25	$7.40	$19.50	$0.00	$104.00
SPRINKLER FITTERS LOCAL 550 SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2	1/1/2026	$64.85	$13.45	$7.45	$18.25	$0.00	$104.00

Apprentice: SPRINKLER FITTER

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	35.00	$22.70	$12.25	$14.22	$0.00	$0.00	$49.17
2	0.00	$25.94	$12.25	$15.20	$0.00	$0.00	$53.39
3	0.00	$29.18	$12.25	$16.18	$0.00	$0.00	$57.61
4	0.00	$32.43	$12.25	$17.15	$0.00	$0.00	$61.83
5	0.00	$35.67	$12.25	$18.12	$0.00	$0.00	$66.04
6	0.00	$38.91	$12.25	$19.10	$0.00	$0.00	$70.26
7	65.00	$42.15	$12.25	$20.08	$0.00	$0.00	$74.48
8	0.00	$45.40	$12.25	$21.05	$0.00	$0.00	$78.70
9	0.00	$48.64	$12.25	$22.02	$0.00	$0.00	$82.91
10	0.00	$51.88	$12.25	$23.00	$0.00	$0.00	$87.13

Apprentice: SPRINKLER FITTER

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	0.00	$22.70	$13.45	$13.84	$0.00	$0.00	$49.99
2	0.00	$25.94	$13.45	$14.75	$0.00	$0.00	$54.14
3	0.00	$29.18	$13.45	$15.67	$0.00	$0.00	$58.30
4	0.00	$32.43	$13.45	$16.57	$0.00	$0.00	$62.45
5	0.00	$35.67	$13.45	$17.49	$0.00	$0.00	$66.61
6	0.00	$38.91	$13.45	$18.40	$0.00	$0.00	$70.76
7	0.00	$42.15	$13.45	$19.32	$0.00	$0.00	$74.92
8	0.00	$45.40	$13.45	$20.22	$0.00	$0.00	$79.07
9	0.00	$48.64	$13.45	$21.15	$0.00	$0.00	$83.24
10	0.00	$51.88	$13.45	$22.05	$0.00	$0.00	$87.38

Apprentice Notes

Apprentice entered prior 9/30/10:

Apprentice to Journeyworker Ratio: 1:3

STEAM BOILER OPERATOR	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN	9/1/2025	$42.52	$12.00	$12.05	$3.25	$0.00	$69.82
TELECOMMUNICATION TECHNICIAN	9/1/2026	$44.41	$12.25	$12.59	$3.50	$0.00	$72.75
ELECTRICIANS LOCAL 223	9/1/2027	$46.51	$12.50	$13.18	$3.75	$0.00	$75.94
ELECTRICIANS LOCAL 223							
For apprentice rates and ratios see "Apprentice- ELECTRICIAN"							
TERRAZZO FINISHERS	8/1/2025	$66.89	$11.49	$15.57	$8.02	$0.00	$101.97
BRICKLAYERS LOCAL 3	2/1/2026	$68.24	$11.49	$15.57	$8.02	$0.00	$103.32
BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2026	$70.44	$11.49	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$71.84	$11.49	$15.57	$8.02	$0.00	$106.92

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

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

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$34.12	$11.49	$15.57	$8.02	$0.00	$69.20
2	60.00	$40.94	$11.49	$15.57	$8.02	$0.00	$76.02
3	70.00	$47.77	$11.49	$15.57	$8.02	$0.00	$82.85
4	80.00	$54.59	$11.49	$15.57	$8.02	$0.00	$89.67
5	90.00	$61.42	$11.49	$15.57	$8.02	$0.00	$96.50

Apprentice to Journeyworker Ratio: 1:5

TEST BORING DRILLER	12/1/2025	$52.70	$10.15	$9.50	$9.80	$0.00	$82.15
LABORERS	6/1/2026	$54.25	$10.15	$9.50	$9.80	$0.00	$83.70
LABORERS - FOUNDATION AND MARINE	12/1/2026	$55.75	$10.15	$9.50	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER	12/1/2025	$48.82	$10.15	$9.50	$9.80	$0.00	$78.27
LABORERS	6/1/2026	$50.37	$10.15	$9.50	$9.80	$0.00	$79.82
LABORERS - FOUNDATION AND MARINE	12/1/2026	$51.87	$10.15	$9.50	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER	12/1/2025	$48.70	$10.15	$9.50	$9.80	$0.00	$78.15
LABORERS	6/1/2026	$50.25	$10.15	$9.50	$9.80	$0.00	$79.70
LABORERS - FOUNDATION AND MARINE	12/1/2026	$51.75	$10.15	$9.50	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS/PORTABLE STEAM GENERATORS	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT	12/1/2025	$41.82	$15.57	$21.78	$0.00	$0.00	$79.17
TEAMSTERS JOINT COUNCIL NO. 10	1/1/2026	$41.82	$16.17	$21.78	$0.00	$0.00	$79.77
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR	12/1/2025	$60.93	$10.15	$9.50	$10.25	$0.00	$90.83
LABORERS	6/1/2026	$62.48	$10.15	$9.50	$10.25	$0.00	$92.38
LABORERS (COMPRESSED AIR)	12/1/2026	$63.98	$10.15	$9.50	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	12/1/2025	$62.93	$10.15	$9.50	$10.25	$0.00	$92.83
LABORERS	6/1/2026	$64.48	$10.15	$9.50	$10.25	$0.00	$94.38
LABORERS (COMPRESSED AIR)	12/1/2026	$65.98	$10.15	$9.50	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR	12/1/2025	$53.00	$10.15	$9.50	$10.25	$0.00	$82.90
LABORERS	6/1/2026	$54.55	$10.15	$9.50	$10.25	$0.00	$84.45
LABORERS (FREE AIR TUNNEL)	12/1/2026	$56.05	$10.15	$9.50	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	12/1/2025	$55.00	$10.15	$9.50	$10.25	$0.00	$84.90
LABORERS	6/1/2026	$56.55	$10.15	$9.50	$10.25	$0.00	$86.45
LABORERS (FREE AIR TUNNEL)	12/1/2026	$58.05	$10.15	$9.50	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
TEAMSTERS JOINT COUNCIL NO. 10	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
WAGON DRILL OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
WASTE WATER PUMP OPERATOR	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
WATER METER INSTALLER	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
PLUMBERS & PIPEFITTERS LOCAL 51							
PLUMBERS & PIPEFITTERS LOCAL 51							
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Additional Apprentice Information

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

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

DOCUMENT A00801

SPECIAL PROVISIONS

Labor Participation goals for this project shall be 15.9% for minorities and 6.3% 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.

PROJECT DESCRIPTION

The Project Work Consists of the following:

1. Removal, replacement and relocation of two (2) existing culverts that contain extensions which have collapsed; the existing 24-inch x 48-inch stone box with a 42-inch corrugated metal pipe (CMP) extension at MP 44.27 and the existing 24-inch x 36-inch stone box with a 24-inch reinforced concrete pipe (RCP) extension at MP 44.29. The Contractor will furnish and install 48" RCP Class V culverts with precast concrete wingwalls and appurtenances at both locations in Rochester, MA.

2. Furnishing and installing approximately 1,200 feet of anchored steel sheet pile retaining wall, to access the culverts, which will extend from the MBTA's Rochester Facility railroad north to the culvert sites. In addition to providing access, this wall will also be anchored to meet railroad loading requirements for a future third track from Rochester to the SEMASS Recycling Facility yard.

3. Retirement of two cattle passes located on the Cape Main south of the Cape Cod Canal at MP 68.00 and MP 71.66. Both cattle passes have "rail top" roofs with headwalls which have been hit and dislodged by passing track equipment. At both locations, once the track and rail top roofs have been removed, the Contractor will clear the bottom of the cattle pass and install an 18" RCP Class V pipe between the remaining stone side walls. This will be followed by backfilling and compaction of the backfill material up to track level. The existing track will then be re-installed, ballasted, surfaced and returned to service.

The Cape Main Line is owned by the Commonwealth of Massachusetts Department of Transportation Rail and Transit Division (MassDOT or Owner) and is inspected, operated and maintained by Massachusetts Coastal Railroad, LLC (MCRR or Railroad) under contract. The Cape Main Line runs the length of Cape Cod and currently operates at speeds varying from FRA Class 3 (30 mph Freight – 55 mph Passenger) from Bay (MP 363) to Buttermilk (MP 53.7) and FRA Class 2 (25 mph Freight - 30 mph Passenger) from Canal Junction (MP 54.90) to Port (MP 78.0)

For the Culvert Replacements at MP 44.27 and MP 44.29

This work includes, but is not limited to: installation and removal of any Contractor required temporary shoring and excavation support; installation of erosion control system; construction of cofferdams and temporary work area dewatering system;; removal and stockpiling of existing track (for re-installation); excavating/stockpiling and disposal of excavated material along railroad right-of-way; filling in and/or removal and disposal of existing culvert once the new culverts are installed and active; placement/preparing crushed stone base; design, furnishing and installation of new RCP Class V culverts, installation of precast concrete headwalls and wingwalls; backfill and compaction of culverts; excavating and grading of the Permit required mitigation areas, grading; preparation of subgrade and ballast once new culverts are installed; re-installing previously removed track; ballast and tamping; re-welding and destressing of rail and clean-up of materials, and clean-up of the site.

For the Installation of the 1200 feet of Anchored Sheet Pile Retaining Wall

This work includes, but is not limited to: the removal of remaining small trees, brush, and debris along the wall line within the confines of the Environmental Permits; grading as necessary to establish the wall line; installation of varying lengths of sheet pile along the edge of the MassDOT Rail RR ROW; installation of anchor piles between the siding track and new wall; installation of the anchors and whalers between the anchor piles and outer face of the sheet pile wall; backfill and compaction of subgrade material behind the wall; installation of compacted layers of both sub-ballast and ballast in preparation for the future third track; cleanup of the site.

For the Retirement of the Cattle Passes at MP 68.00 and MP 71.66

This work includes, but is not limited to: removal and stockpiling of the existing track and ballast; removal and salvage of the steel railroad rail "rail top" roofs; removal of wall stone as necessary to restore 12" of ballast below the bottom of tie; cleaning out of the passages between the existing side walls which are to remain; installation of 18" RCP Class V Pipes wrapped at the joints with geotextile fabric; backfilling and compaction of processed gravel around the pipes; backfill and compaction of the remaining passage between the existing side walls to the bottom of ballast; restoration of 12 inches of ballast below the tie; re-installation of the existing track; ballast and tamping to restore the track geometry to its pre-existing condition; cleanup of the site.

Because the installation of the anchored sheet pile wall is necessary to provide the access to replace the culverts at MP 44.27 and MP 44.29, the work sequence includes, but is not limited to:

1. Perform pre-construction survey.
2. Furnish, install and maintain erosion control measures and maintain water resource shorelines.
3. Furnish, install and maintain cofferdams and temporary dewatering system.
4. Furnish and install new steel sheet pile retaining wall.
5. Remove and stockpile existing track for re-installation.
6. Excavate, stockpile for reinstall and/or dispose of excavated track bed and subgrade material along railroad right-of-way at a designated location as identified in the field during excavation by the MassDOT or MCRR Inspector.
7. Furnish and install compacted crushed stone bedding course on undisturbed substrate for culverts.
8. Furnish and install new 48" RCP Class V culverts, with precast concrete headwalls and wingwalls at MP 44.27 and MP 44.29.
9. Backfill and compact soil above new culverts.
10. Once flow is established in the new culverts, for each existing culvert, remove stone box roof and backfill culvert opening with compacted reused stockpile fill. Remove and dispose of pipe extension.
11. Backfill and fine grade embankments.
12. Furnish, install and compact track subgrade and ballast.
13. Reinstall track previously removed.
14. Ballast, surface, line and tamp the existing and reconstructed track. Re-welding of rails for mainline track.
15. Restore disturbed shoreline areas to match pre-disturbed conditions.
16. Furnish, install and compact rip rap stone pads at new culvert ends and stone revetment protection during low tide conditions only along the embankment toe of slope to limits as shown in the plans
17. Remove cofferdams, temporary dewatering system, and erosion control measures.

18. Furnish and install new steel anchor piles and threaded steel tie rods for the sheet pile retaining wall.
19. Restore and clean up materials from railroad right-of-way and any access areas disturbed during construction activities.
20. Perform as-built survey.

Contractor shall coordinate work windows and train moves with MassDOT and MCRR directly.

Contractor shall submit a Construction Schedule, Water Control/Management Plan, and Sequencing Plan to Owner and Railroad for review and approval before commencing work.

SCOPE OF WORK

The project includes, but is not limited to, the following work items:

The Scope of Work for this Project is to remove and replace two (2) existing railroad culverts located at Mile Post 44.27 and Mile Post 44.29 on the Cape Main Line in Rochester, MA, install a sheet pile retaining wall with anchor piles and tie-backs to provide access for construction of the culverts, and the retirement of two cattle passes at MP 68.00 and MP 71.66. This list has been compiled to provide Contractor with an order of magnitude work scope and to attempt to describe the complexity of the work required. Contractor is advised that it is the sole responsibility of Contractor to perform all the work in conformance with the Contract Documents and to satisfactorily complete the work on time and to the standards of MassDOT (Owner) and pursuant to the direction of MCRR (Railroad).

Environmental

A. Contractor will be responsible for any, and all, permitting conditions and/or requirements stipulated in the MassDEP Order of Conditions for MP 44.27 and MP 44.29 (MassDEP File #: 25-WW11-0001-APP and 25-WW11-0004-APP issued by the Massachusetts Department of Environmental Protection. The Section 401 Water Quality Certificates are included in the appendices of these Contract Specifications. The Section 401 Water Quality Certification expires on April 3, 2030 for MP 44.27 and April 23, 2030 for MP 44.29. All costs associated with meeting the conditions and/or requirements of the environmental permits shall be considered incidental to the overall Project. These costs shall be the responsibility of Contractor. There are no environmental permits required for the cattle pass retirements at MP 68.00 and MP 71.66.

B. Contractor will be responsible for any, and all, permitting conditions and/or requirements stipulated upon issuance of the Section 401 Water Quality Certificate by the Massachusetts Department of Environmental Protection and the Section 404 Self-Verification by the Department of the Army, US Army Corps of Engineers, New England District. Notice shall be provided of the work to occur to the local Conservation Commission for the cattle pass retirements at MP 68.00 and MP 71.66.

C. Contractor shall obtain the services of a qualified Society of Wetland Scientist Professional Wetland Scientist (PWS). All water resource protection work shall be observed and supervised by the PWS. The PWS shall be on site as necessary to verify water resource protection efforts; coffer dam installation and removal; temporary dewatering method installation and removal; erosion control installation and removal; and shoreline restoration

work meets the requirements of the Contract Documents and in accordance with the conditions of the permits. Contractor shall comply with all recommendations of the PWS.

Pre-Construction Survey

A. At all three work sites, the Contractor is responsible for performing a pre-construction site survey, to be reviewed and approved by the Engineer, to determine horizontal and vertical alignment of the existing track structure at the location of the culvert or cattle pass to be removed and at the locations of the new culverts and pipes to be installed. The survey must include existing track alignment and profile; limits of culverts and pipes, with existing invert elevations, sheet pile retaining wall, and cattle passes; and verification of dimensions and material types. The survey shall include topo, including pipe invert elevations at ends of the culverts and cattle passes, of the existing track features within the work limits, and wetland flag locations. Contractor shall submit to the Engineer a survey plan and CAD files for review and approval by the Railroad and Owner.

B. Contractor shall coordinate with MCRR to schedule the necessary ROW access for the pre-construction survey.

Furnish and Install Anchored Steel Sheet Pile Retaining Wall

A. Contractor is responsible for any, and all, permitting conditions and/or requirements stipulated within the project environmental permit.

B. Prior to the start of work, Contractor shall furnish and install all erosion and sedimentation control devices in accordance with the Contract Plans, Scope of Work, Technical Specifications, Special Conditions and all Federal and State DEP Regulations.

C. The limits of the anchored steel sheet pile retaining wall are shown on the Contract Plans. All work associated with the anchored steel sheet pile retaining wall shall be in accordance with the Contract Plans, Scope of Work, Technical Specifications, MassDOT Standard Specifications and Special Conditions.

D. Contractor shall produce shop drawings and a detailed work plan for the installation of the anchored steel sheet pile retaining wall for review and approval by the Engineer.

Furnish and Install Erosion Control, Dewatering and Cofferdams for Installation of the New Culverts

A. Contractor is responsible for any, and all, permitting conditions and/or requirements stipulated within the project environmental permit.

B. Contractor shall submit a detailed plan of dewatering and erosion/sedimentation controls to the Railroad/Owner's Engineer for approval prior to the start of any work. Although there are no permits required, erosion controls are to be installed at the two cattle passes.

C. Prior to the start of work, Contractor shall furnish and install all erosion and sedimentation control devices in accordance with the Contract Plans, Scope of Work, Technical Specifications, Special Conditions and all Federal and State DEP Regulations.

D. Contractor shall install cofferdams in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions on the inlet and outlet ends of the proposed new culverts at MP 44.27 and MP 44.29.

E. The temporary pump dewatering systems shall be designed and installed to accommodate installation of the new culverts inside the cofferdams as shown in the Plans.

Existing Turnout and Track (Jointed & CWR) Removal, Dismantling and Storage

A. Contractor shall coordinate with MCRR for access to the site and Railroad Right-of-Way necessary for the track(s) outage.

B. Contractor shall cut rail, remove, store a segment of the existing rails, ties, switch and other track materials as needed to facilitate the installation of the two (2) new culverts in accordance with the Contract Plans, Scope of Work, Technical Specifications, Special Conditions and environmental permits. At the Cattle Passes, Contractor will re-stagger the joints so that an even amount of rail and ties can be removed by panel or in pieces.

C. Contractor shall be responsible for layout of proposed field cut locations in anticipation of the rail destressing process. Contractor shall consider all potential limiting factors when determining rail expansion cut locations including, but not limited to; grade crossings, bridges, special track work, curves, manageable rail lengths, ambient temperatures and all other possible factors. Contractor shall not destress any length of rail greater than 1200 feet at any one time. Contractor shall coordinate with MassDOT/MCRR Engineering for proposed rail cut locations.

D. There is jointed not welded rail in the siding at the MP 44.27 and MP 44.29 Culverts and at the Cattle Passes so no destressing will be required for these sections of track.

Excavation and Stockpile of the Existing Trackbed and Subgrade Material for the Installation of the New Culverts at MP 44.27 and MP 44.29 and the Cattle Pass Retirements at MP 68.00 and MP 71.66

A. The limits of excavation for culvert replacements and cattle pass retirements are shown on the Contract Plans. Excavation within the limits of disturbance shown in plan shall be accomplished in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions and stockpiled separately from other excavated materials.

B. Provided it is re-usable material, the excavated track bed material is to be reused and any excess material will be disposed of along the Railroad Right-of-Way within five (5) miles of the work site at a location(s) designated by the Engineer.

Furnish and Install New Class V Reinforced Concrete Pipe (RCP) at the Culverts at MP 44.27 and MP 44.29 and at the Cattle Passes at MP 68.00 and MP 71.66 and Precast Concrete Headwalls and Wingwalls at MP 44.27 and MP 44.29

A. Contractor shall produce and submit design shop drawings, product submittals, work plans and erection/demolition plans required for the new culvert installation for review and approval.

B. Contractor shall prepare crushed stone pipe bedding in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions.

C. Contractor shall furnish and install headwalls, wingwalls, footings and culvert pipe in fabric in accordance with the Contract Plans, Scope of Work, Technical Specifications and Special Conditions.

D. Contractor shall backfill areas within the limits of work with materials and compaction in accordance with the Contract Plans and Technical Specifications.

E. Contractor shall place required substrate material inside of the pipes in accordance with the Contract Plans and Technical Specifications.

Furnish, Install and Compact in Place the Rip Rap Stone Pads at Culvert Ends, Remove Cofferdams and Slope Restoration at both the Culverts and Cattle Passes

F. Contractor shall install the rip rap stone pads at the new pipe ends within the limits of work with materials and compaction in accordance with the Contract Plans and Technical Specifications.

G. Contractor shall restore the embankment slopes, per Contract Documents to the limits indicated on the Contract Plans and as directed by the Engineer and per acceptance of the on-site Professional Wetland Scientist.

H. Contractor shall remove cofferdams and dewatering system equipment after the new culvert(s) have been inspected and accepted by MCRR/MassDOT. The new culverts will then be opened to flow.

I. Contractor shall complete excavation and grading of the permit required mitigation areas and restore the remaining disturbed embankment edges per contract documents to the limits as indicated on the drawings.

Retire, Backfill and Compact Existing Culverts at MP 44.27 and MP 44.29 and Cattle Passes at MP 68.00 and MP 71.66

A. The retiring/demolishing of the existing culverts shall only occur after the new culverts are installed and active, and after the approval of the Engineer. Contractor shall excavate, remove and properly dispose of the pipe extension (CMP or RCP) adjacent to the existing stone box culverts including within the wetland limits.

B. For both existing stone box culverts, the Contractor shall excavate to the top of the roof, remove the roof and then the channel is to be backfilled with reused stockpile fill and compacted. Contractor shall then grade, compact and prepare the subbase soil layer for installation of the sub-ballast and ballast bedding in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions.

C. Contractor shall salvage the removed granite masonry blocks of the existing culvert roofs at the discretion of MassDOT/MCRR. The delivery site shall be within 5 miles of the project site.

Installation of Compacted Sub-ballast and Ballast at all Locations

A. The excavated subgrade area for the replaced track ballast shall be thoroughly compacted per the Technical Specifications before installation of the sub-ballast and ballast section (Cattle Passes do not require a sub-ballast layer).

B. A minimum depth of eight-inches (8") of new sub-ballast material shall be installed and thoroughly compacted smooth, flat and uniform in a maximum of four-inch (4") lifts with an approved vibratory compactor within the areas shown on the Contract Plans.

C. A minimum depth of eight (8) to twelve (12) inches of new compacted bottom ballast shall be placed, graded and compacted throughout the excavated areas in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions.

Reinstall Track and Turnout and Surface & Align

A. Contractor shall reinstall the ties, rails and turnout within the limits of work in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions.

B. Track is to be flooded with ballast then raised, surfaced and aligned to finish top of rail elevation in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions.

C. All ballast shall be properly regulated even with the top of ties and broomed so that no ballast remains on the top of the ties, base of rail and plates. Shoulders are to be graded in accordance with the Contract Plans, Scope of Work, Technical Specifications, and Special Conditions.

D. Contractor shall be responsible for the supplying and dumping of all sub-ballast and ballast for the project

Destressing of Disturbed Continuous Welded Rail (CWR) Track (Cattle Passes are jointed rail and do not require destressing)

A. Contractor shall be responsible for destressing the reinstalled welded mainline rail to achieve a neutral rail temperature between 105°F (-5°F/+10°F) per the MassDOT Rail / MCRR CWR Policy.

B. Contractor shall be responsible for all aspects of the rail destressing process including, but not limited to: thermal expansion calculations, rail cutting and removal, removal or popping of spikes as necessary, plugging spike holes, marking and recording quarter points and rail temperatures, record keeping of rail heat reports, thermal expansion of rail, furnishing and installing temporary 6-hole joint bars, removal and re-installation of rail anchors, furnishing and installing new rail holding spikes as necessary and welding of all joints.

C. Contractor shall utilize a railbound vibrating rail heating unit specifically designed for thermal destressing of rail, Teleweld Series I Rail Heater and Vibrator Car or approved equal.

D. Contractor shall be responsible for loading and unloading of any removed OTM designated for scrap for disposal. All OTM designated by MCRR or MassDOT as scrap is to be picked up, transported and loaded into the scrap dumpsters that will be designated by MCRR for disposal by the railroad.

E. Contractor is responsible for the disposal of all defective crossties and switch timbers. Defective crossties and switch timbers shall be taken to a MassDEP approved disposal site and be disposed of in accordance with EPA requirements.

F. Contractor shall be responsible for all ballast cribbing work required to remove and replace the existing rail anchors for the purpose of rail destressing. The Contractor shall be responsible for returning any disturbed ballast section to pre-construction conditions.

G. All rail destressing work shall be in accordance with this Scope of Work, Technical Specifications, Special Conditions, MassDOT MW-1, MCRR CWR Policy, and AREMA Recommended Practices.

H. Contractor to complete all welding and destressing reports per MassDOT MW-1 / MCRR CWR Policy requirements.

Wetland Mitigation Replication

A. Furnishing and installing wetland mitigation area and plantings in accordance with the Contract Plans, Scope of Work, Technical Specifications, Special Conditions and AREMA Standards.

Removal of Erosion Control Measures

A. Contractor shall remove all erosion control measures at the direction of and following final inspection and acceptance of the completed project by the Engineer and the Professional Wetland Scientist.

As-Built Condition Survey

A. Contractor shall perform an as-built condition site survey, to be reviewed and approved by Engineer, to determine final horizontal and vertical alignment of the track structure at the locations of both the newly installed and the nearby existing culverts, cattle passes, and new retaining wall. The survey must include: existing track alignment and profile; limits of

wingwalls, show both the existing and new culverts, with invert elevations. The as-built survey shall include topo, including contour elevations from the edges of the track and throughout the limits of the rework area within the work limits, and the limits of restored shoreline edges. Contractor shall submit to the Engineer a survey plan and CAD files for review and approval by the Railroad and Owner.

B. The survey data shall be obtained by Global Positioning Survey (GPS) and certified by a Professional Land Surveyor registered in Massachusetts.

C. A complete digital base plan shall be provided in AutoCAD, properly referenced to the coordinate system established in the contract. The following standards shall be applicable:

Required Equipment for the Project

A. Contractor will be required to utilize, at a minimum, the following pieces of specialized equipment (with qualified operators) to properly complete this project.

- (1) - Hi-Rail Excavator/Gradall
- (1) to (2) - Hi-Rail Dump Trucks
- (1) – Hi-Rail Grapple Truck
- (1) – Production Tamper (Mark IV or approved equivalent)
- (1) – Ballast Regulator w/ Broom
- (1) – Teleweld Series I Rail Heater with Rail Vibrator
- (1) – Rail Puller

B. In addition, at least one qualified mechanic properly outfitted with fluids, parts, tools and emergency spill kits will be on site at all times during construction.

- One (1) qualified mechanic properly outfitted with a mechanic's truck with fluids, parts and tools will be on site at all times when the Production Tamper is in service.

Survey Crew in the event that the Production Tamper's computer geometry system is not able to align and surface the track per the Contract Plans and Specifications.

1. MATERIALS FURNISHED BY MASSDOT(OWNER)

A. Any Needed 115RE or 107NH Rail
B. Any Needed Ties and Switch Timber
C. Tie Plates & Spikes & Anchors Any Needed Joint Bars, Tie Plates, and Anchors

2. MATERIALS FURNISHED BY CONTRACTOR

A. Liquid Plugging Compound

Contractor shall furnish and install all liquid plugging compound necessary for filling spike holes prior to re-spiking tie plates during crosstie and switch timber replacement and re- gaging of track. Contactor shall submit the type of plugging compound to Owner and Railroad for approval prior to use of the compound. The plugging compound shall have characteristics equivalent to, or greater than that of, the Willamette Valley Company SPIKEFAST® ES-50 RM formula. It is Contractor's responsibility to ensure that the plugging compound is being applied in a manner that is consistent with the manufacturer's instructions. Contractor shall be responsible for all loading, unloading, handling and safeguarding of the material prior to installation. Spike holes shall be filled in completely

with the approved plugging compound in accordance with the provisions of the Contract Drawings, Special Provisions, MassDOT MW-1, and AREMA Recommended Practices. Installation of the liquid plugging compound for all work in this contract shall be incidental to installation of crossties.

B. Ballast

Contractor shall furnish, distribute, and install stone track ballast required for Turnout install, and Turnout Rehab for this project. Ballast shall meet the requirements of AREMA No. 4, maximum size 1-1/2", durable, full-face fractured granite rock in accordance with AREMA Manual for Railway Engineering, Volume 1, Chapter 1, Part 2. Contractor shall provide ballast from quarries pre-approved by MassDOT. Contractor shall be responsible for all loading, unloading, handling and safeguarding of the material prior to installation. Ballast for all work in this contract shall be installed in accordance with the provisions of the Contract Drawings, Special Provisions, MassDOT MW-1, and AREMA Recommended Practices contained in Volume 1, Chapter 5 of the AREMA Manual for Railway Engineering.

C. Spikes and Bolt Assemblies (bolt, washer, nut)

D. Rejection of Unsuitable Contractor-Furnished Materials

All materials furnished by Contractor found defective shall be recovered by Contractor and removed from the project site at no additional cost to Owner or Railroad.

CONTRACTOR WILL BE RESPONSIBLE FOR THE REMOVAL OF ALL TRASH, TRACKWORK PACKAGING MATERIALS, CONSTRUCTION DEBRIS AND ALL OTHER PROJECT-RELATED EQUIPMENT AND SUPPLIES FROM THE RIGHT-OF-WAY AND ADJACENT AREAS AT THE END OF EACH SHIFT AND UPON COMPLETION OF THE PROJECT WORK.

Track construction shall consist of all work necessary to complete the task, including but not limited to, subgrade preparation, spot ditching, installation of subballast and ballast, and track surfacing and aligning.

A full-time dedicated Safety Supervisor and a full-time dedicated Quality Supervisor are required to be on site during all work under this contract. See Special Provision Items for qualifications required of these personnel.

The Contractor shall also provide temporary protection of work and property during the Contract period. This includes existing mainlines, sidings, yard tracks, culverts, bridges, grade crossings, access paths, utility easements, and private crossings. Railroad equipment within the work area, including existing ties, rails, switches, and OTM inside and outside the reconstruction limits shall also be protected. After the work is properly completed, Contractor shall be responsible for protecting work and for repairing, replacing, and cleaning of damaged work, so that all work is complete at the time of acceptance of the work. Contractor to remove all temporary protection and coverings at the completion of the Work.

The Contractor shall provide, maintain, and operate all required types and quantities of equipment required for the Work. A qualified mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

The work to be done under this Contract consists of furnishing all required labor, materials, tools, equipment, and services as indicated in accordance with the provisions of the Contract Documents. The RAILROAD is responsible for providing railroad services such as an Employee-in-Charge (EIC), flagging or signal support. These Specifications describe requirements for construction and for the procurement of materials to be used in the subject project.

The Contractor is responsible for completing all track work necessary to perform the work.

All work under this Contract shall be done in conformance with the 2025 Standard Specifications for Highways and Bridges, the Supplemental Specifications contained in this book, the Construction Standard Details in effect as of June, 2025, the MassDOT Rail MW-1, the MBTA Commuter Rail Track Standards, the MCRR CWR Policy, and the AREMA Manual of Railway Engineering.

DESIGNER/PROJECT MANAGER

DESIGNER
Nikole Bulger, P.E.
WSP
100 Summer St, 13th Floor
Boston, MA 02110
Tel No. (781)707-7441
nikole.bulger@wsp.com

PROJECT MANAGER
Kevin McGrath
MassDOT Rail and Transit Division
10 Park Plaza, Suite 3720A
Boston, MA 02110
Tel No. (617) 620-5734
kevin.mcgrath@dot.state.ma.us

SUBSECTION 1.03 - DEFINED TERMS

- The definition of "Engineer" is deleted and replaced with the following definition: "Engineer/Chief Engineer: The MassDOT Rail & Transit Division, acting directly or through an authorized representative, such representative acting within the scope of the particular duties entrusted to them."
- The following definition of "Owner" is added: "Owner: The Massachusetts Department of Transportation ("MassDOT") Rail and Transit Division, acting through its authorized representative, such representative acting within the scope of the particular duties entrusted to them."

SUBSECTION 2.01 – PROPOSAL FORMS AND PLANS

Amend Subsection 2.01.A of the Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following:

A. PREQAULIFICATION TO BID.

All prospective Bidders who intend to bid on this project must provide the following required pre-qualification information to Kevin McGrath at the MassDOT Rail and Transit Division by email at kevin.mcgrath@dot.state.ma.us and Nikole Bulger at WSP nikole.bulger@wsp.com before 5:00 P. M. seven (7) days prior to the bid opening date.

1. MBTA Prequalification. Bidders must be prequalified in MBTA Class 1 – General Transit Construction (>3,000,000 for Maximum Single Project Rating) **and** in MBTA Class 3 – Trackwork (>$3,000,000 for Maximum Single Project Rating) to bid on the above project. An award will not be made to a Contractor who is not pre-qualified by the MBTA prior to the opening of Proposals.

Go to the MBTA website below to find MBTA Prequalification Procedures.
https://bc.mbta.com/uploadedfiles/Business_Center/Bidding_and_Solicitations/Design_and_Construction/Contractor%20Prequalification%20Application%202022.pdf

Bidders must submit MBTA-issued certificates showing that they are prequalified in the required classes of work for the project.

2. MassDOT Rail & Transit Prequalification. Bidders must be prequalified in the following classes of work: General Rail Construction on or Around Active Rail Lines, and Track Work.

A. Bidders, as the prime contractors, must have satisfactorily performed in the field, managed and completed within the last five (5) years, as determined by MassDOT, three (3) projects, each with a project value of at least $10,000,000 with the following scope of work: track construction, culvert improvement work, and retaining wall work.

Bidders must submit the following:

1. Documentation describing the above-described required project experience.
2. Names of the skilled labor and supervisors that will perform the project track improvement work.
3. Resumes of key project personnel.
4. Number of staff and crews employed by the bidder who will work on the project.
5. A reference for each project, which includes the following information: name, title and affiliation of the reference; address of the reference; phone number and email address of the reference.

B. MASSDOT RAIL & TRANSIT DIVISION PREQUALIFICATION CLASSES OF WORK

General Rail Construction on or Around Active Rail Lines

Heavy rail line construction projects including the following work: site preparation, excavation backfill, support of excavation, grading, storm drainage, utilities, sewage and water systems, gravel base courses, bituminous and cement pavements, retaining walls, steel reinforced concrete structures, precast concrete structures, steel structures, timber structures, landscaping, access roadways, fencing, signing and incidental site work. This Class of work is intended to only include the Contractor's ability to work on or around active facilities without causing disruption. In preparing the Contractor's bid proposal the Contractor must exhibit, on previously completed projects that the scope of work for the project required the contractor to perform or manage work on or around active rapid transit, light rail, commuter rail and/or freight tracks without causing disruption to service.

Track Work

Projects consisting of the rehabilitation of, or new construction of trackwork for a railroad. Work includes the placement of track support structure, ballast, wood or concrete ties, direct fixation, rail fastening, switches and turnouts, rail welding placement, tamping, CWR installation, alignment, maintenance and testing, and track drainage and culvert work.

SUBSECTION 2.01.B. ISSUANCE OF PROPOSAL FORMS AND PLANS

Subsection 2.01.B Issuance of Proposal Forms and Plans in the Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following:

"Modifications to any proposal documents will be made through the addendum process and posted on www.commbuys.com."

SUBSECTION 2.04 – PREPARATION OF PROPOSALS

Subsection 2.04 Preparation of Proposals in the Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following: Electronic proposals for the following project will be received through the internet using on www.commbuys.com("COMMBUYS") until the date and time stated below. Bid documents will be posted on www.commbuys.com forthwith after the bid submission deadline. No paper copies of bids will be accepted.

All bidders must be registered with COMMBUYS in order to bid on this project. If Bidders are not currently registered with COMMBUYS, it is recommended that they register with COMMBUYS at least seven-days

prior to the scheduled bid opening date. To register, go to www.commbuys.com and click on the "Register" link on the home or landing page.

A. At the designated time of the bid opening the MassDOT will accept, as the official bid, the set of proposal forms submitted by the bidder which includes the documents identified in Document B00420 PROPOSAL.

B. MassDOT will not be responsible for any communications or hardware breakdowns, transmission interruptions, delays, or any other problems that interfere with the receipt or withdrawal of proposals as required above either at the Bidder's transmitting location, at www.commbuys.com, or anywhere between these locations will not be considered grounds for a bid protest. MassDOT will not be held responsible if the bidder cannot complete and submit a bid due to failure or incomplete delivery of the files submitted via the Internet.

C. CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Contractor questions concerning the Bid Package are due by 4:00 PM Friday February 6, 2026. Contractor questions must be submitted through Contractor portal on COMMBUYS www.commbuys.com for the project. Any questions received after this time will not be considered for review by MassDOT. MassDOT and Owner's consultants will provide answers to questions by 4:00 PM Tuesday February 10, 2026. Any Amendments to the Drawings will be provided by 4:00 pm on Thursday February 12, 2026

Contractors shall also email addendum acknowledgements through Contractor portal on COMMBUYS www.commbuys.com for the project.

D. PREBID CONFERENCE

A Prebid Conference will be held on project site see Section E.

E. PREBID SITEWALK

A Pre-Bid Meeting/Pre-Bid Site Walk will be held at 10:00 A.M. on Wednesday January 28, 2026 at the Sandwich, MA Station Parking Lot. Prospective bidders shall bring with them all personal protective equipment which must be worn to access the project site.

F. PROPOSAL REQUIREMENTS

1. To be approved for bidding, prospective bidders must submit the prequalification documents outlined in SUBSECTION 2.01 PROPOSAL FORMS AND PLANS
2. The completed and signed documents identified and inserted in Document B00420 PROPOSAL must be included in the bid proposal submittal.

SUBSECTION 2.08: PUBLIC OPENING OF PROPOSALS.

Subsection 2.08 of the Massachusetts Department of Transportation Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following:

The total price of each compliant proposal submitted by the deadline indicated in the Notice to Contractors will be posted on COMMBUYS forthwith after the bid submission deadline. Bids may be examined at MassDOT after the bid submission deadline and posting of the results on COMMBUYS.

SUBSECTION 2.09 – REJECTION OF PROPOSALS

Modify Subsection 2.09 as follows: In the third paragraph, the following text is deleted: "In accordance with 700 CMR 14."

SUBSECTION 3.02 - AWARD OF CONTRACT

Modify Subsection 3.02 as follows: In the fourth paragraph, the following text is deleted: ", and is otherwise in compliance with 700 CMR 14.00 *Prequalification of contractors and subcontractors*."

SUBSECTION 3.05 – EXECUTION OF CONTRACT

Modify Subsection 3.05 as follows: The first paragraph is deleted and replaced with the following paragraph: "Forms to be submitted by the successful bidder are in Contract Document B00421. The successful Bidder shall execute and deliver the contract and furnish the required forms and surety to the Department within 3 days after the date of the notice of award."

SECTION 4.00: SCOPE OF WORK

SUBSECTION 4.10 – FINAL CLEANING UP

Amend Subsection 4.10 of the Standard Specifications by adding the following:

DISPOSAL OF EXCESS MATERIAL

Surplus materials obtained from any type of excavation, and all existing and other materials not required to be removed and stacked or stockpiled, or otherwise needed for use on the project, as identified in these Special Provisions or determined by the Engineer, shall become the property of the Contractor and disposed of subject to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

REMOVING AND STACKING OF MATERIALS

Contractor is responsible for obtaining their own yard for storage of all existing and other materials required to be removed and stacked. No separate payment will be made for this work, but all costs in connection there with shall be included in the prices bid for various Contract 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.

SUBSECTION 5.02 – PLANS AND DETAIL DRAWINGS

Modify Subsection 5.02 as follows: Delete "The Engineer shall make all copies of approved shop drawings as indicated in Table 5.02-1" in Paragraph 8 and Table 5.02-1.

SUBSECTION 5.04 – ORDER OF PRECEDENCE

In the first paragraph of Subsection 5.04, the order of precedence of various contract documents is deleted and replaced with the following text:

1. Contract Amendments (e.g., Extra Work Orders and Time Extensions)
2. Contract (in the following order)
   A. Addenda, including bid questions and responses
   B. Special Provisions, Detail Sheets and Permits
   C. Plans
   D. Contract Documents
   E. AREMA
   F. Attach MassDOT MW-1
   G. MBTA Commuter Rail Standards
   H. Supplemental Specifications to the Highway Division Standard Specifications for Highways and Bridges
   I. Highway Division Standard Specifications for Highways and Bridges

SUBSECTION 6.03 – DELIVERY AND STORAGE OF MATERIALS

Subsection 6.03 must be amended as follows:

The fourth paragraph is deleted and replaced with the following paragraph: "The Contractor may opt to obtain storage outside of the project limits if required. No areas shall be used for storage outside the project limits within the Right-Of-Way layout without written permission of the Engineer. No additional compensation shall be given for the design, construction, preparation, or restoration of the storage site(s) which may include but is not limited to a Traffic Management Plan (TMP), utilities, and lighting."

SECTION 7.00: LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

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.

SUBSECTION 7.02: POLLUTION PREVENTAGE

Amend Subsection 7.02.II of the Standard Specifications by adding the following:

G. EROSION AND SEDIMENT CONTROL

The Engineer has the authority to limit the surface areas of erodible earth material exposed by excavation, borrow and fill, or any such operations, and to direct the Contractor to provide immediate, permanent, or temporary control measures to prevent contamination of any adjacent bodies of water or drainage systems. Such measures will involve the installation of compost filter tubes, staked hay bales, sedimentation basins,

silt fences or other control devices or methods as necessary to control erosion and sedimentation.

The erosion and sediment control features installed by the Contractor shall be satisfactorily maintained by the Contractor until acceptance of work under this Contract.
In the event of conflict between these Specifications and Laws, Rules, or Regulations of local agencies, the more restrictive requirements shall apply.

If temporary erosion and sediment control measures are required due to the Contractor's negligence or carelessness, the control measures shall be performed by the Contractor at his/her own expense. Construction of temporary erosion and sediment control measures, which are not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls, will be performed as shown on the Plans and/or as ordered by the Engineer.

Repeated failures by the Contractor to control erosion, pollution, and/or siltation, shall be cause for the Engineer to employ outside assistance or to use his/her own forces to provide the necessary corrective measures. The cost of such assistance plus project engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.

Payment for temporary soil erosion and sedimentation control work will be included under the various items in this Contract.

SUBSECTION 7.04: MOTOR VEHICLES

SUBSECTION 7.04 is supplemented with the following section:
TRUCK SAFETY DEVICES

All motor vehicles subject to Section 7 of Chapter 90 to be operated under this Contract shall be equipped with safety devices as provided therein and in 540 CMR 4.00.

All Hi-Rail Trucks and Equipment must meet FRA Part 214 Subpart D – On Track Roadway Maintenance Machines and Hi-Rail Vehicles.

Before contractor vehicles and equipment come on to MassDOT Rail property to perform work, the Contractor shall certify to the Registry of Motor Vehicles, in a manner prescribed by the Registrar, that all applicable vehicles are equipped with Lateral Protective Devices, Convex Mirrors, Cross Over Mirror(s) and Back Up Cameras in accordance with the requirements of 540 CMR 4.00.

The Contractor shall provide evidence satisfactory to the Department to demonstrate compliance with the above certification requirement for all applicable vehicles operated under this Contract by the Contractor and its subcontractors and vendors in a manner set forth by the Department.
Thereafter, the Contractor shall have an affirmative obligation to continue to provide such evidence of compliance on an ongoing basis and no later than 7 days after certification with the Registry of Motor Vehicles of any additional vehicles operated under this Contract by the Contractor and its subcontractors and vendors.

Non-compliance with respect to a vehicle that is subject to 540 CMR 4.00 may subject the Contractor to statutory fines as established in M.G.L. c. 90, § 7 and/or contractual remedies up to and including termination of the Contract.

SUBSECTION 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 the Massachusetts Coastal Railroad (MCRR or Railroad). shall be the named insureds.

Paragraph 3

Railroad Protective Liability Insurance and Protective Property Damage Liability Insurance.

Due to the nature of the project, Railroad Protective Insurance will be required for this project with a limit of not less than five Million Dollars ($5,000,000) per occurrence. Such insurance shall also contain an aggregate of not less than ten Million Dollars ($10,000,000) for damages arising out of more than one occurrence.

MassDOT and the Massachusetts Coastal Railroad (MCRR or Railroad). shall be the named insureds.

SUBSECTION 7.09 – PUBLIC SAFETY AND CONVENIENCE
Amend Subsection 7.09 of the Standard Specification by adding the following:

The Contractor shall protect all work areas from unauthorized access by methods acceptable to the Engineer.

The Contractor shall repair any damage to public or private property adjacent to the Project caused by the Contractor's operations and shall leave the property in a condition equal to or better than what it was in prior to commencement of the work.

SUBSECTION 7.14 – RESPONSIBILITY FOR DAMAGE CLAIMS

1. First paragraph: The first sentence must be edited by as follows: "The Contractor shall indemnify, defend, and save harmless the Commonwealth, the Department, **the Railroad (including Railroad's parent company, affiliates, and subsidiaries)**, the Municipality …."
2. Third paragraph: The following text is hereby stricken: "The Contractor's attention is directed to the provisions of General Laws, Chapter 30, Section 39H as amended. In accordance therewith,"

SUBSECTION 7.16.B – CONSTRUCTION CLAIMS COMMITTEE DETERMINATION (STEP 2)

A modified Subsection is as follows:
Subsections 7.16.B: Determination by Administrator (Step 2)

Within 14 Days after the receipt date of the Department's written decision denying a claim, the Contractor may file a request with the Chief Engineer for a hearing before **the Deputy Administrator of the Rail & Transit Division**. The Contractor shall also provide any additional information, at the Department's request, that the **Division's Deputy Administrator** determines is necessary for evaluation of the claim. The Contractor's claim information must be enhanced to include sufficient description and information to enable understanding by a third party who has no knowledge of the dispute or familiarity with the Project and this documentation must also include a description of the efforts undertaken to resolve the dispute. The Contractor shall present the claim to the **Deputy Administrator** at a meeting to be scheduled after the filing of the request. After the meeting, the Chief Engineer will provide to the Contractor a written determination of each claim made.

Subsection 7.16.C: Appeal to the Administrative Law Judge (Step 3)

The Subsection must be modified as follows:

1. Delete the first two paragraphs.
2. Modify the topic sentence of the third paragraph r. as follows: "At any time after the determination by the **Engineer**, the Contractor at its sole discretion may appeal the **Engineer's** determination to the Superior Court Department of the Commonwealth of Massachusetts in the County of Suffolk for further consideration."
3. Modify the last paragraph as follows: "The acceptance by the Contractor of the final payment made under the provisions of Subsection 9.05: Final Acceptance and Final Payment shall operate as and shall be a release to the Department and every member, agent and employee thereof, **as well as the Railroad**, from all claim and liability to the Contractor for anything done or furnished for, or relating to, the work, or for any act or neglect of the Department or of any person relating to or affecting the work, except the claim against the Department for the remainder, if any there be, of the amounts kept or retained as provided in Subsection 7.15: Claims Against Contractors for Payment of Labor, Materials and Other Purposes. For claims for extensions of time see Subsection 8.10: Determination and Extension of Contract Time for Completion (Time Extension).

SUBSECTION 7.20: NO WAIVER OF LEGAL RIGHTS

The third sentence must be modified as follows: "Neither the acceptance by the Department, or any representative of the Department, nor any payment for any acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the Department **or by the Railroad**, shall operate as a waiver of any portion of the Contract, or of any power herein reserved, or of any right to damages."

ACCESS MASSDOT INFORMATION ON WEBSITE

Access MassDOT information related to Construction, Design/Engineering, Contractor/Vendor Information, Approved Materials and Fabricators, Manuals, Publications and Forms at:

Massachusetts Department of Transportation | Mass.gov

PROTECTION OF UNDERGROUND FACILITIES

The Contractor's attention is directed to the necessity of making his own investigation in order to assure that no damage to existing structures, drainage lines, traffic signal conduits, etcetera, will occur.

The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. Contact the Dig Safe Call Center by 811 or 1-888-344-7233 or online at www.digsafe.com.

ENVIRONMENTAL

As a supplement to Section 7.00 of the Standard Specifications, the Contractor is reminded that no debris of any type shall be allowed to enter water or wetland resource areas, either temporarily or permanently.

Precautions for Protection of the Environment

During the execution of work under this Contract, the Contractor shall exercise care in the placement and storage of equipment, materials and debris as some areas of the site are in environmentally sensitive areas. No equipment, materials or debris can be placed or stored in or near a resource or drainage area leading to a resource as required by the Engineer. The Contractor shall neither stockpile material or equipment nor perform maintenance or refueling of equipment in a wetland area, within 100 feet of a wetland, or within 200 feet of a river, stream, pond or drainage area leading to a resource or other similar open body of water.

Oil and Hazardous Material Spill Prevention

Measures must be taken by the Contractor to prevent spills and leaks of oils and other hazardous materials to the environment. Such measures include but are not limited to properly maintaining construction equipment, establishing fuel and hazardous material handling areas that are designed to prevent releases to the environment (include containment structures if needed), instructing personnel in proper waste handling procedures and strictly prohibiting disposal into drains, water ways or receptacles, such as dumpsters, designed for non-hazardous waste. Spills or leaks of oil or hazardous materials must be reported to the DEP in accordance with the reportable quantities and criteria for "spills" as designed by the DEP in 310 CMR 40.370. Notification to the Engineer and to DEP must be made as soon as possible, but not more than two (2) hours after a spill or leak occurs. For various locations projects with work on or around existing steel or bearing areas.
Also, for designed projects involving full demolition, superstructure demolition, or superstructure demolition with modifications to the substructures.

WORK SCHEDULE & NOISE CONTROL

Use every effort and every means possible to minimize noises caused by construction operations, which the Engineer may consider as objectionable. Provide working machinery and equipment designed to operate with the least possible noise, and when gearing is used, such gearing shall be of a type designed to reduce noise to a minimum. Equip compressors with silencers on intake lines. Equip gas or oil operated equipment with silencers or mufflers on intake and exhaust lines.

The Contractor shall make all reasonable effort to minimize community disruption that might result from construction, including safety and security problems; the creation of noise, vibration, truck traffic on residential streets, traffic diversions, dust, storage and removal of materials; the choice of location of construction staging, the movement of construction equipment; provision of site cleanup; and hours of operation. Construction activities that may cause community disruption must be agreed upon in consultation with the Engineer prior to the start of construction.

Contractor shall be aware of the codes from the municipalities of Rochester and Barnstable, MA and shall comply with the codes, regulation of construction hours, and construction noise levels.

Municipalities through which MassCoastal Railroad operates have varying ordinances which control various activities such as work hours. While Railroad believes that the ICC Termination Act exempts railroad activities from local regulation, Railroad has adopted a “Good Neighbor Policy” and one element of that policy limits, to the extent consistent with efficiency and safety, early morning and late night operations.

Noise control is a part of Railroad’s “Good Neighbor Policy” and includes many of the activities discussed above. Noise from trackwork operations shall be controlled to the extent possible, including the sounding of horns and warning devices on railway maintenance and construction machinery. Nothing set forth in this Section shall relieve Contractors from full compliance with FRA and Commonwealth regulations regarding sounding of horns, whistles and/or bells at crossings and approaching and passing through work zones.

The Contractor shall give notice to the Engineer at least 48 hours in advance of beginning any work affecting the maintenance of traffic and shall not proceed with surfacing operations without specific notice to, and the approval of, the Engineer.

The Contractor shall coordinate with the Engineer and the municipalities of Rochester and Barnstable, MA to provide access and accommodation for these events. Work on a holiday or on the day before or after a long weekend which involves a holiday requires prior approval by the Engineer. Times will need to be submitted in advance for approval.

TRAIN OPERATIONS & RAILROAD COORDINATION (See MCRR Operations Schedule)

Coordination with Railroad
The Contractor shall review the weekday and weekend work windows and confirm with RAILROAD, for agreement and approval of the work windows. Changes to these work windows will require approval of all railroad entities. Any cost associated with additional outages or time shall be borne by the Contractor. The Contractor shall comply with the limits of work windows and shall clear the tracks and return the site to the Railroad before the specified work windows expire. The site and the track shall conform to FRA standards for safe operation of trains at the end of the work windows. The RAILROAD Chief Engineer, or representative thereof, shall be the sole judge of the condition of the site and tracks.

The Contractor must clearly identify all aspects of this work in the preparation of the Construction Schedule and throughout the contract duration. The Contractor is reminded that, in bidding this work, the Contractor is obligated to meet the Contract Milestones and Durations (Time) and is obligated to plan the successful completion of Work, prior to submitting the bid.

In submitting a bid price for this contract, the Contractor acknowledges that a detailed plan, has been developed to meet the Contract Time for all aspects of the Contact; including shift work; extended work hour requirements/restrictions; as well as the planning of all subcontractor and supplier operations.

Employee in Charge

No work will be permitted by the contractor without the RAILROAD EIC (Employee in Charge) being present. Each workday will begin with the required Job Briefing which will be given by the RAILROAD EIC.

Frequent and ongoing communication between the Contractor, the Engineer, and RAILROAD representatives is highly encouraged to enable efficient coordination of work activities and train service.

The Railroad determination of work schedules will take precedence over all other planning and scheduling efforts. The protection of trains, overall safe operations, and the protection of workmen and railroad personnel are paramount objectives in prosecuting the Work.

Preconstruction Meeting

Before proceeding with any Work, a preconstruction meeting shall be held at which time the Contractor shall submit for approval by the Engineer and review by the RAILROAD, the Contractor's proposed schedule of Work including the requirements for RAILROAD assistance (i.e., EICs, flagging support, signal support), including methods of protecting railroad traffic. However, such approval shall not serve in any way to relieve the Contractor of its complete responsibility for the adequacy and safety of its methods of protection of the railroad and railroad traffic.

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.

CONTRACTUAL MILESTONES AND DURATIONS:

Contractual Milestones:
This Contract contains the following Contractual Milestones 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 through the inclusion of a Finish

Milestone and hammock activities in the accepted baseline Contract Progress Schedule using the stated description.

MS#01 – Contractor Field Completion: The Contractor shall achieve Substantial Completion of the work by Friday May 22, 2026. Contractor Field Completion, which is defined as the completion of all physical contract work including the completion of the punch-list work, and the Contractor has fully demobilized from the field operations shall be complete by June 30, 2026.

SUBSECTION 8.03 PROSECUTION OF WORK

Amend Subsection 8.03 of the Standard Specifications by adding the following:

Prior to the start of any work, the Contractor shall submit the required Scheduling in accordance with Section 722 of these Special Provisions. In addition to Section 722, the Contractor shall comply with the following:

The Contractor shall meet with MassDOT to review their work plan on how they intend to approach the various work items including the number of crews they intend to utilize, and the level of railroad support that they anticipate will be needed.

The Contractor is responsible to restore areas used for site access to their previous condition, which costs shall be considered incidental to the various Contract pay items, unless specific restoration work items are shown on the Plans.

SCHEDULE OF OPERATIONS - SCHEDULE TYPE

The applicable schedule type for this project is Type C.

SUBSECTION 8.06 – LIMITATIONS OF OPERATIONS

Amend Subsection 8.06 of the Standard Specifications by adding the following:

The Contractor shall review the weekday and weekend work windows and confirm with MCRR, for agreement and approval of the work windows. Changes to these work windows will require approval of all railroad entities. Any cost associated with additional outages or time shall be borne by the Contractor. The Contractor shall comply with the limits of work windows and shall clear the tracks and return the site to The Railroad before the specified work windows expire. The site and the track shall conform to FRA standards for safe operation of trains at the end of the work windows. The MCRR Chief Engineer, or representative thereof, shall be the sole judge of the condition of the site and tracks.

The Contractor must clearly identify all aspects of this work in the preparation of the Construction Schedule and throughout the contract duration. The Contractor is reminded that, in bidding this work, the Contractor is obligated to meet the Contract Milestones and Durations (Time) and is obligated to plan the successful completion of Work, prior to submitting the bid.

In submitting a bid price for this contract, the Contractor acknowledges that a detailed plan, has been developed to meet the Contract Time for all aspects of the Contact; including shift work; extended work hour requirements/restrictions; as well as the planning of all subcontractor and supplier operations.

TRAFFIC CONTROL

Contractor to coordinate all requests for traffic control with MassDOT contact.

For any work that may impact traffic, the Contractor shall be responsible for the scheduling and coordination of the work with the MCRR, municipality, any affected abutters, and MassDOT. All traffic management arrangements shall be the responsibility of the Contractor including all advance notification that may be required and all signage, traffic barricades and police details that may be necessary. Streets and driveways adjacent to the work area shall remain open at all times.

The Contractor may be required to access project locations through adjacent properties. The Contractor shall coordinate with the property owners and provide a minimum advanced notice of 2 weeks prior to the start of work at these locations.

NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsection 7.13)

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of publicly or privately owned utilities of the Contractor's intention to commence operations affecting such utilities at least one (1) week in advance of the commencement of such operations in accordance with Chapter 82, Section 40 of the General Laws, as amended, and the Contractor shall at that time file a copy of such notice with the Engineer.

The Plans indicate the approximate location of known utilities in the vicinity of the work. The accuracy and completeness of the information is not guaranteed.

Any damage to these utilities caused by negligence of the Contractor shall be repaired by the Contractor at their own expense and to the satisfaction of the Engineer.

It is the intent of these Special Provisions that the Contractor having been given due notice hereof will safeguard the utilities during construction and shall assume liability for damage, relieving the Department from any liability.

A list of public and private utilities can be found on the MassDOT – Highway website at:
https://www.mass.gov/info-details/utility-contacts-by-district-and-municipality

Select District **5**
Select Town of **ROCHESTER, BARNSTABLE**
Locate the utility contact

The Contractor shall inform the following officials in each area that he assigned to work:
Superintendent, Department of Public Works or Town Engineer,
Superintendent, Water Department,
Superintendent, Sewer Department,
Police and Fire Department,
Electric Department

Town officials are shown at website https://www.mass.gov/lists/cities-and-town.
Select “Choose **Rochester, Barnstable**” from the “pull down” menu.

Press “Go” and locate the official Municipality Home Page.

The Engineer may authorize work to continue during these specified time periods if it is determined by the Engineer that the work will not negatively impact the traveling public or the quality of the work.

Below are the holiday work restrictions:

1. New Years Day (Federal Holiday)
2. Martin Luther King's Birthday (Federal Holiday)
3. President's Day (Federal Holiday)
4. Patriot's Day (State Holiday)
5. Memorial Day (Federal Holiday)
6. Juneteenth (Federal Holiday)
7. Independence Day (Federal Holiday)
8. Labor Day (Federal Holiday)
9. Columbus Day (Federal Holiday)
10. Veterans' Day (Federal Holiday)
11. Thanksgiving Day (Federal Holiday)
12. Christmas Day (Federal Holiday)

ROADWAY WORKER PROTECTION FOR RAILROAD CONTRACTORS (See MCRR On-Track Safety Manual)

MCRR strictly adheres to the practice of operating a safe railroad and mandates that all Contractors and their Subcontractors, their Officers, employees, agents and all personnel employed or engaged by them in the performance of the Work or activity while on or adjacent to Railroad property operate and perform all activities in a safe manner and in strict accordance with MCRR On-Track Safety Manual and all Provisions of 49 CFR Parts 214, 219 and 243, as promulgated by the Federal Railroad Administration (FRA).

All employees, agents and any personnel employed by and or engaged by the Contractor or his Subcontractors shall attend Roadway Worker Protection (RWP) training conducted by the MCRR, prior to entry upon Railroad property. RWP training provided online by the MCRR shall be completed prior to initiation of work activities and at other times to accommodate the project schedules. The training will be conducted in English. If the Contractor has employees who may not be able to adequately understand the content of the training in English, then the Contractor will be responsible to provide the appropriate translation to ensure that their employees are in compliance with FRA requirements. All costs for training are the responsibility of the Contractor.

Personal Protective Equipment (PPE) requirements are specified in the FRA Regulations and the MCRR On-Track Safety Manual. The manual is included in the bid documents. Wearing and use of PPE shall be mandatory and strictly enforced. Failure to adhere to the PPE requirements may be grounds for removal of an individual from Railroad property and prohibition from work. Continual disregard for safety and failure to obey and adhere to safety directives of the Railroad shall be cause for termination of the Contract.

RAILROAD PROVIDED SUPPORT SERVICES

Coordination of on-track safety protection for the Contractor and/or Subcontractor’s personnel and equipment. Contractors will be provided the following required Railroad Support Services by MassCoastal Railroad (MCRR or Railroad) personnel:

A. Railway Worker Protection (“RWP”) training will be provided by Railroad to each Contractor and/or Subcontractor employee on the Project site. RWP Training is mandatory and must be successfully completed prior to accessing the ROW. Contractor will be charged a nominal fee by Railroad for each

worker trained in RWP. Contractor shall be responsible for all other costs incurred by workers related to the RWP training.

B. Daily onsite worker safety inspections by MCRR.

C. One full-time EIC person and additional personnel as required supplied by MCRR for the duration of the Contractor and/or Subcontractor's presence on site. The EIC person will provide the following services to the Contractor and/or Subcontractor:

1. Daily Job Briefings at the beginning of each workday and anytime work conditions change.
2. Coordination of on-track safety protection for the Contractor and/or Subcontractor's personnel and equipment.
3. Flagging of all train movements through Contractor and/or Subcontractor's work location.
4. Flagging ofall vehicles at highway crossings fouled by Contractor and/or Subcontractor's personnel and/or equipment; and
5. Daily end of work track inspections required to place track worked on by Contractor and/or Subcontractor back in service.

D. MCRR shall provide a work train with train crew on an as-needed basis for the dumping of ballast and other needs.

PROJECT OVERSIGHT

MassDOT and MassDOT representatives will be present on site at times throughout the project for the purpose of representing the Owner's interests with regard to this project and will provide:

1. Oversight and Construction Inspection Services.
2. Act as a liaison between MCRR and Contractor.
3. Daily end of day employee production reporting.

SUBMITTALS

Prior to beginning any work, the Contractor shall submit to the Engineer for its review and approval proposed work plans, schedules and materials to be used in the Work as required in the specifications and special provisions. Contractor shall not commence any work requiring an approved submittal, including but not limited to schedules, work plans, materials and change orders without having first received approval by the Engineer.

Contractor shall also be required to submit, as part of their proposal, evidence of Dig Safe notification at project site.

CONDITIONS OF ACCEPTANCE

Materials that do not fully meet the requirements of these Specifications shall be rejected, removed from MassDOT property (if rejected following shipment) and replaced at no additional costs to MassDOT. It is the responsibility of the Contractor to meet the Specifications and in no case is rejection of materials a cause for a change in the contract completion date.

WARRANTY OF WORK

1. Neither final acceptance, final payment nor any provision in the Contract Documents nor partial or entire use or occupancy of the premises by MassDOT or the MCRR shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability with respect to any express warranties or responsibility for faulty materials or workmanship.

2. Except where longer periods of warranty are specified for certain items, the Contractor warrants all work done under the Contract to be free from faulty materials and workmanship for a period of one year from date of Final Acceptance.
3. Upon receiving notification from MassDOT, the Contractor shall immediately make the required repairs or replacements to any work found defective. If repairs or replacements are not started within 10 days from the date of notification and prosecuted to completion, the MassDOT reserves the right to employ others to complete the work. The Contractor agrees, upon demand, to pay MassDOT all amounts which it expends for such repairs or replacements.
4. All remedied work shall carry the same warranty as the original work starting with the date of accepted replacement or repair.

SUBSECTION 8.11 FAILURE TO COMPLETE WORK ON TIME.

Remove Table 8.11-1 and amend Subsection 8.11 of the Standard Specifications by adding the following:

If the Contractor fails to comply with the schedule for occupancy which results in MCRR being unable to operate trains or other on-track equipment within the project territory, said Contractor shall pay to the following liquidated damages:

The Liquidated Damages for the Contract is $15,000 per day.

Contractor and MassDOT agree that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that the Railroad will sustain by reason of delayed completion. These liquidated damages are intended as compensation for losses that are difficult to estimate. The Contractor and MassDOT agree that this $15,000 per day liquidated damages amount would compensate the Railroad for loss of revenue service. In addition, in the event that the Contractor fails to complete a portion(s) or the whole of the Contract Work by the above-stated times, the Contractor recognizes that MassDOT may incur other expenses which are not covered by the payment of the Liquidated Damages referenced above, including, but not limited to, costs to defend and/or pay third party claims brought against MassDOT for damages.

As a consequence and in addition to the payment of the above referenced Liquidated Damages, the Contractor agrees that it will defend, indemnify and hold MassDOT Harmless from all claims, damages and expenses, other than the construction engineering inspection costs referenced above, which arise, in whole or in part, out of the Contractor's failure to complete a portion(s) or the whole of the Contract Work by the above-stated times.

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:

1. Providing advanced notice, for all utility-related meetings initiated by the Contractor.
2. Providing meeting minutes for all utility-related meetings that the Contractor attends.
3. Providing all test pit records.
4. Request for Early Utility work requirements of this section (see below).

5. Notification letters for any proposed changes to Utility start dates and/or sequencing.
6. 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.
7. Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
8. 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.

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.

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.

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:

1. Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
2. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video
3. 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).
4. Telecommunications or video surveillance services provided by such entities or using such equipment.
5. 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 9.00: MEASUREMENT AND PAYMENT

SUBSECTION 9.03 – PAYMENT FOR EXTRA WORK

Amend Subsection 9.03 of the Standard Specifications with the following:

No extra work shall be started without written authorization by MassDOT. Any extra work involving time and materials shall have a MassDOT representative on site while work is being performed.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL

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 handwashing 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”.

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.

PROVISIONS FOR TRAVEL AND PROSECUTION OF WORK

The Contractor shall coordinate their work with the work done by Utility Companies/Utility Owners who will be performing relocations and other work within the project limits, and they shall so schedule their operations as to cause the least interruption to the normal flow of traffic on the existing road.

Following provisions shall apply, unless otherwise required by the Engineer:

Prior to commencing work, the Contractor shall place protective shielding/work platforms/containment under the demolition locations so as not to allow debris to fall to the waterway or ground below.

The Contractor shall not start any operation until all materials required for the operation are at the site or until the Engineer is satisfied that the materials will be delivered in such order that there will be no interruption to continuous and efficient progress.

Under no circumstance should a Contractor close a travel lane or in any way affect traffic outside the specified work hours. All travel lanes of the roadway must be fully open to traffic prior to the start and after the end of the approved work schedule. In no case will operations commence prior to the specified work hours. This includes traffic set-ups that restrict the flow of traffic.

The Contractor’s schedule of operations shall be of sufficient detail to show all work elements and stages and shall account for all facets of the job, including but not limited to: traffic management control deployment and subsequent restoration, and anticipated restrictions due to weather.

The Contractor shall notify the Engineer in writing two (2) weeks in advance of any proposed temporary roadway closures required to complete the work. Before starting any work under this Contract, the Contractor shall submit a Schedule of Operations. Work on the roadway shall proceed only on such sections and widths thereof as will be approved by the Engineer.

The Contractor shall serve written notice to all abutters one week in advance of any reconstruction work adjacent to their property, and during such time that construction is in progress, provide

safe access to the abutting properties.

Signs having messages that are irrelevant to normal traffic conditions will be removed or properly covered at the end of each work period. Signs are to be kept clean at all times, and legends shall be distinctive and unmarred.

The Contractor may opt to obtain storage outside of the project limits if required. No areas shall be used for storage outside the project limits within the Right-Of-Way layout without written permission of the Engineer.

SECTION 722
CONSTRUCTION SCHEDULING
DESCRIPTION

722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded Construction Schedule as defined by the schedule type set forth below. These requirements are in addition to any requirements imposed in other sections.

This section establishes the requirement for scheduling submissions. There are four schedule types identified as types A, B, C and D.

All schedules shall be prepared and submitted in accordance with this specification and the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit.

Type A –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded & Resource Loaded CPM
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

Type B –

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

Type C –

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

SECTION 722 (Continued)

Type D -

- Bar chart schedule updated monthly or at the request of the Engineer
- Short-term Construction Schedule
- Monthly Projected Spending Report (PSR)

EQUIPMENT, PERSONNEL

722.40 General

A.Software Requirements

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Section 740 – Engineer's Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer's Field Office. The computer and software shall be maintained and serviced at no additional cost to the Department.

B. Scheduler Requirements

The Scheduler shall be approved by the Engineer.

For Type A, B and C Schedules the name of the Contractor's Project Scheduler together with his/her qualifications shall be submitted to the Department for approval by the Engineer within seven (7) Calendar Days after NTP. The Project Scheduler shall have a minimum of five (5) years of project CPM scheduling experience, three (3) years of which shall be on projects of similar scope and value as the project for which the Project Scheduler is being proposed. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

SCHEDULING METHODS

722.60 General

A.Schedule Planning Session

The Contractor shall conduct a schedule planning session prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

1. the Work to be performed by the Contractor and its subcontractors;
2. the planned construction sequence and phasing; planned crew sizes;
3. summary of equipment types, sizes, and numbers to be used for each work activity;
4. all early work related to third party utilities;
5. identification of the most critical submittals and projected submission timelines;
6. estimated durations of major work activities;
7. the anticipated Critical Path of the project and a summary of the activities on that Critical Path;
8. a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;

SECTION 722 (Continued)

9. a summary of the anticipated quarterly cash flow over the life of the project.

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

B. Schedule Reviews by the Department

1. Baseline Schedule Reviews
   The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Rejected Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.
2. Contract Progress Schedule / Monthly Update Reviews / Recovery Schedules
   The Engineer will respond to each submittal within twenty-one (21) Calendar Days. Rejected schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

The Engineer's review comments shall not be construed as direction to change the Contractor's means and methods. The review and acceptance of the CPM schedule does not relieve the Contractor of the responsibility for accomplishing the work within the contract required completion dates. Omissions and errors in the accepted CPM schedule shall not excuse performance less than that required by the Contract.

722.61 Schedule Content and Preparation Requirements

All schedules shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:
https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit
and the following:

A. LOGIC

The schedules shall divide the Work into activities with appropriate logic ties to show:

1. conformance with the requirements of this Section and Division I, Subsection 8.02 - Schedule of Operations
2. the Contractor's overall approach to the planning, scheduling, and execution of the Work
3. conformance with any additional sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

SECTION 722 (Continued)

B. ACTIVITIES

The schedule shall clearly define the progression of the Work from the Notice to Proceed (NTP) to Contractor Field Completion (CFC) by using separate activities, or including attributes within appropriate activities, to address each of the following:

1. Notice to Proceed
2. Work Breakdown Structure
3. The Critical Path is clearly defined and organized.
4. Float shall be clearly identified.
5. Detailed activities to satisfy permit requirements.
6. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
7. The preparation and submission of shop drawings, procedures, and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable.
8. The review and return of shop drawings, procedures, and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer.
9. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
10. Each component of the Work defined by specific activities.
11. Right-of-Way (ROW) takings that have been identified in the Contract.
12. Early Utility Relocation (by others) that has been identified in the Contract.
13. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
14. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Section 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
15. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
16. Limitations of Work – time of year restrictions and any other limitations identified in the contract
17. Traffic work zone set-up and removal, night work and phasing
18. Material Certifications
19. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
20. For Type A and B Contracts only: All items to be paid for, including all Unit Price and Lump Sum pay items, shall be identified by activity. This shall include all non-construction activities such as engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

SECTION 722 (Continued)

21. Contractor's request for validation of FBU (ready to open to traffic)
22. Full Beneficial Use (FBU) Contract Milestone per the following requirements: The majority of contract Work has been completed and the asset(s) has been opened for full multi-modal transportation use, except for limited contract work items that do not materially impair or hinder the intended public use of the transportation facility. All anticipated lane takings have been completed, except for minor, short term work items and as defined in Subsection 8.03 - Prosecution of Work
23. The Department's confirmation of completed work to allow for FBU.
24. Contractor's request for validation of Substantial Completion
25. Department generated punch list of twenty-one (21) Calendar Days
26. Substantial Completion Contract Milestone as defined in the standard specifications.
27. Punch list Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes
28. Contractor confirmation that all punchlist work and documentation has been completed.
29. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
30. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
31. Contractor Field Completion Contract Milestone (which can also be considered the completion date) per the following requirements: All physical contract Work is complete including punchlist. The Contractor has fully de-mobilized from field operations and as defined in Subsection 5.11

C. EARLY AND LATE DATES

Early Dates shall be based on proceeding with the Work or a designated part of the Work exactly on the date when the corresponding Contract Time commences. Late Dates shall be based on completing the Work or a designated part of the Work exactly on the corresponding Contract Time, even if the Contractor anticipates early completion.

D. DURATIONS

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration of resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

SECTION 722 (Continued)

Should there be an activity with a duration that is determined by the Engineer to be unreasonable, the Contractor will be asked to provide a basis of the duration using bid documents, historic production rates for similar work, or other form of validation that is acceptable to the Engineer. Should the Contractor and the Engineer be unable to agree on reasonable activity durations, the Engineer will, at a minimum, note the disagreement in the Baseline Schedule Review along with a duration the Engineer considers reasonable and the basis for that duration. A schedule that contains a substantial number of activities with durations that are deemed unreasonable by the Engineer will not be accepted.

E. MATERIALS ON HAND

The Contractor shall identify in the Baseline Schedule all items of permanent materials (Materials On Hand) for which the Contractor intends to request payment prior to the incorporation of such items into the Work.

F. ACTIVITY DESCRIPTIONS

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label.

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

I. CALENDARS

Different calendars may be created and assigned to all activities or to individual activities. Calendars define the available hours of work in each Calendar Day, holidays and general or project-specific non-Work Days such as Fish Migration Periods, time-of-year (TOY) restrictions and/or area roadway restrictions. All calendars shall extend two years beyond the current project completion date.

Project Special Provisions identify specific calendar restrictions some examples of special calendars include, but are not limited to:

- Winter Shutdown Period, specific work is required by separate special provision to be performed during the winter. See Special Provision 8.03 (if applicable)
- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Planting seasons for trees, shrubs and grasses and wetlands mitigation work.

SECTION 722 (Continued)

- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods.
- Night-time paving and striping operations, traffic, and temperature restrictions.
- Utility Restrictions shall be as specified within the Contract.

J. FLOAT

For the calculation of float in the CPM schedule, the setting for *Retained Logic* is required for all schedule submissions, starting with the Baseline Schedule Submission. Should the Contractor have a reason to propose that an alternative calculation setting such as *Progress Override* be used, the Contractor shall obtain the Engineer's approval prior to modifying to this setting.

K. COST AND RESOURCE LOADING (Types A and B only)

For all Type A and B Schedules, the Contractor shall provide a cost and resource-loaded schedule with an accurate allocation of the costs and resources necessary to complete the Work. The costs and resources shall be assigned to all schedule activities in order to enable the Contractor to efficiently execute the Contract requirements and the Engineer to validate the original plan, monitor progress, provide cash flow projections, and analyze delays.

1. Each schedule activity shall have an assigned cost that accurately represents the value of the Work. Each schedule activity shall have its resources assigned to it by craft and the anticipated hours to accomplish the work. Each schedule activity's equipment resources shall be assigned to it by equipment type and hours operated. Front-loading or other unbalancing of the cost distribution will not be permitted.
2. The sum of the cost of all schedule activities shall be equal to the Contractor's Bid Price.
3. Indicating the labor hours per individual, per day, by craft and equipment hours/day will be acceptable.
4. The Engineer reserves the right to use the cost-loading as a means to resolve changes, disputes, time entitlement evaluations, increases or decreases in the scope of Work, unit price renegotiations and/or claims.
5. For all Type A and B Schedules, all subnets, fragnets, Proposal Schedules, and Recovery Schedules shall be cost and resource- loaded to help to quickly validate and monitor the duration of the Work to be performed.
6. For Type A Schedules, cost-loading of the schedule will also be used for cash flow projection purposes.
7. The cost-loading of each activity shall indicate the portion of the cost for that activity that is applicable to a specific bid item (cost account.) The total cost for each cost account must equal the bid item price.

SECTION 722 (Continued)

L. NOT TO BE USED IN THE CONTRACTOR'S CPM SCHEDULE

1. Milestones or constraint dates not specified in the Contract.
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer.
4. Delayed starts of follow-on trades.
5. Float suppression techniques.
6. Leads such as leads, lags, SS, SF, & FF relationships without the expressed permission of the Department.

722.62 Submittal Requirements

All schedules shall be prepared and submitted in accordance with the requirements listed below.
Each monthly Contract Progress Schedule submittal shall be uniquely identified.
Each Submission shall, at a minimum, include the following:

a. Narrative
b. Schedule submittals shall be signed by the Scheduler
c. Schedule Printout - All Activities
d. Schedule Printout - Critical Path Layout
e. Schedule Printout - Remaining Work
f. Schedule Printout - Top 3 Float Path
g. Work Breakdown Structure (WBS) Summary
h. Project Spending Report (PSR) in Portable Document Format (.PDF)
i. Project Spending Report (PSR) in Microsoft Excel spreadsheet (.XLS)
j. Oracle Primavera P6 Schedule File (.XER)

All digital file submittals will be labeled with the following information.

- Contract Number
- Project Number
- Project locations (i.e., town(s))
- Brief description
- Submittal description (i.e., UP07)
- Data Date (MM-DD-YY)
- File Description (i.e., Critical Path)

Example: C110464 (P606309) - Orange Route 2 over 202 – UP23 (07-15-22) - Critical Path

A. Narratives

A written narrative shall be submitted with every schedule submittal. The narrative shall:

1. itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress Schedule / Monthly Update or the Baseline Schedule, whichever is most recent.
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements.

SECTION 722 (Continued)

3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A – Notice of Delay.
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record.
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path.
6. provide a description of any possible considerations to improve the probability of completing the project early or on time.
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths.
8. describe the Contractor's plan, approach, methodologies, and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required.
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule.
10. describe any out-of-sequence logic and provide an explanation of why each out-of-sequence activity does not require a correction, if one has not been provided, and an adequate demonstration that these changes represent the basis of how these activities will be built, including considerations for resources, dependencies, and previously approved production rates.
11. identify any possible duration increases resulting from actual or anticipated unit price item quantity overruns as compared to the baseline duration, with a corresponding suggestion to mitigate any possible delays to the Critical Path. If the delay is anticipated to impact the Critical Path, refer to Subsections 4.06 – Increased or Decreased Contract Quantities and 8.10 – Determination and Extension of Contract Time for Completion and submit a letter to the Engineer notifying of a potential delay.
12. include a schedule log consisting of the name of the schedule, the data date and the date submitted.
13. include and describe any notifications, communications and coordination meetings with third-parties such as utility companies that occurred from the last update including personnel names, job titles and contact information, date of meeting(s)/correspondence(s), topics discussed, and reasons the third party provided for deviations from the PUC form.

SECTION 722 (Continued)

B. CPM Bar Charts

One (1) timescaled bar chart containing all activities shall be prepared and submitted using a scale that yields readable plots and that meets the requirements of Subsection 722.61 – Schedule Content and Preparation Requirements Activities shall be linked by logic ties and shown on their Early Dates. Critical Paths shall be highlighted, and Total Float shall be shown for all activities.

A second timescaled bar chart shall also be prepared containing only the Critical Path or, if the Critical Path is not the longest path, the Longest Path using a scale that yields readable plots and that meets the requirements of Subsection 722.61 – Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Total Float shall be shown for all activities.

C. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily read comparison of progress during the present and previous reporting periods.

D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)

With each Contractor Quantity Estimate (CQE), the Contractor shall submit an Activity Cost Report and Cash Flow Projection that includes all activities grouped by Contract Bid Item.

The Activity Cost Report shall be generated from the Schedule of Record and shall be the basis of the Monthly Cash Flow Projection. Within each contract Bid Item, activities shall be sequenced by ascending activity identification number and shall show:

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start, and finish dates for each completed activity.
4. any variance to the estimated contract quantity shall be shown.

E. Resource Graphs (Type A only)

Monthly and cumulative resource graphs for the remaining Contract period using the Early Dates and Late Dates in the Contract Progress Schedule shall be included as part of each schedule submittal.

SECTION 722 (Continued)

F. Projected Spending Reports

A Projected Spending Report (PSR) shall be prepared and submitted monthly. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF.

722.63. Progress Schedule Requirements

A. Baseline Schedule

The Baseline Schedule shall be due thirty (30) Calendar Days after Notice to Proceed (NTP). The Baseline Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving Extra Work Orders or any other type of alleged delay. The Baseline Schedule shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements. Once the Baseline Schedule has been accepted by the Engineer, with or without comments, it shall represent the as-planned schedule for the Work and become the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 722.63.C - Contract Progress Schedules / Monthly Updates, 722.64.C - Recovery Schedules and 722.64.D - Proposal Schedules.

The Cost and Resource-Loading information (Types A and B only) shall be provided by the Contractor within forty-five (45) Calendar Days after NTP.

The Engineer's review comments on the Baseline Schedule and the Contractor's responses to them will be maintained for the duration of the Contract and will be used by the Engineer to monitor the Contractor's work progress by comparing it to the Contract Progress Schedule / Monthly Update.

B. Interim Progress-Only Schedule Submissions

The first monthly update of the Contract Progress Schedule/Monthly Update is due within seventy (70) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule review period ends at sixty (60) Calendar Days after NTP, see Subsection 722.60.B - Schedule Reviews by the Department. If the Baseline Schedule has not been accepted within sixty (60) Calendar Days after NTP, an Interim Progress-Only Schedule shall be due within seventy (70) Calendar Days after NTP. The purpose of the Interim Progress-Only Schedule is to document the actual progress of all activities, including non-construction activities, from NTP until the Baseline Schedule is accepted.

SECTION 722 (Continued)

C. Contract Progress Schedules / Monthly Updates

The first Contract Progress Schedule shall be submitted by the Contractor no later than seventy (70) Calendar Days after NTP. The data date for this first Progress Schedule shall be two months (approximately sixty (60) Calendar Days) after NTP. Subsequent Progress Schedules shall be submitted monthly.

Each Contract Progress Schedule shall reflect progress up to the data date. Updated progress shall be limited to asbuilt sequencing and asbuilt dates for completed and inprogress activities. Asbuilt data shall include actual start dates, remaining Work Days and actual finish dates for each activity, but shall not change any activity descriptions, the Original Durations, or the Original Resources (as planned at the time of bid), without the acceptance of the Engineer. If any activities have been completed out-of-sequence, the Contractor shall propose new logic ties for affected in-progress and future activities that accurately reflect the previously approved sequencing. Alternatively, the Contractor may submit to the Engineer for approval an explanation of why an out-of-sequence activity does not require a correction and an adequate demonstration that the changes accurately represent how the activities will be built, including considerations for resources, dependencies, and previously approved production rates. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

No revisions to logic ties, sequence, description, or duration of future activities; or planned resource costs shall be made without prior approval by the Engineer.

Any proposed logic changes for in-progress or future activities shall be submitted to the Engineer for approval before being incorporated into a Contract Progress Schedule. The logic changes must be submitted using a Proposal Schedule or a schedule fragnet submission. Once approved by the Engineer, the Contractor may incorporate the logic in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

For any proposed changes to the original sequence, description or duration of future activities, the Contractor shall submit to the Engineer for approval an explanation of how the proposed description or duration change reflects how the activity will be progressed, including considerations for resources and previously approved production rates. Any description or duration change that does not accurately reflect how the activity will be progressed will not be approved by the Engineer. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

Contract Progress Schedules that extend performance beyond the Contract Time or beyond any Contract Milestone shall not be approved by the Engineer. The Contractor shall submit a Recovery Schedule, or a Time Entitlement Analysis, if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

SECTION 722 (Continued)

D. Short-Term Construction Schedule

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a spreadsheet format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule and may be at a greater level of detail. The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities. Short-Term Construction Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements.

722.64 Impacted Schedule Requirements

A. Notice of Delay

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within fifteen (15) of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor. Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such a delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

B. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) shall consist of a descriptive narrative, prepared in accordance with Subsection 722.62.A - Narratives, and an as-built CPM schedule, which may be in the form of a schedule fragnet that has been developed from the project's Contract Progress Schedule of Record, and illustrates the impact of a delay to the Critical Path, Contract Milestones and/or Contract Completion Date as required in Subsection 8.10 - Determination and Extension of Contract Time for Completion. TEAs shall also be used to determine the schedule impact of proposed Extra Work Orders (EWO) as also required in Subsection 8.10.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements and shall be based on the Contract Progress Schedule of Record applicable at the start of the delay or impact from an EWO. A TEA fragnet must start with a specific new activity describing the work contained in either a Notice of Delay previously submitted to the Department per Subsection 722.64.A - Notice of Delay or an EWO.

SECTION 722 (Continued)

TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fifteen (15) Calendar Days after a request for a TEA by the Engineer for any other reason.

A TEA shall be submitted to the Engineer before any Time Extension is granted to the Contractor. Time Extensions will not be granted unless the TEA accurately reflects an evaluation of all past delays and the actual events that occurred that impacted the Critical Path. The TEA must also demonstrate a plan for the efficient completion of all of the remaining work through an optimized CPM Schedule. The analysis shall include all delays, including Contractor-caused delays, and shall be subdivided into timeframes and causes of delays.

TEAs shall incorporate any proposed activities, logic ties, resource considerations, and activity costs required to demonstrate the schedule impacts most efficiently in addition to detailing all impacts to existing activities, logic ties, the Critical Path, Contract Milestones, and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, restraints, and activity costs, necessitated by an Extra Work Order or other schedule impact, for the completion of the remaining work. The Contractor shall provide TEAs that demonstrate that all delays have been mitigated to the fullest extent possible without requiring an Equitable Adjustment to the original bid basis.

All TEAs shall clearly indicate any overtime hours, additional shifts and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. The Engineer shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions if it is determined to be in the best interest of the Department to do so.

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates. During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

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

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Contract Progress Schedules that predict performance extended beyond the Contract Time or beyond any Contract Milestone shall not be approved as the schedule of record. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

The Contractor shall submit a Recovery Schedule within fifteen (15) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates unless a recovery schedule is waived by the Department. Waiving the recovery schedule does not relieve the contractor of the responsibility for the delay. The Department may revoke the waiver of a Recovery Schedule, at which time a Recovery Schedule shall be submitted within fifteen (15) Calendar Days of the Contractor being notified.

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

SECTION 722 (Continued)

D. Proposal Schedules

A Proposal Schedule is an alternative schedule used to evaluate proposed changes to the Contract scope or significant alternatives to previously approved approaches to complete the Work, which may include changes to activity durations, logic, and sequence. For Types A and B Schedules, the Proposal Schedule shall be cost and resource loaded.

A Proposal Schedule may be requested by the Department at any time or may be offered by the Contractor. The Engineer may request that the Contractor prepare a Proposal Schedule to further mitigate any delays that are shown in an accepted TEA or Contract Progress Schedule.

The Contractor shall submit the Proposal Schedule within thirty (30) Calendar Days of a request from the Department.

The Proposal Schedule shall not be considered a Schedule of Record until the logic, durations, narrative, and basis of the Proposal Schedule have been accepted by the Engineer. If the Proposal Schedule took the form of a fragnet, it must be incorporated into the Contract Progress Schedule of Record showing the current progress of all other activities and the impacts/results of the changes made by the Proposal Schedule before the Proposal Schedule is accepted by the Department.

Proposal Schedules shall clearly indicate any proposed acceleration including overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. Proposal Schedules that contain a cost element shall be submitted with a separate Cost Proposal.

Changes represented in the accepted Proposal Schedules shall be incorporated into the next Contract Progress Schedule. During the review of any Proposal Schedule, all Contract Progress Schedules shall continue to be required every month.

E. Disputes

All schedules shall be submitted, reviewed, dispositioned, and accepted in the timely manner specified herein so as to provide the greatest possible benefit to the execution of this Contract.

The Contractor may dispute a decision by the Engineer by filing a claim notice within seven (7) days after the Contractor's request for additional time has been denied or if the Contractor does not accept the number of days granted in a time extension. The Contractor's claim notice shall include a revised time entitlement analysis that sufficiently explains the basis of the time-related claim. Failure to submit the required time entitlement analysis with the claim notice shall result in denial of the Contractor's claim. A determination on the Contractor’s claim shall be in accordance with Subsection 7.16 Claims of Contractor for Compensation. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

SECTION 722 (Continued)

722.65 Schedule Type D Requirements

This section is to detail the requirements for Type D Schedules and is separate from the requirements listed above. These schedules are intended for a project in which a more formal schedule would not be practical. Schedules for Type D projects shall be submitted for each work assignment. The Schedule Type D shall be submitted electronically in .XLS and .PDF format and meet the following requirements.

The schedule requirements for work assignments that are anticipated to last three weeks or less shall conform to the requirements for Short-term Construction Schedules below.

Work assignments that are anticipated to last longer than three weeks shall submit a bar chart baseline and provided update schedules upon request of the engineer as required under Bar Chart Schedule below in addition to meeting the Short-term Construction schedule requirements.

A. Bar Chart Schedule

A Bar Chart that shall include the following:

- Work Assignment start date.
- Activities to identify.
  - Major work operations broken down to be no longer than 14 days.
  - Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
  - The preparation and submission of shop drawings, procedures, and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable.
  - The review and return of shop drawings, procedures, and other required submittals, approved or with comments, the duration of which shall be shown as thirty (30) Calendar Days,
  - Detailed activities to satisfy permit requirements.
  - Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
  - Project Close out activities including a 21-calendar day creation of a punchlist activity and 30 calendar day minimum completion of punchlist activity.
- Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
- Access Restraints – restrictions on access to areas of the Work
- Traffic work zone set-up and removal, night work and phasing
- Contract Milestones including Full beneficial Use, Substantial Completion and Contractor Field Completion

The Bar Char Schedule shall be provided at the beginning of the project and updated with each work order created for the project.

SECTION 722 (Continued)

B. Short-Term Construction Schedule

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a spreadsheet format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule and may be at a greater level of detail. See schedule toolkit for suggested format.

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work on the assignment for the two week period prior and all planned work for the following three week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities.

C. Project Spending Report (PSR)

A Projected Spending Report (PSR) shall be prepared and submitted monthly. The PSR shall be for all active work assignments, broken down by work assignment. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF.

MEASUREMENT AND PAYMENT

A. The Work described under the Specification shall be incidental to the project and to the pay items listed in the Bid Form. No payment will be made under this item.

.

ITEM 100.1 SUBMITTALS N/A

GENERAL

1. This Section specifies the general requirements and procedures for preparing and transmitting data to the Engineer for his/her information, acceptance or approval. Submittals should be made to the MassDOT (Owner's) Engineer and MassCoastal Railroad (MCRR or Railroad) for all materials supplied by Contractor.

GENERAL PROCEDURES

A. Transmit submittals sufficiently in advance of construction requirements to permit a maximum of five (5) calendar days for checking and appropriate action by MassDOT's Consulting Engineers and/or MassCoastal Railroad.

B. Submit all work-related submittals as defined in this Section and as required by Contract Documents on a Transmittal Form: Prepare draft of required transmittal form and submit it to Engineer for acceptance. At a minimum, furnish: transmittal forms sequentially numbered and show contract number, project name, date; names of subcontractors, suppliers, manufacturers, and required specification references; category and type of submittal, purpose, description, distribution record (for both transmittals and submittals) and signature of transmitter.

1. Examine and check submission for accuracy, completeness, and compliance with Contract before delivery to Engineer.
   - Stamp and sign each submission with following statement: "Having checked this submission, we certify that it conforms to the requirements of the Contract in all respects, except as otherwise indicated."
   - By reviewing and approving each submittal, Contractor represents that he has determined and verified materials, field measurements and field construction criteria related thereto, and has checked and coordinated information contained within such submittals with requirements of Work and Contract.
   - Submit one construction material or one drawing per submittal review.

2. Maintain at site of work a complete up-to-date, organized file of all past and current submittals including an index and locating system, which identifies the status of each submission.
   A. Assign sequential numbers to each submittal.
   B. Assign new submittal numbers to all re-submissions and cross-reference to previous submittals.
   C. Certify shop drawings, working drawings and calculations as submitted by a professional engineer registered in the Commonwealth of Massachusetts when required by individual Specification Sections. Convey, or be accompanied by, information sufficient to completely explain the structures, machines, or systems described and their intended manner of use. When professional certification is required by Contract requirements, Engineer is entitled to rely upon accuracy and completeness of such calculations and certifications.

3. Engineer's Review and Action
   A. Engineer will review and approve or take other appropriate action upon Contractor's

submittals only for the limited purpose of reviewing for conformance with information given and design concept expressed in Contract requirements. Engineer's action will be taken as to cause no delay in Work or in activities of Contractor. Review of such submittals is not conducted for purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of Contractor as required by Contract. Engineer's review will not constitute approval of safety precautions or, unless specifically stated by Engineer, of any construction means, methods, techniques, sequences or procedures. Engineer's review of a specific item does not indicate approval of entire assembly of which the item is a component.

B. Time required for review of submittals and resubmittals by Engineer will be a maximum of 5 calendar days, except as otherwise specified.

C. All Contractors' submittals will be stamped with one of following dispositions.

- NO EXCEPTIONS TAKEN: Work may proceed, provided it complies with Contract. Approval of shop drawings and samples will be general, but approval is not construed:
    - As relieving Contractor of responsibility for any errors or omissions, including details, dimensions, and quantity of materials; or
    - As approving departures from details furnished by Engineer.
- EXCEPTION AS NOTED: Work may proceed, provided it complies with Contract and changes shall be made by Contractor. Resubmission not required. Exception, as noted, will be general. The above dispositions will be general, but approval or exceptions noted shall not be construed as:
    - Permitting any departure from Contract requirements;
    - Relieving Contractor of responsibility for any errors or omissions, including details, dimensions, and quantity of materials; or
    - As approving departures from details furnished by Engineer.
- REVISE AND RESUBMIT: Work recognized as not being able to proceed. Revise submittal in accordance with notations thereon and resubmit without delay.

D. Handle re-submissions in the same manner as first submittals. On re-submissions, direct specific attention in writing to revisions other than the corrections on previous submissions. Make any correction required by Engineer.

E. Failure of any material to pass specified tests is sufficient cause for refusal to consider, under this Contract, further samples of same brand or make of that material. Engineer reserves right to disapprove any material or equipment previously proven unsatisfactory in service.

F. Samples of various materials on site, stored or in place may be taken by Contractor for testing. Samples failing to meet Contract requirements will automatically void approval of items tested. Replace such materials or equipment to meet Contract requirements. When tests are required, make only one test of each sample. Samples that do not meet specified requirements will be rejected. Additional testing of samples will be made by Engineer at Contractor's

expense.

C. Requirements for shop drawings

1. Shop drawings shall include fabrication details of all special trackwork material, including, but not limited to rail, frog, switch points, insulated joint plugs, joint assemblies, fasteners, tie plates, switch rods and switch stand, and any other supplementary data required by the Engineer.

2. Detail drawings for cribs, cofferdams, falsework, shoring, decking, form work, and for other temporary work and methods of construction the Contractor proposes to use, will be required to be furnished. Such drawings shall be subject to review, but details of design will be left to the Contractor who shall be responsible for the safety and successful construction of the Work. Drawings, the original design for which is the responsibility of the Contractor, shall bear the seal of a Professional Engineer registered in the Commonwealth.

3. Shop drawings shall show design, dimensions, connections, and other details necessary to ensure that the Contract Documents are accurately interpreted. Shop drawings shall show proper connections with adjoining work in detail. Where adjoining work requires shop drawings, such drawing must be submitted for approval at the same time so that connections can be accurately checked.

4. Shop drawings shall establish the actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work and amplify design details of mechanical and electrical equipment in the physical spaces in any structure and incorporate minor changes of design or construction details to suit actual conditions. Where separate sections or trades are involved, shop drawings shall be coordinated and where required by the Engineer shall be submitted in composite form (coordination drawings) clearly designating which trade will perform which work; the words "work by others" will not be accepted.

5. All requests for approval of materials and equipment and submissions of drawings shall indicate the corresponding number of the section and paragraph of the Specifications and reference to the Contract Drawing sheet numbers under which each of the above are required.

6. All shop drawings shall be thoroughly checked by Contractor for compliance with the Contract Documents before submitting them to Engineer for approval and shall bear Contractor's stamp of approval certifying that they have been so checked. Shop drawings submitted without the stamp of approval and certification, or which are incomplete, contain numerous errors, have not been checked, or have been checked only superficially will be returned unchecked by Owner and Railroad for resubmission by Contractor. Contractor shall certify: “This shop drawing has been thoroughly checked and complies with the Contract Documents and field measurements and the item fits with adjoining work except as noted.”

7. In checking shop drawings, Contractor shall verify all dimensions and field conditions and shall check and coordinate the shop drawings with the requirements of all other Sections, adjoining materials or trades whose work is related thereto, as required for the proper and complete installation of the work.

D. When submitting shop drawings or working drawings for approval or review by the Engineer, the following procedures shall apply:

1. Submit to Engineer with such promptness as to cause no delay in his work, two copies of prints to be checked and approved by him, of all shop drawings and detail drawings required for the work.

2. Engineer will make a prompt decision on approval of such drawings no later than five (5) days after submittal; but if such decision requires extended investigation and study, Engineer will, within five (5) days after the receipt of the submission, give the party making the submission written notice of the reason why the decisions cannot be made within the five (5) day period and the date by which the decisions will be made.

3. Markings of approval, or of corrections required, will be made on a copy of the submittal by the Engineer and record copies made by Engineer for his own use will be at Railroad and Owner's expense.

4. If corrections are required by the Engineer, make such corrections and resubmit the drawings, again as three prints, and PDF copy of the submittal to Engineer for approval. If corrections are still required, the same procedure shall be carried out until the drawings are acceptable.

5. Upon Engineer's approval, furnish Engineer two corrected prints.

6. All items shown on shop drawings shall be clearly identified with their location in the Contract, or by the sheet or detail number in which they appear, in order to facilitate checking by Owner and Railroad.

E. Upon completion of the Work, submit to Engineer all files (AutoCAD, Word Documents, PDF) associated with each shop drawing only, which shall become the property of Railroad and Owner. Contractor will submit a disc with all files associated with the shop drawings to Railroad, Owner and Engineer.

F. Resolution of the shop drawings copies / prints shall be readable.

G. Portions of the shop drawings copies / prints, which are not readable, shall be replaced, at no expense to Owner and Railroad.

H. Contract prices shall include the cost of furnishing all shop and detail drawings as specified.

I. Progress Photographs - Progress photographs are required to be taken by Contractor. Ten (10) 8x10-inch color photographs (including slides of these photographs) of progress and construction operations shall be required each week.

REQUESTS FOR INFORMATION

A. Upon discovery of the need for interpretation of the Contract Documents, Contractor shall prepare and submit a Request for Information (RFI). RFIs shall not be used to request approval of submittals, request approval of design changes or substitutions, nonconforming conditions, or requests for changes to Contract schedule and/or Quantities.

1. RFIs shall be issued by Contractor to Engineer. RFIs submitted by entities other than Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner as to avoid delays in the work.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project Name
2. Contract Number
3. Date
4. Name of Contractor
5. RFI Number, numbered sequentially
6. Specification Section number and title and related paragraphs, as appropriate
7. Drawing number and detail references, as appropriate
8. Field dimensions and conditions, as appropriate
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Completion Date or Quantities, Contractor shall state the impact in the RFI.
10. Contractor's signature
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe item needing interpretation.

C. RFI Log: Prepare, maintain and submit a log of RFIs organized by the RFI number containing the following information:

1. Project Name
2. Project Contract Number
3. Name of Contractor
4. RFI number and Revision Indicator
5. RFI Description
6. Date RFI was submitted
7. Date Response Required
8. Date Response Received
9. Date Closed

D. Engineer's Action: Engineer will review each RFI, determine action required and return to Contractor within five (5) days. Any change to the Contract Completion Date or Quantities may result in a change being submitted.

MEASUREMENT AND PAYMENT

B. The Work described under the Specification shall be incidental to the project and to the pay items listed in the Bid Form. No payment will be made under this item.

END OF SECTION

ITEM 100.2 PROTECTION OF WORK AND PROPERTY N/A

GENERAL

A. Work Included: This Section specifies the general requirements for the temporary protection of work and property during the Contract period.

TEMPORARY PROTECTION

A. Protect the following:

1. Existing mainline, siding, and yard tracks from damage and impacts.

2. Existing railroad culverts, bridges and grade crossings.

3. Existing public and private access paths and utility easements and crossings.

4. Existing railroad ties, rail, turnouts, OTM, bumping posts and signal equipment.

5. Existing railroad rolling stock and railroad equipment within the work area.

6. Existing platforms, buildings and maintenance facilities.

7. Existing track drainage ditch, drainage pipes and drainage structures.

8. Existing on site utility structures

B. After work is properly completed, be responsible for protecting work and for repairing, replacing, and cleaning of damaged work, so that all work is complete at the time of acceptance of the work.

C. Remove all temporary protection and coverings at the completion of the Work.

MEASUREMENT AND PAYMENT

A. Measurement and Payment of the work items included in this contract are defined under the bid items listed in the Bid Form. All costs associated with the work in accordance with the requirements specified under this Section shall be included in the bid price for the respective bid item.

END OF SECTION

ITEM 102. SELECTIVE CLEARING AND THINNING N/A

The work under this section shall conform to the requirements of the Special Provisions, plans and all relevant Sections of the Standard Specifications including the Supplemental Specifications, and the requirements below.

Trees less than six inches in diameter may be removed as necessary for construction. Any tree greater than or equal to six inches in diameter shall be retained and protected; however, if any trees conflict with construction operations, these trees may be removed as required by direction of the Engineer.

The Contractor shall perform selective clearing and thinning in areas within 10 feet of the centerline of culverts, cattle passes, and retaining wall and 20 feet by 20 feet beyond each end of the culverts and cattle passes to be replaced or retired, limited by the MassDOT right of way. Roots of brush and trees within 6 feet to ends of the headwalls of the culverts and cattle passes, and retaining wall shall be removed and restore the areas with loam and seed.

The Contractor shall trim low hanging tree limbs in areas adjacent to both sides of the culverts, cattle passes, and retaining wall which may conflict with construction operations, at the direction of the Engineer, limited by the MassDOT right of way.

Prior to selective clearing and thinning and tree trimming operations, the Contractor shall identify all trees to be removed. The Contractor shall review all proposed work with the Engineer, and no work shall begin without approval of the Engineer.

The method of disposal of all materials shall be the responsibility of the Contractor and shall be submitted to the Engineer for approval. No chipped material, trees debris, or branches shall be disposed of on the MassDOT right of way, all tree debris shall be disposed of offsite. All methods of disposal shall be accomplished in accordance with all applicable Federal, State and local ordinances.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102 Selective Clearing and Thinning is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, Item 234.2 Cattle Pass Retirement at MP 71.66, and Item 996.01 Retaining Wall Structure. No payment will be made under this Item.

ITEM 180.2 HAZARDOUS MATERIALS HEALTH AND SAFETY N/A

For all construction activities that require handling or exposure to regulated soils, the Health and Safety Plan (HASP) shall specify an on-site Health and Safety Officer. The on-site Health and Safety Officer duties shall include but are not limited to: implementation of the site Health and Safety Plan, training, evaluating risks, safety oversight, determining levels of personnel protection required, and performing any required monitoring at the site. A Daily Log shall be kept by the on-site Safety Officer and provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personnel protection being employed, monitoring data and any other information relevant to on-site safety conditions. The on-site Health and Safety officer shall sign and date the Daily Log.

The level of protection, relative to respiratory and dermal hazards, required to ensure the health and safety of on-site personnel will be stipulated in the Health and Safety Plan and will be subject to modification by the on-site Safety Officer based on changing site and weather conditions and the following factors: type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and equipment, and type of equipment to be utilized.

The Contractor shall be required to provide appropriate personnel protective equipment for anyone who is working in an area either containing or suspected of containing a hazardous environment. This work will include both individuals physically working in these areas and those directing the work of same. Contingencies for upgrading the level of protection for on-site workers will be identified in the Health and Safety Plan and the Contractor shall have the necessary materials/equipment on hand to implement the level of protection upgrade in a timely manner.

MEASUREMENT AND PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 180.2 HAZARDOUS MATERIAL HEALTH AND SAFETY shall be considered incidental to the Work.

ITEM 180.3 FULL TIME SAFETY SUPERVISORS N/A

GENERAL

The Contractor shall have full-time (all working hours/one each shift) on-site experienced Safety Supervisors, whose sole responsibility is on-site safety management. Work may not proceed without a Safety Supervisor present on-site.

Safety Supervisors shall successfully complete RAILROAD RWP training and qualification.

The Contractor shall within thirty (30) days after receipt of the award of the contract submit the resume of the qualifications and work experience of the designated Safety Supervisors proposed for assignment to the Project and evidence of their successful completion of Roadway Worker Protection training and qualification. No construction work shall begin until project Safety Supervisors have been approved by MassDOT.

Safety Supervisors shall have a minimum of 5 years of experience as a construction safety supervisor, three of which include full-time on-site construction safety experience. Qualifications shall include:

- Thorough knowledge of construction safety and OSHA regulations
- Successful completion of OSHA 30-hour Construction Safety and Health training course
- Specialized safety training relevant to the project
- Demonstrated ability in creating a safe work environment
- Working knowledge of safety regulations and hazard control measures
- Demonstrated ability to conduct safety training
- Working knowledge of safety specific contract hazardous work procedures
- Physically able to perform the job
- Thorough knowledge of Title 49 Part 213 Track Safety Standards, Subparts A to F
- Thorough knowledge of Title 49 Parts 219 and 243.
- Thorough knowledge of RAILROAD Safety Rules & Procedures and Roadway Worker On-Track Protection Manual (see Document A00901)
- Thorough knowledge of applicable Provisions of Title 49 CFR Part 214 Railroad Workplace Safety, as promulgated by the FRA, in particular:
    - Subpart B-Bridge Worker Safety Standards
    - Subpart C-Roadway Worker Protection
    - Subpart D-Track Roadway Maintenance machines and Hi-Rail Vehicles

The duties of the Safety Supervisors shall include maintenance of the Contractor's safety program, enforcement of safe practices, and the use of safety equipment and personal protective equipment, and other such activities as may be required by OSHA and MassDOT to maintain job safety and accident prevention. Safety Supervisors shall not be replaced, terminated, nor reassigned without the written approval of MassDOT. MassDOT shall be informed immediately of all safety representative resignations and replacements. A minimum transition period of two weeks shall occur to orient newly appointed safety supervisors. Vacancies in these positions must be filled within two weeks of the vacancy occurring.

Safety Supervisors shall be assigned full-time to the contract and shall not be utilized concurrently on any other MassDOT contract or any other projects outside this MassDOT contract. Each Safety Supervisor shall have no other duties than the role of Safety Supervisor.

SUBMITTALS

Prior to the start of work, the Contractor shall submit resumes for the Safety Supervisors for review and approval of the Engineer.

In the event of a replacement Safety Supervisor, the Contractor shall submit the resume of the replacement Safety Supervisor within 3 business days of the resignation of a Safety Supervisor.

MEASUREMENT AND PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 180.3 FULL TIME SAFETY SUPERVISORS shall be considered incidental to the Work.

ITEM 180.4 FULL TIME QUALITY CONTROL SUPERVISORS N/A

The Contractor shall have full-time (all working hours/one each shift) on-site experienced Quality Supervisors, whose sole responsibility is on-site quality management, including management of the Contractor's Quality Program. Work may not proceed without a Quality Supervisor present on-site.

Quality Control supervisors must possess thorough knowledge of Title 49 Part 213 Track Safety Standards, Subparts A to F and maintain an active RAILROAD CWR Plan qualification prior to any work commencing in the field and lasting for the duration of the project.

The Contractor is responsible for controlling the quality of Work including work of its Subcontractors and suppliers and for assuring that the specified quality is achieved. The Contractor, Subcontractors and suppliers shall establish, maintain, and implement a written Quality Assurance Program (QAP). The Contractor shall ensure their Quality Assurance Program includes a responsibility to audit themselves plus all subcontracts, fabricators, and suppliers. The Contractor shall note that MassDOT reserves its right to also perform audits. The Program shall be tailored to the scope and complexity of the Work and shall include implementing procedures and inspection forms equal to or more detailed than those included at the end of this Section and throughout the Special Provisions.

The Contractor shall within thirty (30) days after receipt of the award of the contract submit their QAP, the resumes of the qualifications and work experience of the designated Quality Supervisors proposed for assignment to the Project and evidence of their successful completion of Roadway Worker Protection training and qualification. No construction work shall begin until the QAP and project Quality Supervisors have been approved by MassDOT. The Quality Supervisors shall have at least five (5) years of experience in implementing a quality control program on construction projects of similar size, scope and complexity. The Quality Supervisors shall be technical competent with the freedom and authority to make decisions without pressure or bias and shall have sufficient authority to ensure that quality requirements are consistently maintained.

Quality Supervisors shall be assigned full-time to the contract and shall not be utilized concurrently on any other MassDOT contract or any other projects outside this MassDOT contract. Each Quality Supervisor shall have no other duties than the role of Quality Supervisor.

SUBMITTALS

Prior to the start of work, the Contractor shall submit resumes for the Quality Supervisors for review and approval of the Engineer.

In the event of a replacement Quality Supervisor, the Contractor shall submit the resume of the replacement Quality Supervisor within 3 business days of the resignation of a Quality Supervisor.

MEASUREMENT AND PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 180.4 FULL TIME QUALITY CONTROL SUPERVISORS shall be considered incidental to the Work.

ITEM 233.1 CULVERT AT MP 44.27 REPLACEMENT LUMP SUM
ITEM 233.2 CULVERT AT MP 44.29 REPLACEMENT LUMP SUM

GENERAL

The work under this section shall conform to the requirements of the Special Provisions, plans and all relevant Sections of the Standard Specifications including the Supplemental Specifications, and the requirements below. For those component parts where no specific requirement is stipulated, the MBTA Commuter Rail Standards shall apply except for payment.

Work under Items 233.1 and 233.2 shall include all materials, equipment and labor needed to replace each of the existing culverts and associated headwalls and wingwalls with new precast concrete culverts with headwalls and wingwalls as shown on the Plans. The work also includes selective clearing and thinning at ends of the existing and proposed culverts, removal and reinstallation of the existing tracks, excavation, backfilling and placement of rip-rap at ends of culverts, installation of erosion control including compost filter tubes with silt fence, construction of cobble splash pads, and other work as shown on the Plans. Once the new culverts are active, the existing stone box portion of the culverts will be retired and the pipe (CMP or RCP) extensions removed. This includes the removal and disposal of the existing roof of the stone box portion and placement of compacted reused stockpiled fill within the existing culvert void, and removal and disposal of the existing pipe extensions.
The Contractor is responsible for removal and disposal of excavated soil at a location within railroad right-of-way as directed by the Engineer or Railroad. Any slope restoration for disposal shall be considered incidental to the culvert replacement.

The water level at the existing culverts is subject to change, and the Contractor is responsible for determining the water levels that will exist during construction. The Contractor shall take the appropriate measures to control water during construction, and any associated dewatering shall be considered incidental to the culvert replacement.

Cost for temporary removal and reinstalling ballast and track for construction phasing at each culvert is incidental to the culvert replacement.

Payment for materials shown on the Plans as being part of these culvert replacements or which may be incidental to their construction shall be included in the Items 233.1 and 233.2.

SELECTIVE CLEARING AND THINNING

The work under this heading shall be performed in accordance with the requirements under Item 102. SELECTIVE CLEARING AND THINNING in the Special Provisions. The work is incidental to the culvert replacement.

FURNISH BALLAST

The work under this heading shall be performed in accordance with the requirements under Item 458.6.1 FURNISH BALLAST in the Special Provisions. The work is incidental to the culvert replacement.
BALLAST CLEANING

The work under this heading shall be performed in accordance with the requirements under Item 492.10.1 BALLAST CLEANING in the Special Provisions. The work is incidental to the culvert replacement.

TRACK RECONSTRUCTION
The work under this heading shall be performed in accordance with the requirements under Item 492.11.1

TRACK RECONSTRUCTION in the Special Provisions. The work is incidental to the culvert replacement.

HANDLING & DISPOSAL OF EXCAVATION SPOILS

The work under this heading shall be performed in accordance with the requirements under Item 492.11.3 HANDLING & DISPOSAL OF EXCAVATION SPOILS in the Special Provisions. The work is incidental to the culvert replacement.

CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS

The work under this heading shall be performed in accordance with the requirements under Item 492.3 CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS in the Special Provisions. The work is incidental to the culvert replacement.

SURFACE AND ALIGN BALLASTED TRACK

The work under this heading shall be performed in accordance with the requirements under Item 492.8.1 SURFACE AND ALIGN BALLASTED TRACK in the Special Provisions. The work is incidental to the culvert replacement.

SEDIMENT CONTROL BARRIER

The work under this heading shall be performed in accordance with the requirements under Item 767.121 SEDIMENT CONTROL BARRIER in the Special Provisions and Contract Documents. The work is incidental to the culvert replacement.

CONTROL OF WATER

The work under this heading shall be performed in accordance with the requirements under Item 991. CONTROL OF WATER in the Special Provisions and Contract Documents. The work is incidental to the culvert replacement.

EXCAVATION FOR TRACK

The work under this heading shall be performed in accordance with the requirements under ITEM 492.11.1 TRACK RECONSTRUCTION in the Special Provisions. Handling and Disposal of excavated track bed material is to be performed in accordance with ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS in Special Provisions. The work is incidental to the culvert replacement.

PRECAST CONCRETE

The work under this heading shall be performed in accordance with requirements under Item 906.1 PRECAST CONCRETE CULVERT ELEMENTS in the Special Provisions. The work is incidental to the culvert replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described in this special provision shall be paid for at the Contract lump sum price for ITEM 233.1 CULVERT AT MP 44.27 REPLACEMENT and ITEM 233.2 CULVERT AT MP 44.29 REPLACEMENT and shall include all necessary labor, equipment, materials and incidental work necessary for the completion of the work.

ITEM 234.1 CATTLE PASS RETIREMENT AT MP 68.00 LUMP SUM
ITEM 234.2 CATTLE PASS RETIREMENT AT MP 71.66 LUMP SUM

GENERAL

The work under this section shall conform to the requirements of the Special Provisions, plans and all relevant Sections of the Standard Specifications including the Supplemental Specifications, and the requirements below. For those component parts where no specific requirement is stipulated, the MBTA Commuter Rail Standards shall apply except for payment.

Work under Items 234.1 and 234.2 shall include all materials, equipment and labor needed to retire each of the existing cattle pass structures as shown on the plans. The work also includes selective clearing and thinning, removal and reinstallation of existing track, excavation, removal and disposal of existing rail top roof, fill cattle pass with compacted reused stockpiled fill, installation of compost filter tubes with silt fence, placement of the proposed RCP.

Payment for materials shown on the Plans as being part of these cattle pass retirement, or which may be incidental to their construction shall be included in Items 234.1 and 234.2.

SELECTIVE CLEARING AND THINNING

The work under this heading shall be performed in accordance with the requirements under Item 102. SELECTIVE CLEARING AND THINNING in the Special Provisions. The work is incidental to the cattle pass retirement.

FURNISH BALLAST

The work under this heading shall be performed in accordance with the requirements under Item 458.6.1 FURNISH BALLAST in the Special Provisions. The work is incidental to the cattle pass retirement.

BALLAST CLEANING

The work under this heading shall be performed in accordance with the requirements under Item 492.10.1 BALLAST CLEANING in the Special Provisions. The work is incidental to the cattle pass retirement.

TRACK RECONSTRUCTION

The work under this heading shall be performed in accordance with the requirements under Item 492.11.1 TRACK RECONSTRUCTION in the Special Provisions. The work is incidental to the cattle pass retirement.

HANDLING & DISPOSAL OF EXCAVATION SPOILS

The work under this heading shall be performed in accordance with the requirements under Item 492.11.3 HANDLING & DISPOSAL OF EXCAVATION SPOILS in the Special Provisions. The work is incidental to the cattle pass retirement.

CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS

The work under this heading shall be performed in accordance with the requirements under Item 492.3 CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS in the Special Provisions. The work is incidental to the cattle pass retirement.

SURFACE AND ALIGN BALLASTED TRACK

The work under this heading shall be performed in accordance with the requirements under Item 492.8.1 SURFACE AND ALIGN BALLASTED TRACK in the Special Provisions. The work is incidental to the cattle pass retirement.

SEDIMENT CONTROL BARRIER

The work under this heading shall be performed in accordance with the requirements under Item 767.121 SEDIMENT CONTROL BARRIER in the Special Provisions. The work is incidental to the cattle pass retirement.

CONTROL OF WATER

The work under this heading shall be performed in accordance with the requirements under Item 991. CONTROL OF WATER in the Special Provisions The work is incidental to the cattle pass retirement.

EXCAVATION FOR TRACK

The work under this heading shall be performed in accordance with the requirements under ITEM 492.11.1 TRACK RECONSTRUCTION in the Special Provisions. Handling and Disposal of excavated track bed material is to be performed in accordance with ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS in Special Provisions. The work is incidental to the cattle pass retirement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described in this special provision shall be paid for at the Contract lump sum price for ITEM 234.1 CATTLE PASS RETIREMENT AT MP 68.00 and ITEM 234.2 CATTLE PASS RETIREMENT AT MP 71.66 and shall include all necessary labor, equipment, materials and incidental work necessary for the completion of the work.

ITEM 458.6.1 FURNISH BALLAST N/A

GENERAL

These Specifications describe requirements for the furnishing, testing, and procurement of ballast to be used in track construction and for aligning and surfacing track. Ballast shall meet, in every respect, specifications of the American Railway Engineering and Maintenance-of-Way Association (AREMA) contained in the Manual for Railway Engineering, Volume 1, Chapter 1, Part 2 – Ballast, Sections 2.2 through 2.6 standards. Ballast shall be installed at locations per the Contract Drawings and at the direction of the Engineer. o

SUBMITTALS

1. Prior to shipment of ballast, submit the name of the ballast supplier, processing facility and testing laboratory that will sample and test the ballast as in AREMA, Chapter 1, Tables 1.2.1 and 1.2.2 to the Engineer for review and approval.
2. Prior to shipment of ballast, submit inspection reports certifying that all required tests and inspections as specified herein have been made and that the ballast being shipped is in full compliance with AREMA specifications and as specified herein to the Engineer for review and approval.
3. Prior to shipment of ballast, submit a certification that field samples were secured in accordance with the current ASTM Methods of Sampling Designation D75, and that test samples were reduced from field samples by the means of ASTM C702 to the Engineer for review and approval.aRequired testing includes, but is not limited to:
    a. Sieve Analysis: ASTM Method of Test Designation C136
    b. Material Finer than No. 200 Sieve: ASTM Method of Test Designation C117
    c. Bulk Specific Gravity: ASTM Method of Test Designation C127
    d. Absorption: ASTM Method of Test Designation C127
    e. Percentage of Clay Lumps and Friable Particles: ASTM Method of Test Designation C142
    f. Resistance to Degradation: ASTM Method of Test C131
    g. Designation C535 - Material gradations with particles retained on 1” sieve
    h. Designation C131 - Material gradations with 100% passing the 1” sieve
    i. Sodium Sulfate Soundness: ASTM Method of Test Designation C88
    j. Unit Weight: ASTM Method of Test Designation C29
    k. Percent of Flat and/or Elongated Particles: ASTM Method of Test Designation D4791
4. For each ballast sample obtained, test results shall be entered in the **Field Inspection Summary Report** included in this specification and submitted to the Engineer for review and approval prior to the shipment of ballast.
5. Sampling and testing of ballast as specified herein shall not be billed separately but are included in the cost per ton of ballast supplied to MassDOT.

Submit the following for review and approval by the Engineer before ballast work is started:

1. List of proposed equipment for use in construction. The list shall be submitted to the Engineer twenty-one (21) days prior to the start of work and shall include the name of the manufacturer, dimensions and weights of the equipment, and the intended use of each piece of equipment.
2. Proposed construction and installation procedures for ballast installation, and track surface and alignment.
3. Manufacturer’s certificate of compliance to the Engineer for all materials that are incorporated into the work.

QUALITY ASSURANCE

1. Provide certified test results of ballast quality and grading as conducted by the approved testing laboratory.
2. In addition, provide tests for gradation (sieve analysis) for every 1,000 tons of ballast delivered to the job site.
3. Testing, as defined by this specification, shall be performed at least two (2) times a year or as directed by the Engineer, to ensure the quality of the material being produced. If the supplier changes the location of the source or encounters changes within the supply source, laboratory testing shall be performed on the new material to ensure compliance with specifications.
4. Field samples shall be secured in accordance with the current ASTM Methods of Sampling, Designation D75. Test samples shall be reduced from field samples by the means of ASTM C702. If the source of ballast changes during ballast installation, additional certified test results (in accordance with the requirements included under Submittals and Quality Assurance) shall be provided to the Engineer for review and approval prior to the shipment of the ballast from the new source.
5. Supplier shall certify with billing that the ballast delivered is typical of the ballast which has been tested and that has been approved by the Engineer.
6. Perform sampling and tests of the ballast material to determine compliance with specified requirements. Samples shall be initially taken from the supplier's source (quarry). Additional samples may be taken from the site at the direction of the Engineer.

PRODUCTS

PRODUCTS AND MATERIALS TO BE PROVIDED BY MCRR OR MASSDOT

1. None

PRODUCTS AND MATERIALS TO BE PROVIDED BY THE CONTRACTOR

1. All Ballast MATERIALS
    1. Ballast shall conform to AREMA Number 4 Gradation.
    2. Ballast shall be crushed, quarried, and washed Granite or Traprock composed of hard, strong, angular, and durable particles, free from frozen lumps, foreign materials, and injurious amounts of substances and conforming to all of the requirements of these specifications.
    3. Ballast shall conform to the following Limiting Values:

No.	**Property**	**Ballast Material**	
		Granite	**Traprock**
1.	Sieve Analysis	AREMA No. 4	AREMA No. 4
2.	Percent Material Passing No. 200 Sieve	1.0%	1.0%
3.	Bulk Specific Gravity See Note 1 below	2.60	2.60
4.	Absorption Percent	1.0	1.0
5.	Percent Clay Lumps and Friable Particles	0.5%	0.5%
6.	Degradation Percent	35%	25%
7.	Soundness (Sodium Sulfate) 5 Cycles (Percent Material Loss)	5.0%	5.0%

8.	Unit Weight (lb/ft^3)	By Engineer	By Engineer
9.	Percent Flat and/or Elongated Particles	5.0%	5.0%
	Note 1: Use ASTM Test Designation most representative of ballast material gradation as specified above. Note 2: The limit for bulk specific gravity is a minimum value. Limits for the remainder of the tests are maximum values.		

EXECUTION

DELIVERY OF BALLAST

1. Contractor is responsible for coordinating delivery of ballast, including the delivery schedule. Contractor shall coordinate delivery windows and track access required for ballast delivery with MCRR.
2. Contractor shall provide MCRR written notice a minimum of two weeks prior to the date ballast will be delivered to the site.
3. The Contractor is responsible for all ballast distributed by rail and truck.
4. Should the Contractor want work train assistance to dump ballast, that work train assistance will be provided by MCRR under its railroad field services agreement with MassDOT.
5. Contractor is responsible to stockpile, load, and distribute the ballast should a work train be utilized.
6. Contractor is responsible for all scheduling and coordination for ballast delivery. MassDOT is not responsible for delays or any additional costs associated with delivery of ballast, all costs shall be the responsibility of the Contractor.

LOADING

1. Ballast shall be loaded only into rail cars or trucks which are in good order, tight enough to prevent leakage and waste of material, and clean and free from rubbish or any substance which would foul the ballast.

INSPECTION

1. MassDOT, or its representatives, reserve the right to make unscheduled visits to the supplier's facility during normal business hours for the following purposes:
    a. Observe sampling and testing procedures to assure compliance with the requirements of these specifications.
    b. Obtain representative samples of the prepared material being produced and shipped.
    c. Review plant inspection, methods, quality control procedures, and equipment and review test results of both current and previous tests.
2. The supplier shall provide MassDOT or its representative with such assistance, materials, and laboratory testing equipment as necessary to perform so called "on site production tests" consisting of site gradation and percent passing No. 200 sieve.
3. Performance of these tests at the time of an unscheduled inspection visit is the right, but not the duty, of the inspector.

CONSTRUCTION QUALITY CONTROL AND ASSURANCE

ACCEPTANCE/REJECTION

1. To be accepted, ballast offered shall conform to this specification in all respects. Ballast is also subject to inspection at delivery and is at the supplier's risk until acceptance. Ballast rejected for non-compliance with this specification will be picked up, loaded, and transported off-site at the Contractor's expense. Ballast installed prior to acceptance and subsequently rejected for non-compliance with this specification shall be removed and replaced at the Contractor's expense. MassDOT is not responsible for any costs associated with rejection of ballast.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 458.6.1 Furnish Ballast is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, Item 234.2 Cattle Pass Retirement at MP 71.66, and Item 996.01. Retaining Wall Structure. No payment will be made under this Item.

MassDOT Rail Division
FIELD INSPECTION SUMMARY REPORT
To Be Submitted by Supplier

Ballast Supplier:	**Sample Location:**
Quarry Location:	**Sample No./Type:**
Date Sampled:	**Testing Company:**

Field samples were secured in accordance with the current ASTM Methods of Sampling Designation D75. Test samples were reduced from field samples by the means of ASTM C702.

_____

Supplier's Authorized Signature

TEST	ASTM STANDARD		ALLOWABLE RESULT/RANGE		TEST RESULT	PASS/ FAIL	COMMENTS
1. Sieve analysis AREMA No. 4	**C136**		**UL %**	**LL %**			
Ballast Material ❑ Granite (G) ❑ Traprock (T)	% Passing	2"	-	100%			
		1 ½"	100%	90%			
		1"	55%	20%			
		¾"	15%	0			
		½"	N/A	N/A		N/A	
		⅜"	5%	0			

TEST	ASTM STANDARD	LIMITING VALUE	TEST VALUE	PASS/ FAIL	COMMENTS
2. Percent Material Passing No. 200 Sieve	C117	1.0%			
3. Bulk Specific Gravity	C127	2.60			
4. Absorption Percent	C127	1.0			
5. Percent Clay Lumps and Friable Particles	C142	0.5%			
6. Degradation Percent	□C131/□C535	G-35% /T-25%			
7. Soundness (Sodium Sulfate) 5 Cycles (Percent Material Loss)	C88	5.0%			
8. Unit Weight (lb/ft^3)	C29	By Engineer			
9. Percent Flat and/or Elongated Particles	D4791	5.0%			

ITEM 492.3 CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS N/A

DISPOSAL REGULATIONS

Wood materials are to be disposed in accordance with local, State and Federal regulations. The Contractor shall notify MassDOT which facility will be used to dispose of crossties and wood materials. A copy of the MassDEP certification showing that it is an approved disposal facility along with all weight slips for crossties/timbers sent to an approved facility shall be provided to MassDOT.

1. REMOVALS/DEMOLITION

The Contractor shall remove and dispose of materials to the limits indicated in the Contract Drawings and these Special Provisions.

a. Non-contaminated and contaminated materials shall be disposed of at a certified disposal facility. The Contractor shall provide the weight slips and other documentation as required for the disposal of all materials.
b. Disposal of all ties/timber removed from track during general tie/timber replacement and track rehabilitation at a certified and registered facility. Pieces of ties may have to be picked up by hand and/or raked up to be loaded out for disposal.

DISPOSAL OF OLD CROSSTIES

The Contractor is responsible for the cleanup of all crossties on the right-of-way including those from previous crosstie installation projects. All old crossties and timbers are to be picked up and disposed of at a MassDEP approved disposal site as specified in the Special Provisions. Wood pickup is to be done concurrently with installation of crossties.

1. Disposal of Materials

a. Dispose of scrap ties and timber.
b. Disposal of all ties/timber removed from track during general tie replacement and track reconstruction at a certified and registered facility.
c. The Contractor to obtain:
    i. Weight tickets from certified facility giving tie tonnage, trucker, truck number and date brought to the plant.
    ii. Corresponding truck tickets used by haulers to remove ties from project and transferred to certified facility.
    iii. Tickets from (a) and (b) must match and will be used to determine actual payment to the Contractor.
d. Small pieces of removed ties will not be allowed to remain on the right-of-way. Pieces of ties may have to be picked up by hand and/or raked up to be loaded out for disposal

PRODUCTION RATES

Scrap crossties and other wood products shall be removed from the right of way within five (5) working days of their removal from the track.

Piles of scrap crossties and other wood products are permitted at locations agreed upon between the Contractor and

the MCRR. Such staging piles must be removed within thirty (30) days of completion of the crosstie installation phase of this Contract.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 492.3 is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, Item 234.2 Cattle Pass Retirement at MP 71.66, and Item 996.01 Retaining Wall Structure. No payment will be made under this Item.

ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK N/A

GENERAL

This Section specifies the requirements for placing ballast for surfacing and aligning the track. Work includes general procedures for curve modifications in existing track, including track raises, changes in track superelevation where existing conditions have been modified by contract work, as well as final surfacing and alignment in areas where complete track reconstruction will be performed. Work includes:

1. Initial and final surfacing and aligning of tracks
2. Track ballast compaction
3. Track Raises
4. Curve and superelevation modification
5. Resurfacing and aligning of track

Related work specified elsewhere includes:

1. ITEM 458.6.1 – FURNISH BALLAST
2. ITEM 492.11.1 – TRACK RECONSTRUCTION

REFERENCE STANDARDS

1. Current American Railway Engineering and Maintenance-of-Way Association (AREMA), Manual for Railway Engineering, Chapter 1.

SUBMITTALS

1. Submittals will be reviewed for general conformance with the intent of the Contract Documents. This review will not relieve the Contractor of final responsibility for the means, methods, procedures, and sequences to be used.
2. The following submittals shall be made to the Engineer for review and approval prior to procuring any material or performing any work required under this Section:
    a. A detailed description of the methods and procedures to distribute, tamp, regulate, compact and dress ballast for track work.
    b. Submit type and specifications for equipment to be used in the placing, compacting, and tamping of track ballast and for aligning of track.
    c. Submit charts and reports from tamper/liner for all curves adjusted as part of the Work.

MECHANIC

1. A Qualified Mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

QUALITY CONTROL

1. Testing of ballast at the production facility and on the job-site shall be performed in accordance with ITEM 458.6.1 FURNISH BALLAST.
2. Tolerances
    a. Track construction tolerances shown below shall not be exceeded.

3. Document and provide existing track geometry data prior to commencing surface and align work and upon completion of all surface and align work. Data may be collected by geometry car or other suitable survey equipment capable of measuring and documenting line and surface data required to confirm construction

is within required tolerances. All data shall be submitted to MassDOT for record.

PRODUCTS

PRODUCTS AND MATERIALS TO BE PROVIDED BY MCRR OR MASSDOT

1. None.

PRODUCTS AND MATERIALS TO BE PROVIDED BY THE CONTRACTOR

1. Ballast furnished by ITEM 458.6.1 FURNISH BALLAST.

EXECUTION

LINE AND GRADE

1. Final track line and grade shall conform to the existing track line and grade to the extent possible except as indicated otherwise in the Contract Drawings.
2. The final profile shall be raised in additional areas as indicated in the Contract Drawings.

CONSTRUCTION TOLERANCES

1. Final surface, aligning and gauge must meet FRA Standards and Class for the line that's being worked
2. Final surface, aligning and gauge of track shall be within the following tolerances:

Track Surface and Alignment

Construction Tolerance	**(Inches)**
Deviation from uniform profile on either rail at the midordinate of a 62 ft. chord shall not exceed	± ¼"
Deviation from zero cross level at any two points less than 62 ft. apart on tangents or specified elevation on curves shall not exceed	± ⅛"
The difference in cross level between any two points less than 62 ft. apart on tangents or curves shall not exceed	± ¼"
Deviation from uniform alignment between any two points less than 62 ft. apart on tangent and curved track shall not exceed	± ¼"

3. There is no reverse elevation allowed in curves. Curves shall be elevated as follows:
    a. Elevation shall be run out in spirals as indicated on the Contract Documents.
    b. The actual elevation in a curve shall be within +⅛" and -0" of the design value.
4. Gauge of track shall be as follows:
    a. **CWR: 56½" (± 1/8").**
    b. Jointed Rail: 56½" (± 1/8").
5. Required superelevation in curves is as indicated in the Contract Drawings.
6. The Contractor, at no cost to the Project, shall correct any deviations from the above specified tolerances.

RUNOFF – VERTICAL ALIGNMENT

1. The runoff at the end of a raise into a hold point in track, such as at the project limits location, shall not exceed 1-1/2 inch in 31 feet of track unless otherwise approved by the Engineer.

MONITORING CURVE MOVEMENT FOLLOWING TRACK SURFACING AND ALIGNING

1. Stake and monitor curves for movement in accordance with requirements of MassDOT MW-1, Appendix A Continuous Welded Rail (CWR) procedures.

SURFACING AND ALIGNING FOR TRACK RECONSTRUCTION AND CURVE MODIFICATIONS

1. Check grade lines and cross section prior to placing ballast. Bring ballast to proper elevation as shown in the Contract Drawings.
2. Clean trackbed area of debris and standing water prior to placing ballast.
3. Distribute and compact four inch layers (maximum) of ballast uniformly and as required to achieve required ballast depth prior to tie distribution.
4. Deliver ballast at a rate no faster than can be satisfactorily incorporated into the work, maintaining a proper interval of operations, and at such times as to permit proper inspection by the Engineer.
5. To extent practicable, unload ballast in position for use with a minimum of redistribution and dressing.
6. Self-spreading vehicles may be used as approved by the Engineer. When stone is initially spread by self-spreading vehicle a power grader may be used to assist spreading operations.
7. Shape ballast to a true section conforming to the ballast section shown on Standard Plans and Contract Drawings.
8. Thoroughly compact each ballast layer until stones are firmly interlocked and surface is true and unyielding. Compact each lift with not less than four passes of a roller or a vibratory compactor subject to the following requirements:
    a. Compact by rolling using either a self-propelled, three-wheel, or two axle roller of such weight that will provide compression under the rear wheels of not less than 350 pounds per linear inch of tread; or using a two or three-wheel tandem roller having a weight per inch of drive roll of not less than 350 pounds, and every part of the surface receiving compression from the drive wheels.rCompact by vibration using vibratory compactors of either the roller or pad type. Dynamic force for either type shall not be less than 20,000 pounds and the frequency range shall be 1100 to 1500 vpm. Use machines equipped with a governor which can be set and locked to control rate of impulse. Provide a tachometer or other suitable device for accurately checking the frequency of vibration during the compacting operation.tTop surface of initial layers of ballast shall be smooth, flat and uniformly compacted prior to distributing ties. Surface shall be free of ruts.
    b. Unload ballast in quantities which will fill tie cribs and provide an adequate amount of ballast for the initial track raise with sufficient surplus to continue to hold track after initial raise.
    c. Prior to dumping ballast in track, ties shall be properly spaced as specified and shall be square with rails.
    d. Contractor shall re-space and straighten ties as required before stone is distributed.
    e. The Contractor shall use a ballast regulator machine to distribute the stone ballast in sufficient quantity for tamping the track and for restoring the ballast section.
    f. The Contractor shall avoid pulling sod, vegetation, and other foreign material onto the track structure or shoulders for purpose of tamping or dressing the ballast section. Any sod, vegetation or foreign matter inadvertently pulled in shall be removed by the Contractor prior to tamping.

g. Clean the track way area of all debris and standing water prior to placing of ballast. Do not place ballast on frozen subgrade or subballast.
h. Deliver ballast at a rate no faster than can be satisfactorily incorporated into the work.
i. To the extent practicable, unload ballast in position for use with a minimum of redistribution and dressing.

9. Tamping
   a. Tamp ballast with 16 tool, squeeze-vibratory type, power tamping equipment. Control of power tamper shall ensure maximum compaction of ballast uniformly along track. The Engineer will determine tamping variables, including rate of advance, number of passes, number of insertions per tie (if more than two are required), length and number of blades, and frequency of vibration. Tamping tools shall be replaced when the working surface is worn more than 30 percent of its original surface area. Procedures and equipment shall be as approved. To allow for proper insertion depth below bottom of crossties, the tamping tools shall be adjusted to compensate for concrete/timber crosstie size difference. Tamp ballast thoroughly under both sides of tie from a point 15 inches inside rails to ends of tie.
   b. For each tie, tamp simultaneously inside and outside both running rails on both sides of tie. Minimum tamping insertions shall be two.
   c. The Contractor shall remove 5 ties per mile, at locations selected by the Engineer, in order that the Engineer may inspect ballast compaction beneath ties. If compaction does not meet requirements of these Specifications, additional ties shall be pulled at the Engineer's direction to discover limits of inadequate tamping. Areas of inadequate tamping shall be retamped at no additional cost to MassDOT.aTamping on snow covered or frozen ballast will not be permitted.
10. Surfacing and Aligning
   a. Surface and align track by methods which will prevent undue bending of rail, straining of joints, or damaging of rail fastening assemblies.
   b. Surface and align track only after cribs are filled with ballast.
   c. Restore ties pulled loose during surfacing to full bearing against rail and properly secure them.
   d. Remove and replace any ties or fasteners damaged during surfacing operations with new ties and fasteners at no additional expense to MassDOT.
   e. Surface and align track to meet Class 3 specifications per FRA Track Safety Standards Part 213 and the Contract Documents.
   f. Surfacing and aligning shall be performed to comply with surface and superelevation tolerances specified and shall consist of a lift of one inch maximum, unless otherwise directed by the Engineer, and shall not endanger horizontal and vertical stability of tracks.
   g. Track liner employed shall be a fully automatic model capable of determining existing curve data, computing new values for optimum curve value, and lining track to the new values without disturbing track surface.
   h. Machine shall be capable of producing a tape or graph showing existing and proposed values and this tape shall be reviewed and approved by the Engineer prior to final lining. Tape shall become the property of MassDOT.
11. Ballast Compaction and Ballast Dressing
   a. Concurrent with surfacing and aligning of all tracks and turnouts, consolidate cribs and shoulders and dress ballast to conform to ballast section shown in the Contract Drawings and as directed by the Engineer.
   b. After surfacing and alignment of track is completed, consolidate cribs and shoulders and dress ballast to conform to ballast section shown in the Contract Drawings. Top of ballast shall be one inch below base of rail. Ballast shoulders shall be 12” minimum on tangents and 16” minimum on curves. The 16” minimum shoulder width on curves may be reduced at the direction of the Engineer, shoulder width on curves shall not be reduced without prior approval of the Engineer.1Subbase outside toe of slope of ballast that has been fouled or disturbed by Contractor's

operations shall be properly sloped as shown in the Contract Drawings or as directed by the Engineer.

c. Upon completion of surfacing and aligning produce as-built chart from tamper or liner and submit to the Engineer.
d. Reconsolidate cribs, shoulders and redress ballast if disturbed during removal of existing rail.

FINAL TRACK INSPECTIONS

1. Final horizontal and vertical alignment, gauge, superelevation and cross level shall be within the tolerances specified. In order to determine the acceptability of finished track, the Contractor together with MassDOT and MCRR, and at the Contractor's expense, shall conduct a final inspection to establish that track construction is within tolerances specified in ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK.
2. Track deviations disclosed by inspection, which exceed tolerances specified herein, shall be corrected by the Contractor at no additional cost to MassDOT. Reinspections shall be made by the Contractor and MassDOT and MCRR to ensure that corrections have been made.tFinal inspection shall include testing by geometry car or survey equipment equipment with test parameters set for FRA Class 4 track, to evaluate gauge, cross level, left and right rail profiles, track alignment, twist, warp and superelevation. Equipment shall be capable of measuring the parameters specified above with sufficient accuracy to establish that the track construction is within the specified tolerances. Contractor shall submit for approval the proposed equipment to be used and who will be conducting the testing, prior to the start of the work. Records of all testing and results shall be submitted to the Engineer.
3. Notify the Engineer one month in advance regarding the request for the scheduling of final track inspections.
4. The Contractor shall correct track deviations, as disclosed by final inspection, at no additional cost to MassDOT.
5. The Contractor shall participate in any retesting, required as a result of corrections to work, at no additional cost to MassDOT. Cost of MassDOT approved equipment required for retesting shall be the sole responsibility of the Contractor.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 492.8.1 is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, Item 234.2 Cattle Pass Retirement at MP 71.66, and Item 996.01 Retaining Wall Structure. No payment will be made under this Item.

ITEM 492.8.2 TRACK MONITORING N/A

GENERAL

The work under this section shall conform to the requirements of all relevant Sections of the Standard Specifications including the Supplemental Specifications and the requirements below.
This work shall consist of:

- Supplying and installing track monitoring points along the track within the construction zone of the sheet pile wall and associated anchor piles.
- Taking and recording track monitoring measurements (both horizontal and vertical) in the locations and at the frequency spelled out in this specification.
- Allowing access for the Engineer to verify the coordinates and elevations at all Track Monitoring Points.

SUBMITTALS

A. Qualifications of the Registered Land Surveyor preparing and submitting measurements of track monitoring points.
B. Submit field notes prepared by the surveyor when installing the track monitoring points. Each monitoring point shall be given a unique identification number. Submit a 20-scale plan showing each monitoring point. For each point, provide point number, coordinates (MA state grid), initially surveyed elevation, description of point, and 3 ties to existing features.
C. Daily log of track monitoring data (horizontal and vertical location) taken at monitoring points in accordance with the frequency of measurements described below. d

QUALITY ASSURANCE

A. The Contractor shall use the services of a Registered Land Surveyor, licensed in the Commonwealth of Massachusetts, to set all track monitoring points, to establish the base line survey at all track monitoring points, and to take all measurements of the horizontal location and elevation at each monitoring point.

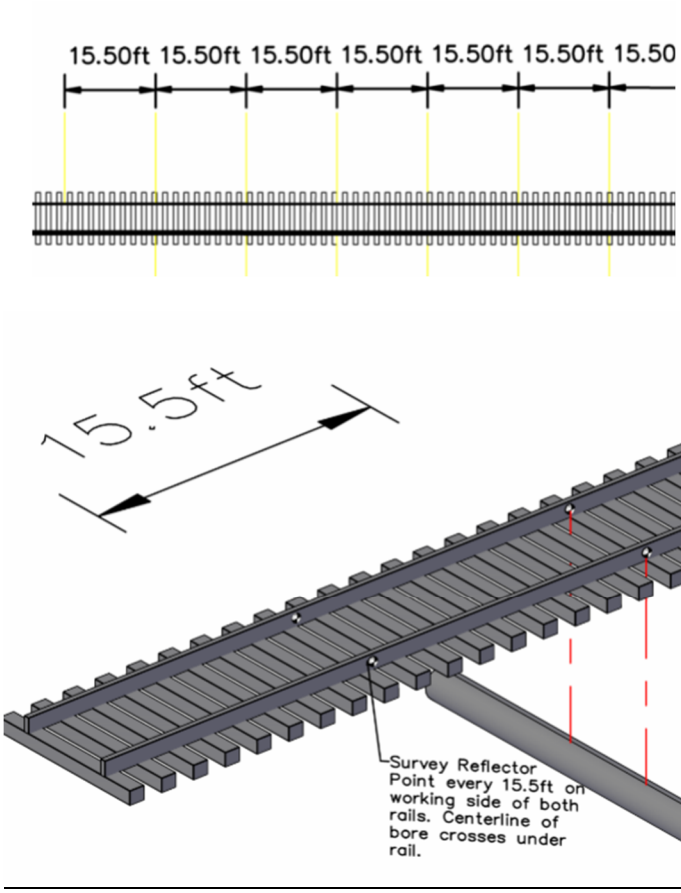
MATERIALS

Measurement points can be established utilizing survey reflector or target type equipment attached to the base of the rail or by simply taking Top of Rail measurements.

CONSTRUCTION METHODS

MONITORING POINTS:

A. Monitoring points through the work area shall be located every 15.5 feet as shown in the two drawings below and placed on the working side of both rails so that they are not affected by passing trains.
B. The elevation of each point shall be based on at least two benchmarks approved by the Engineer.
C. The initial location and elevation of each monitoring point shall be established by three independent surveys and certified by a Registered Land Surveyor.
D. Monitoring points shall be located so that they are protected from damage and wear. Locations of the monitoring points shall be reviewed and approved by the Engineer.
E. Contractor shall replace and restore any monitoring points that become damaged to the same standard as the initial installation, at no additional cost to MassDOT Rail.



MONITORING PLAN

Monitoring will be conducted by taking measurements of the survey reflectors or targets. Top of Rail measurements will be permitted for this project. The survey area will monitor both the Cape Main Line and Siding Track within the construction limits at least 100 feet on each side beyond the wall and anchor pile construction limits with the survey reflector points continuing to be placed at every 15.5 feet. Once all targets are installed (under the supervision of MCRR), no track fouling will be required for surveying after installation. If Top of Rail survey shots are the chosen method, then measurements will be taken under proper track protection from MCRR.oSurvey Reflector or Top of Rail measurements will be taken:

1. Prior to the commencement of active sheet pile and anchor pile installation within 14 days (about 2 weeks) ahead of the start of the work. These will be the baseline measurements to which subsequent data will be compared.
2. Twice each day at the beginning and end of all work shifts during active sheet pile and anchor pile installation.
3. Any time that an anomaly is noticed in the track geometry.
4. Upon completion of the work to install the sheet pile wall and anchor pile tie backs.
5. Five days after completion of the sheet pile wall and anchor pile tie backs.

MEASUREMENTS:

A. All measurements shall be taken by the Registered Land Surveyor as specified herein. All monitoring data must be submitted at the end of each day for review by MCRR and the Engineer. For documentation purposes, at the project's completion, a final complete version of the monitoring data that is stamped by

the Registered Land Surveyor shall be submitted to the Engineer.

B. All elevations and horizontal locations shall be compared to the initial elevations and horizontal locations at each monitoring point. The monitoring logs shall note the surveyed elevation and horizontal location, the initial elevation and horizontal location, and the difference between each. Provide a sketch or plan showing where each monitoring point is located. Elevation and horizontal location readings shall show the date, time, weather conditions, and temperature. Each reading shall also indicate:
    1. Monitoring Point unique identification number
    2. Station and offset, based on stationing of the track centerline
    3. Coordinates (Mass State Grid)
    4. Initial or base elevation (with date taken)
    5. Static elevation and horizontal location as surveyed
    6. Change in elevation and horizontal location (in inches)
    7. Total vertical and horizontal deflection in inches

C. Threshold and limiting values of vertical movement of the track that require action:
    a) Review - .25 inches
    b) Alert - .5 inches

D. Review Level - If a specific monitoring location indicates that movement exceeds the Review tolerance (0.25 inches), then the contractor shall:
    1. Re-survey the monitoring point to verify exceedance.
    2. Notify the MCRR and the Engineering representative on site before the end of shift.
    3. Present to MCRR and the Engineer representative on site an assessment of the nature/extent/cause of the exceedance, including consideration of any potential contributing factors.
    4. As needed based on Item 3, submit and implement a corrective action plan within 24 hours.

E. Alert Level - If a specific monitoring location indicates that movement exceeds the Alert tolerance (.5 inches), then the contractor shall:
    1. Cease all construction operations, potentially impacting the monitoring location.
    2. Immediately notify MCRR and the Engineering representative on site via phone; followed by an email.
    3. Submit and implement a corrective action plan within 24 hours.

F. There shall be no claims for additional payment by the Contractor nor will there be an extension of the project Completion Dates for delays related to stopping work because of movements and/or damages, mitigating movements and/or repairing damages.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate measurement and payment will not be made for the work of this Special Provision. All costs for ITEM 492.8.2 TRACK MONITORING shall be considered incidental to Item 996.01 Retaining Wall Structure.

ITEM 492.10.1 BALLAST CLEANING N/A

GENERAL

This work will consist of cleaning fouled ballast along the Railroad right-of-way at various locations on the line as shown in the Contract Drawings and/or as directed by MassDOT or the MassDOT (Owner's) Authorized Representative.

EXECUTION

LIMITS OF BALLAST CLEANING

1. Contractor is responsible for ballast cleaning at locations shown in the Contract Drawings and/or as directed by Owner's Authorized Representative.

BALLAST CLEANING REQUIREMENTS

1. Contractor shall remove fouled ballast from tie cribs to a depth of 4-inches below the bottom of tie.
2. Removal of fouled ballast shall be made via an excavator-mounted ballast cribbing bucket assembly or by another method subject to approval of the Engineer.
3. Contractor shall remove and dispose of fouled ballast in accordance with ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATED SPOILS.
4. Contractor shall place clean ballast in accordance with ITEM 458.6.1 FURNISH BALLAST.
5. Contractor shall surface and align track in accordance with ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK.

MECHANIC

1. A Qualified Mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 492.10.1 is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, Item 234.2 Cattle Pass Retirement at MP 71.66, and Item 996.01 Retaining Wall Structure. No payment will be made under this Item.

ITEM 492.11.1 TRACK RECONSTRUCTION N/A

This section specifies demolition of track, ballast and subballast; preparing subgrade; furnishing and installation of subballast, installation of ballast, ties, tie plates and associated new trackwork.

SUBMITTALS

All submittals shall be approved before any work may proceed. Contractor shall submit the following for review and approval:

1. Proposed Protection Measures: Submit informational report in accordance with FRA Title 49 Part 214 Railroad Work Place Safety and OSHA Part 1926 procedures, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

2. Indicate the following:
   a. Adjacent trackwork and systems equipment: Detail special measures proposed to protect adjacent trackwork and systems equipment to remain.
   b. Detailed sequence of demolition work, with starting and ending dates for each activity.

3. Contractor shall submit for approval the facility to be used for the disposal of crossties.

4. A detailed construction work plan describing of the methods and procedures to be used in the execution of TRACK RECONSTRUCTION and TRACK CONSTRUCTION – CULVERT AND CATTLE PASS AREAS as specified herein, including:
   a. Proposed construction and installation procedures for ballasted track construction, ballasted track panel removal and installation, tie installation, tie plate removals and replacements, and track surface and alignment.
   b. Proposed methods to distribute, tamp, regulate and compact ballast for track construction, reconstruction and track surface and alignment.

5. Proposed methods to distribute, tamp, regulate, and compact ballast for track surface and alignment.
   a. This submittal shall specify which equipment, and methods will be used for track work.
   b. The Contractor shall furnish for review and approval by the Engineer the type of tamping, aligning, and compacting equipment to be used for surfacing and aligning ballasted track.
      i. In general, the Contractor shall provide a 16-tool vibratory production tamper Mark IV Tamper or approved equal that is capable of tamping and aligning both the ballasted trackwork and ballasted special trackwork.
      ii. The Contractor shall provide one or more ballast regulators with brooms, plows, and wings.
6. Prior to bringing equipment to the job site, submit list of equipment proposed for use in construction. The list shall be submitted to the Engineer fifteen (15) days prior to the start of work and shall include the name of the manufacturer dimensions, type, age, present condition, and weights of the equipment and the intended use of each piece of equipment.

7. The Contractor shall furnish resumes for the Superintendent and Foremen who are to be employed in the Work to the Engineer for review and approval prior to the start of Work.

8. Additional submittals listed under PRODUCTS and MATERIALS sections.

QUALITY CONTROL

GENERAL

1. The Contractor shall perform all measures necessary to assure the quality of the Work. This shall include quality control and field quality control requirements specified in these Special Provisions.
2. Prepare a quality control plan for the Work to be performed for review and approval by the Engineer prior to start of work.
3. Contractor shall implement a comprehensive quality assurance program to assure that the Work is performed as specified in the Contract Documents.
4. Contractor's Quality Assurance program shall be supervised by supervisors in accordance with ITEM 180.4 FULL TIME QUALITY CONTROL SUPERVISORS qualified to supervise the installation, restoration, and renewal of tracks.
5. Track construction tolerances shall be in compliance with ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK
6. Except as modified by these Special Provisions or the Contract Drawings, trackwork construction and materials shall conform to the current AREMA Manual for Railway Engineering , MassDOT Rail MW-1 and all applicable MBTA and MassCoastal Railroad (MCRR) Track Standards.

REQUIRED CONTRACTOR SUPERVISION

1. One (1) Qualified Supervisor shall be on site during track reconstruction, track construction in bridge areas and quality control operations overseeing, instructing. and assuring quality workmanship. If multiple site are under construction at the same time, Contractor shall provide additional Supervisors as necessary, one (1) per site.

2. One (1) Qualified Foreman is to be on site during operations. If multiple sites are under construction at the same time, Contractor shall provide additional Foremen, one (1) per site. Qualified Foreman will work to ensure that quality deficiencies are addressed prior to the next step in the production sequence. Foremen are to be on the ground directly supervising the production process. Performing tasks that do not support this purpose shall not be permitted.

REQUIRED AMOUNT OF PERSONNEL

1. The Contractor shall have on site at all times a sufficient number of qualified Machine Operators to ensure safe operation and quality workmanship.
2. The Contractor shall ensure there is a sufficient number of Laborers to perform all tasks as needed for crosstie, bridge timber, and QC operations.

MECHANIC

1. A Qualified Mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

FINAL TRACK INSPECTIONS

1. The final surface, alignment, gauge, cross level, and superelevation shall be within the tolerances as specified in these Special Provisions.
2. In order to determine the acceptability of finished track, the Contractor, Engineer and MCRR shall make a final inspection to establish that track construction is within the tolerances specified herein and obtain approval of the Engineer.

3. Track deviations, as disclosed by the inspection described above, which exceed tolerances specified herein shall be corrected by the Contractor at no additional cost to MassDOT.
4. The Contractor shall make necessary re-inspections to confirm that corrections have been made.
5. The Contractor shall notify the Engineer and MCRR one week in advance before requesting any track inspection.

PRODUCTS

PRODUCTS TO BE PROVIDED BY MASSDOT RAIL

1. TRACK RECONSTRUCTION
    a. Crossties
    b. Replacement tie plates and joint bars that are not suitable for reuse as determined by the Engineer.
    c. Any existing track components damaged during construction shall be replaced by the Contractor at no additional cost to MassDOT.
    d. Contractor is responsible for all loading, transporting, distribution, and installation of plates, fasteners, and screw spikes.

2. TRACK CONSTRUCTION –CULVERT AND CATTLE PASS AREAS
    a. Crossties
    b. Rail
        i. 115 RE CWR mainline rail
        ii. 107 NH Jointed on Passing Siding and Mainline at Cattle Passes
        iii. Contractor is responsible for all loading, transporting, distribution, installation of rail, and de-stressing of CWR
        iv. Contractor shall install rail as shown in the Contract Drawings and as directed by the Engineer and MCRR.
    c. Resilient fasteners where applicable
    d. 5 ½" double shouldered relay Tie Plates
    e. 115RE and 107NH Rail Anchors
    f. 115RE Joint Bars as required
    g. 107NH Joint Bars as required
    h. 115RE/107NH Compromise Joint Bars as required
    i. Screw Spikes
    j. Contractor shall replace MassDOT provided materials damaged during construction at the Contractor's expense.
    k. Contractor is responsible for all loading, transporting, distribution, and installation of plates, fasteners, and screw spikes.

PRODUCTS TO BE FURNISHED BY THE CONTRACTOR

1. Subballast/Gravel Borrow
2. Ballast by ITEM 458.6.1 FURNISH BALLAST.
3. Nuts, bolts, and washers in conformance with AREMA.
4. Track spikes
5. Liquid plugging compound
6. Geotextile fabric

7. All additional materials not specifically cited as being provided by MassDOT or MassCoastal Railroad shall be provided by the Contractor and considered incidental to the work described in this section.

MATERIALS

SUBBALLAST/GRAVEL BORROW

1. Submittals:
    a. Prior to shipment of subballast, submit the name of the subballast supplier, processing facility and testing laboratory that will sample and test the subballast and submit to the Engineer for review and approval.
    b. Submit test results for the following required testing, which includes but is not limited to:
        i. Particle Size Analysis: ASTM Method of Test Designation D422
        ii. Material Finer than No. 200 Sieve: ASTM Method of Test Designation C117
        iii. Absorption: ASTM Method of Test Designation C127
        iv. Percentage of Clay Lumps and Friable Particles: ASTM Method of Test Designation C142
        v. Resistance to Degradation: ASTM Method of Test Designation C131 - Material gradations with 100% passing the 1” sieve
        vi. Unit Weight: ASTM Method of Test Designation C29
        vii. Sampling and testing of subballast as specified herein shall not be billed separately, but are included in the cost per ton of subballast supplied.

2. Quality Assurance:
    a. Provide certified test results of subballast quality and grading as conducted by the approved testing laboratory.
    Testing, as defined by this specification, shall be performed at least two times a year or as directed by the Engineer, to ensure the quality of the material being produced. If the supplier changes the location of the source or encounters changes within the supply source, laboratory testing shall be performed on the new material to ensure compliance with specifications.
    b. Field samples shall be secured in accordance with the current ASTM Methods of Sampling, Designation D75. Test samples shall be reduced from field samples by the means of ASTM C702.mContractor shall use the attached Field Inspection Summary Report
    c. If the source of subballast changes during subballast installation, additional certified test results (in accordance with the requirements included under Submittals and Quality Assurance) shall be provided to the Engineer for review and approval prior to the shipment of the subballast from the new source.
    d. Supplier shall certify with billing that the subballast delivered is typical of the subballast which has been tested and approved by the Engineer.
    e. Perform sampling and tests of the subballast material to determine compliance with specified requirements. Samples shall be initially taken from the supplier’s source (quarry). Additional samples may be taken from the site at the direction of the Engineer.

3. Subballast shall conform to the following gradation (MBTA Commuter Rail Material Specification No. 9251):

Subballast	
Sieve Size	Percent Passing by Weight
1 Inch	100
3/8 Inch	50 to 85
No. 4	35 to 65
No. 10	25 to 50
No.40	15 to 25
No.200	4 to 10

Subballast shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials.

4. Production and Handling:
    a. The subballast production facility shall be of such a design to permit production and/or blending without excessive working of the materials. The capacity of the production facility shall be adequate to efficiently produce the anticipated daily loadings providing sufficient stockpiles to facilitate loadings without any delays.
    b. Blending, stockpiling and other production and handling operations shall be managed by the producer to keep subballast clean and minimize segregation of the finished product. Stockpiling operations shall minimize the breakage or excessive fall in stockpiling operations. The movement of wheeled or tracked machines over stockpiled materials shall be limited.l
5. Loading:
    a. Processed subballast shall be loaded only into rail cars or trucks which are in good order, tight enough to prevent leakage and waste of material, and clean and free from rubbish and other deleterious materials.

6. Inspection:
    a. MassDOT, or its representatives, reserve the right to make unscheduled visits the supplier's facility during normal business hours for the following purposes:
        i. Observe sampling and testing procedures to assure compliance with the requirements of these specifications.
        ii. Obtain representative samples of the prepared material being produced and shipped.
        iii. Review plant inspection, methods, quality control procedures, equipment and review test results of both current and previous tests.
    b. The supplier shall provide MassDOT or its representative with such assistance, materials, and laboratory testing equipment as necessary to perform so called "on site production tests" consisting of site gradation and percent passing No. 200 sieve. Performance of these tests at the time of an unscheduled inspection visit is the right, but not the duty, of the inspector.

7. Acceptance/Rejection:
    a. To be accepted, subballast offered shall conform to this specification in all respects.
    b. Subballast is also subject to inspection at delivery and is at the supplier's risk until acceptance. Subballast rejected for non-compliance with this specification will be picked up, loaded and transported off-site at the supplier's expense.

EXECUTION

GENERAL

Except as otherwise indicated in the Construction Documents, trackwork shall be completed and restored within the service outage times coordinated with the MassCoastal Railroad as specified previously.

1. Trackwork shall be constructed to match existing line and existing profile except as indicated otherwise in the Contract Drawings and in these Special Provisions.

2. Contractor shall install track in accordance with current American Railway Engineering and Maintenance of Way Association, Manual for Railway Engineering, MassDOT MW-1 and MBTA & MassCoastal Track Standards including all Appendices, and these special provisions.

DEMOLITION & TRACK EXCAVATION

1. Contractor shall verify that utilities have been disconnected and capped before starting demolition operations.

2. Contractor shall protect any existing utilities, culverts, signal system equipment, mile posts, fences, and any other items not part of the demolition along the ROW. Should demolition activities damage any existing item, it shall be repaired or replaced immediately at no cost to MassDOT.

3. Contractor shall protect any adjacent tracks and walkways not part of demolition during demolition operations. Contractor shall take care to not undermine or structurally impact any adjacent tracks and will be responsible for any damage that occurs to adjacent tracks during demolition operations. Contractor shall repair any damage at no cost to MassDOT.

4. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from MassDOT and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction. Provide no less than 72 hours' notice of activities that may impact these facilities.

5. Remove rail, ties, OTM, switch and save for use in reconstructing track in areas designated for Track Reconstruction as shown in the Contract Drawings.

6. Remove existing ballast to the depth required to provide for installation of new subballast, and ballast as indicated in the Contract Drawings.

7. Use methods required to complete the Work within limitations of governing regulations and as follows:
   c. In the event torch cutting is approved by the Engineer, do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire- suppression devices during flame-cutting operations.
   d. In the event torch cutting is approved by the Engineer, maintain fire watch during and for at least four hours after flame cutting operations.
   e. In the event torch cutting is approved by the Engineer, maintain adequate ventilation when using cutting torches.

8. Use of explosives is not permitted.

9. Do not burn demolished materials on site.

10. Use water mist and/or other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

11. On-site storage or sale of removed items or materials is not permitted. With the exception of ferrous materials, all demolition waste and materials removed as part of this demolition shall become the property of the Contractor and shall be disposed of properly according to applicable local, State and Federal regulations, unless otherwise specified herein or by the Engineer.

12. All ferrous materials shall be salvaged and shall remain the property of the MassDOT Rail and Transit Division. All rail, joint bars, spikes, tie plates, and other OTM and ferrous materials removed as part of demolition shall be organized, transported to, and stockpiled at locations to be determined by the Operating Railroad. Joint bars shall be sorted separately from the remainder of the OTM.

13. Salvaged items, Contractor shall comply with the following:
    a. Clean salvaged items of dirt and demolition debris.
    b. Pack or crate items after cleaning. Identify contents of containers.
    c. Store items in a secure area until delivery to MassDOT Rail and Transit Division.
    d. Transport items to storage area designated by MassDOT Rail and Transit Division.
    e. Protect items from damage during transport and storage.
    f. Contractor shall follow MCRR and MassDOT Rail and Transit Division instructions for stockpiling, stacking and organizing salvaged materials to maintain proper organization and neatness.

14. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to the Operating Railroad or MassDOT that may be uncovered during demolition shall remain the property of MassDOT.

15. All timber ties, bridge timbers and wood materials being removed as part of this ITEM shall be removed from the property and disposed of under ITEM 492.3 CLEANUP AND DISPOSE OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS.
    a. All existing crossties removed shall become the property of the Contractor, removed from the ROW and disposed of at an approved facility.
    b. The Contractor shall provide the Engineer with a copy of a certified weight slip for each quantity shipped, unloaded, and properly disposed of at the licensed facility.

16. Unless classified as hazardous material, disposal of all excess excavated material will be along the railroad right-of-way within five (5) miles of the work site at a location(s) designated by Engineer.

17. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

18. Excess soil and ballast excavation spoils shall be transported and handled in accordance with ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS

REMOVAL OF EXISTING RAIL

1. Limits of rail removal shall be as indicated in the Contract Drawings.

2. Carefully remove the rail and OTM and transport to a storage area approved by the Engineer without damage. Materials damaged by the Contractor shall be replaced at no cost to MassDOT.

3. Protect rail and OTM from damage during the Work.

SPOT CROSSTIES AND SWITCH TIMBERS REPLACEMENT

1. The Engineer will mark existing ties and switch timbers to be changed

2. The Contractor shall change said crossties and switch timbers.

3. The Contractor shall dispose of crossties and switch timbers and legally dispose of them in location acceptable to authorities having jurisdiction.

PREPARATION OF SUBGRADE

1. Prior to placement of subballast or ballast, all trash and debris shall be removed from subgrade. Subgrade shall be clear and void of tire ruts, large stone or other deleterious objects before placement of subballast or ballast.

2. Subgrade shall be freely drained and compacted to the required density before placement of subballast or ballast conforming to the requirements of the AREMA for Railway Engineering, Volume 1, Chapter 1, Part 3 – Construction, Section 7.5.3 standards.

3. Before placement of subballast or ballast, subgrade shall be proof-rolled using heavily loaded pneumatic-tired equipment or, by vibratory roller on granular subgrades.

4. Where soft places are located they shall be undercut to a suitable depth, no less than 6 inches, and backfilled with compacted granular aggregate as directed by the Engineer.

PLACEMENT OF SUBBALLAST

1. Apply subballast course over the prepared subgrade and compact.

2. Deliver aggregate for subballast as uniform mixture and spread in layers without segregation.

3. Place subballast material with sufficient moisture to allow compaction to specified maximum density.

4. Compaction shall be accomplished with one or more of the following:
   a. Pneumatic-Tire Roller. Pneumatic-tire rollers shall be of the self-propelled type consisting of two axles equipped with pneumatic tires mounted so as to completely cover the area to be compacted in a single pass. The wheels on at least one axle shall oscillate vertically, either singly or in pairs. The roller shall have a width of not less than 5 feet. Wobble-wheel rollers will not be permitted. The wheels shall be equipped with smooth, wide-tread compactor tires of equal size and diameter, capable of producing a uniform, ground-contact pressure on a level, unyielding surface through a range of 60 to 95 pounds per square inch on all wheels. Operating tire contact pressure shall be maintained by the use of ballast, and tire inflation pressure combinations shall not exceed the recommendations of the Tire and Rim Association Incorporated for the applicable tire size and ply rating.dAll tires shall be uniformly inflated so that their respective tire pressures do not vary more than 5 pounds. Charts and tabulations shall be furnished showing the contact areas and contact

pressures for the full range of tire inflation pressures and for the full range of loadings for the tires used.sDynamic Compactor. The compactor shall be a vibratory roller or vibratory pad- type compactor capable of operating at the optimum frequency of vibration required for the size and type of compactor used and for the type of material being compacted. Vibratory pad-type compactors shall be used only when access with a vibratory roller is not practical. Vibratory rollers shall be equipped with a readily visible instruction plate containing the manufacturer's recommended operating frequency, amplitude and roller speed. A calibrated vibrating reed tachometer shall be provided with each roller to permit a mechanical check of the roller vibration control system.

5. Subballast course shall be minimum uniform thickness, after compaction, of dimensions indicated in the Contract Drawings. Where not indicated, compacted thickness shall be a minimum of 4 inches.

6. Compaction of each layer shall continue until the material meets 95% dry density compaction. The in-place dry density of each compacted layer will be determined in accordance with AASHTO T 191.
7. Thickness of finished subballast course shall not vary more than 1 inch from the indicated thickness at any point. Reshape or rework, water, and recompact subballast to achieve compliance with specified requirements which do not conform to this requirement.

8. The surface of the finished subballast course at any point shall not vary more than +1” above or 0” below the indicated grade.

9. The Contractor shall obtain a test lab approved by the Engineer to perform tests in accordance with AASHTO T 191 and ASTM D2922 to determine compliance with specified requirements for density and compaction of subballast, and with ASTM D3017 to determine moisture content of the installed subballast.

PLACING INITIAL LAYERS OF BALLAST

1. Check grade lines and cross section prior to placing ballast. Bring ballast to proper elevation as shown in the Contract Drawings.

2. Clean trackbed area of debris and standing water prior to placing ballast.

3. Distribute and compact four-inch layers (maximum) of ballast uniformly and as required to achieve required ballast depth prior to tie distribution.

4. Deliver ballast at a rate no faster than can be satisfactorily incorporated into the work, maintaining a proper interval of operations, and at such times as to permit proper inspection by the Engineer.

5. To extent practicable, unload ballast in position for use with a limited redistribution and dressing.

6. Self-spreading vehicles may be used as approved by the Engineer. When stone is initially spread by self-spreading vehicle a power grader may be used to assist spreading operations.

7. Shape ballast to a true section conforming to the ballast section shown in Standard Plans and Contract Drawings.

8. Thoroughly compact each ballast layer until stones are firmly interlocked and surface is true and unyielding. Compact each lift with not less than four passes of a roller or a vibratory compactor subject to the following requirements:

a. Compact by rolling using either a self-propelled, three-wheel, or two axle roller of such weight that will provide compression under the rear wheels of not less than 350 pounds per linear inch of tread; or using a two or three-wheel tandem roller having a weight per inch of drive roll of not less than 350 pounds, and every part of the surface receiving compression from the drive wheels.rCompact by vibration using vibratory compactors of either the roller or pad type. Dynamic force for either type shall not be less than 20,000 pounds and the frequency range shall be 1100 to 1500 vpm. Use machines equipped with a governor which can be set and locked to control rate of impulse. Provide a tachometer or other suitable device for accurately checking the frequency of vibration during the compacting operation.t

9. Top surface of initial layers of ballast shall be smooth, flat and uniformly compacted prior to distributing ties. Surface shall be free of ruts.

DISTRIBUTING AND SPACING TIES

1. Carefully distribute and properly space all ties on initial layer of ballast. Space ties center to center as follows:
   a. Mainline Track Reconstruction: 19 ½ inches, unless otherwise noted on plans.

2. Place timber ties so that heartwood is down. Place all ties so that the bottom surface of the tie shall have full bearing against the initial layer of ballast.

3. Handle treated timber ties in a manner to avoid breaking and bruising. Do not throw ties from cars or trucks onto rails or rocks.

4. Place all ties normal to center line of track unless shown otherwise in the Contract Drawings.

5. Properly space and align all ties prior to rail installation.

6. In placing or spacing treated ties, handle only with tongs or suitable devices. Do not use bars, chisels, forks, mauls, picks, punches, shovels, or sledges for moving ties or placing them in position beneath rails.

7. Avoid unnecessary handling, redistribution, and reloading of all ties. To extent practical, distribute ties in proper position for use without further handling.

8. Remove any tie damaged as result of improper handling by the Contractor and rejected by the Engineer and replace with undamaged ties at no additional cost to MassDOT.

TRACK RECONSTRUCTION CROSSTIE INSTALLATION

1. PLUGGING EXISTING TIES

   a. The Contractor shall use a MassDOT approved chemical formulation for plugging crossties not designated for replacement. Such compound shall have the equivalent or greater characteristics of the Willamette Valley Company SPIKEFAST® ES-50 RM formula.
   b. Plugging compound shall be applied in a manner that is consistent with the chemical manufacturer's instructions. Spike holes shall be filled in completely with the approved plugging compound. Furnishing and installing liquid plugging compound for all work in this Contract shall be incidental to installation of the rail.s

2. REMOVE AND REUSE TIE PLATES ON EXISTING CROSSTIES & TIMBERS

a. Tie plates to be installed on crossties will be provided by MassDOT.
b. Contractor shall remove existing tie plates and spikes from crossties and timbers being replaced.
c. Removed tie plates are to be reused on newly installed crossties.
d. Removed spikes are to be collected by the Contractor and returned to a location designated by MCRR.

3. TIE PLATES

a. Crossties and timbers shall have tie plates installed under each rail.
b. Prior to installation of tie plates, clean contact surfaces to allow proper bearing of the tie plate on the tie.
c. Install tie plates so crosstie is centered under the track.
d. Locate tie plates on 8 foot 6 inch crossties so that the line side of crosstie and timber is 18 1/2 inches from outer edge of base of rail. Tie plate shall be centered on the crosstie and timber under rail.
e. Locate tie plates on longitudinal centerline of each crosstie and timber and place square to centerline of rail so that field side of plate bears fully against rail base. Place plate with the downward cant toward center of track.
f. Secure rail on line end of crossties and timbers to tie-in proper relation to crosstie and timber end, before securing opposite rail.
g. Use line rail as reference in securing opposite rail to proper gauge.

4. SPIKING

a. All spikes shall be driven with the head pointed toward the rail, except that spikes driven against the sides of insulated joints shall be driven with the head pointing away from the rail and not be in contact with the joint bars.
b. Start and install spikes vertically and square with rail. Install spikes straight/plumb. Spikes should be driven in accordance with the AREMA Manual, Chapter 5, leaving 1/8” clearance between the spike head and the base of the rail. Do not overdrive spikes.
c. Straightening spikes will not be permitted.
d. Avoid removal of spikes once driven. When necessary, pull spikes and plug hole using approved liquid plugging compound.
e. Under no circumstances shall gauge be adjusted by striking spikes or plate edge after it is fixed to tie.
f. Seat rail properly between tie plate shoulders on debris free plate with field side base of rail tight against field side plate shoulder.
g. Each newly installed crosstie shall be spiked in accordance with MBTA’s Spiking Pattern A contained in the Appendix of MCRR’s CWR plan. The Contractor shall ensure that four (4) spikes are installed on all crossties.
h. Each newly installed timber shall be spiked to match existing spiking pattern or as directed by the Engineer.

INSTALLATION OF RAIL

1. Rail shall be installed in accordance with MassDOT MW-1 requirements for jointed rail.
2. The distance between jointed rail ends shall be adjusted according to the temperature at which the rails are laid as per MassDOT MW-1.
3. Expansion shims shall be used to set rail end openings. The opening between the ends of rails for different rail temperatures shall be as follows:

TRACK RECONSTRUCTION:

Jointed Rail Expansion Table	
Rail Temperature (F)	Rail End Opening (39’ Rails)
Below 6°	5/16”
6° to 25°	1/4”
26° to 45°	3/16”
46° to 65°	1/8”
66° to 85°	1/16”
Over 85°	None

4. A standard rail thermometer shall be used to determine the rail temperature. The thermometer shall be laid close to the web on the side of the rail base, which is shaded from the sun’s rays in advance of the laying operation and left there long enough to accurately record the temperature.

5. The supervisory employee in charge shall see that rail temperature is checked frequently and that proper rail expansion shims are used.

6. The Contractor shall provide a record of all rail temperatures and the required expansion shims used for review and approval by the Engineer.

7. In general, rails laid out-of-face in track panel rehabilitation and at rail replacement locations shall be placed so that the joints of one line of rails shall be opposite third point of rails in the other line.

8. Short rails less than 33’ long shall not be used in track unless approved by the Engineer and shall be shown on the Contractor’s steel plan.

9. Every effort shall be made by the Contractor to utilize existing joint location.

10. Rails with unequal wear and different sections must be brought to an even surface at joints on the tread and gage side of the rail by welding/grinding. Excessive rail-end mismatch will not be permitted .When shimming is required to run off the difference in height of rails, the requirements of §129.0(M) must be met.

11. Rail shall be anchored in accordance with MassDOT MW-1 and the following:

12. A minimum of 16 anchors for a 39’ rail and be boxed on 8 ties.

13. A minimum of 10 anchors per 33’ rail and be boxed on 5 ties.

TRACK GAUGE

1. Track gauge by ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK LIQUID PLUGGING COMPOUND
    1. The Contractor shall use a MassDOT approved chemical formulation for plugging crossties designated for salvage. Such compound shall have the equivalent or greater characteristics of the Willamette Valley Company SPIKEFAST® ES-50 RM formula.

    2. Plugging compound shall be applied in a manner that is consistent with the chemical manufacturer’s

instructions. Spike holes shall be filled in completely with the approved plugging compound. Furnishing and installing liquid plugging compound for all work in this contact shall be incidental to installation of the rail.

HANDLING AND STORAGE

1. Contractor shall be responsible for loading and transporting all Owner and Railroad supplied products and materials from delivery and storage locations to the installation sites.

TAMPING AND DRESSING OF BALLAST

1. Tamping and dressing of ballast by ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK

FINISHED TRACK CONDITION (FOR FINAL INSPECTION AND PAYMENT)

1. The Contractor shall provide a continuous On-Site Supervisor and Gang Foreman to provide continuous quality control as the ties/timber are installed.

2. The following items must be accomplished by the Contractor so payments can be made for the work:
   a. Crossties and timbers installed complete with ballast in cribs, tamped, regulated and dressed to either side to within 1" of the base of rail.
   b. Track gauge is within required tolerances.
   c. A minimum ballast shoulder of 12" on tangent track and 16" (or as otherwise previously directed and approved by the Engineer) on curved track on each side of the track with a slope of 2:1 or conforming to existing shoulder, as directed by the Engineer.
   d. Ballast dressed with ballast regulator and by hand as required in accordance with AREMA Specifications.
   e. All stone removed from the top of crosstie, base of the rail, and track plates following installation of crossties.
   f. Each installed crosstie/timber carefully, mechanically tamped (multiple squeezes may be required) as part of the installation process.
   g. Line and Surface conforms to the requirements specified in ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK where required and the Contract Documents.
   h. Any damage to existing track as a result of this surfacing was repaired by the Contractor at no cost to the project.
   i. Base of the rail rests firmly on tie plates.
   j. Field shoulder of the tie plate is tight up against field side of running rail.
   k. Tie plates are centered longitudinally on the crossties and timbers.
   l. No tie plates overhang the edge of the crossties and timbers.
   m. No ballast between base of rail and tie plate.
   n. No ballast between the tie plate and top of crossties and timbers.
   o. All of the above items are considered to be incidental to the installation of crossties and timbers.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 492.11.1 Track Reconstruction is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, and Item 234.2 Cattle Pass Retirement at MP 71.66. No payment will be made under this Item.

ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATED SPOILS N/A

GENERAL

This section specifies handling and disposal of excavation spoils.

EXECUTION

HANDLING AND DISPOSAL OF EXCAVATION SPOILS

1. Excess soil and ballast excavation spoils shall be transported and disposed of entirely within the railroad right of way in a manner to be approved by the Engineer, MassDOT and MassCoastal Railroad (MCRR) at specific locations as directed by Engineer or MassDOT representative and as may be shown on the Contract Documents. Disposal areas may be located up to 10 miles from the excavation areas.

2. Contractor shall load excavation spoils directly into air side dump cars, high rail swivel dumps or equivalent as approved by the Engineer. Stockpiling of excavation spoils is not allowed.

3. Contractor is responsible for providing, maintaining, and operating all rail mounted equipment.

4. Contactor is responsible for unloading spoils at the disposal areas and for dispersing and evenly spreading the materials at the disposal sites as directed by the Engineer.

5. Contractor is responsible for all scheduling and coordination with MCRR for transportation of spoils to the disposal areas. MassDOT is not responsible for delays or any additional costs associated with transportation of spoils, all costs shall be the responsibility of the Contractor.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision complete in place. All costs for HANDLING AND DISPOSAL OF EXCAVATION SPOILS shall be considered incidental to the item or items of work to which they pertain.

ITEM 493.1 **MISCELLANEOUS WORK AS DIRECTED BY THE ENGINEER** **ALLOWANCE**

GENERAL

This section specifies miscellaneous work to be performed as directed by the Engineer. No work shall be performed that is not within the scope of this Project unless explicitly directed by the Engineer.

SUBMITTALS

Prior to commencement of any directed work, Contractor shall submit a cost proposal for all required labor, equipment, and materials to complete the work. Subsequent technical submittals may be required for proposed methodology, equipment, and materials to be used.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for work will be based upon Time & Material costs utilizing Contractor load rates for the actual work performed. Contractor shall submit receipted copies of itemized invoices for such work to MassDOT for payments. Payment under this item will be made under this allowance item.

ITEM 767.121 SEDIMENT CONTROL BARRIER N/A

The work under this section shall conform to the requirements of the Special Provisions, plans and all relevant Sections of the Standard Specifications including the Supplemental Specifications, and the requirements below 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.

Nine-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

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.

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.

See DEP approval and requirements for use of Compost Filter Tube in Document A00841.

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.l
Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

SEDIMENTATION (SILT) 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 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.

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 is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, Item 234.2 Cattle Pass Retirement at MP 71.66, and Item 996.01. Retaining Wall Structure. No payment will be made under this Item.

ITEM 906.1 PRECAST CONCRETE CULVERT ELEMENTS N/A

GENERAL

The work under this Heading consists of fabricating, transporting and installing Precast Concrete Culvert Elements and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The Precast Concrete Culvert Elements shall meet the requirements of Section M4: Cement Concrete and Related Materials of the Standard Specifications.

MATERIALS

Materials shall conform to M4.09.1 of the Standard Specifications and the following:

Non-Shrink Grout Products	M4.04.5
Welded Steel Wire Fabric	M8.01.2
Mechanical Reinforcing Bar Splicer	M8.01.9
Lifting Devices	PCI MNL-116

1. 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.

2. 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.

CONSTRUCTION METHODS – PLANT FABRICATION

HEADWALLS AND WINGWALLS

The Contractor shall submit design computations for the headwalls and wingwalls to the Engineer for review and approval. The computations shall be prepared in accordance with the latest edition of the AREMA Manual for Railway Engineering, the MassDOT Bridge Manual (Hundredth Anniversary Edition), and the Plans using English units and the appropriate train live loading (AREMA Cooper E-80 and other train configurations). The design computations shall consider all Strength, Extreme Event and Service Limit States as are appropriate for each stage of fabrication, shipment, construction, and for the final in-service condition. Design computations and shop drawings shall be prepared and stamped by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts. The shop drawings shall be prepared and submitted in accordance with M4.09.2.B.

The headwall and wingwall dimensions provided on the Plans are shown to establish the size of the proposed culvert. The width and thickness of each element may vary depending upon the manufacturer's specifications provided that the culvert opening size is maintained. The Contractor shall be responsible for modifying the dimensions of the culvert elements to compensate for elastic shortening, shrinkage, grade corrections, and other phenomena that make in-process fabricating dimensions different from those shown on the drawings. Approval of the shop drawings shall not relieve the Contractor from responsibility for the correctness of the dimensions shown.o

1. CONNECTIONS AND CONSTRUCTION JOINTS

The manufacturer shall design the headwall to wingwall and headwall/wingwall to footing connections and construction joints as necessary for installation and shipping. Such connections and joints shall be designed accordingly and documented in the submitted computations as well as detailed on the shop drawings. Connections and joints shall form a watertight seal.

2. MARKING

The following information shall be clearly marked on the interior of each precast culvert element by indentation, waterproof paint, or other approved means:

(a) Element designation or name
(b) Date of manufacture and lot number
(c) Name and trademark of the manufacturer

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 M4.09.4 *Department Acceptance*), and at least seven (7) days prior to the scheduled casting of any Precast Concrete Culvert Element or control section. The Contractor shall schedule the meeting, which shall include representatives of the Fabricator and MassDOT.

REINFORCEMENT

1. The reinforcing bars shall be installed in accordance with Subsection 901.35 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 Culvert 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.

TOLERANCES

Fabrication shall comply with tolerances specified on the plans. Tolerances for steel reinforcement placement shall be in accordance with Subsection 901.35 of the Standard Specifications. In the absence of specifications on the plans, tolerances shall comply with the latest version of the PCI MNL 135, Precast Tolerance Manual.

FORMS

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Culvert 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. 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.e
CONSTRUCTION METHODS – FIELD CONSTRUCTION

GENERAL

All of the Contractor's field personnel involved in the erection and assembly of the Precast Concrete Culvert Elements shall have knowledge of and follow the approved Erection Procedure and Quality Control Plan for Precast Concrete Culvert Element Assembly.

Prior to installation, the following documentation shall be reviewed and confirmed by the MassDOT Resident Engineer or designee:

(a) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Precast Concrete Bridge Element's representative sublot.
(b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
(c) QC Inspection Reports signed by the Quality Control Manager.

Field construction staff shall verify that the Resident Engineer has accepted all Precast Concrete Culvert Elements prior to installation.

ERECTION PROCEDURE AND QUALITY CONTROL PLAN FOR PRECAST CONCRETE CULVERT ELEMENT ASSEMBLY.

Prior to the erection, the Contractor shall submit an Erection Procedure and a Quality Control Plan for Precast Concrete Culvert Element Assembly 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 and Quality Control Plan for Precast Concrete

Culvert Element Assembly shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the culvert elements. The Erection Procedure and Quality Control Plan for Precast Concrete Culvert Assembly shall, at a minimum, include the following:

1. ERECTION PROCEDURE

The Erection Procedure shall be prepared to conform to the requirements of Subsection 960.61 of the Standard Specifications, Design, Fabrication and Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (eighth 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 Culvert 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 Culvert 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.
(h) 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.

(i) Except in approach slabs, 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.

(j) 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. tIf 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.

2. QUALITY CONTROL PLAN FOR PRECAST CONCRETE CULVERT ELEMENT ASSEMBLY

The Quality Control Plan for Precast Concrete Culvert Element Assembly is a document prepared and submitted by the Contractor prior to the start of work which requires the Contractor to identify and detail the sequence of construction in accordance with the project schedule and which clearly identifies all stages of field construction. The assembly procedures for the Precast Concrete Culvert Elements shall be submitted in PDF format on 24”x36” sheets. This document will be treated as a Construction Procedure and will be reviewed by the Engineer and/or MassDOT. The approval of this document will serve as a guideline for setting interim concrete and grout strengths and curing procedures to allow construction to proceed without waiting for the final in-service strengths to be achieved.

The following list details the minimum criteria that should be included in the Quality Control Plan for Precast Concrete Culvert Element Assembly:

(a) A detailed schedule showing the sequence of operations that the Contractor will follow. The schedule shall include a timeline for installation of all major elements of the culvert accounting for the installation of temporary works and cure times of grouts or closure pour concrete and other selected materials.

(b) Calculations that support the schedule outlined above should be included verifying that the selected materials have adequate interim strength to proceed from one step to another. The minimum factor of safety of two (2) will be required for the interim strength of grouts and closure pour concrete before construction is allowed to proceed to subsequent steps. The factor of safety is applied to the service loads that are supported by the elements and materials during various stages of construction. The required strength of materials for subsequent construction stages shall also be calculated and the material strength verified. oThe Contractor is responsible for determining the center of gravity for all elements. Special care shall be used for unusual elements that are not symmetric. These elements may require special lifting hardware to allow for installation in a plumb or flat position.

(c) Plan of the work area, depicting items such as temporary earth support, utilities within the immediate vicinity of the work, drainage structures, etc. The Contractor shall coordinate the various subcontractors that will need to occupy the same area and shall ensure that there are no conflicts. Details of all equipment that shall be employed for the construction of the culvert.

(d) Methods of providing temporary support of the elements. Include methods of adjusting and securing the element after placement.

(e) Vertical Adjustment Assemblies to be used as a means of setting precast concrete footings to the correct elevations.

(f) Procedures for controlling the overall horizontal dimensions and the vertical elevations as each precast concrete bridge element is erected by using the tolerance limits of the joints as detailed on the plans.

(g) Methods for curing grout.

(h) Proposed methods for installing non-shrink grout and the sequence and equipment for the grouting operation.

(i) Methods for sealing the keyways in preparation for filling with non-shrink grout, including the use of

backer rods. The Contractor shall not assume that the backer rods will restrain the pressure from the grout in vertical grout joints. Provide additional forming to retain the backer rod.

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.

PREPARATION OF CLOSURE POURS AND GROUTED KEYWAYS

Immediately prior to erecting the Precast Concrete Culvert Elements, the closure pours and grouted keyways 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 or grout and precast concrete using a high-pressure water blast. Any exposed reinforcing steel in the precast concrete shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer. The surfaces of the closure pours and grouted keyways 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

(a) The elements shall be placed in the sequence and according to the methods outlined in the Erection Procedure and Quality Control Plan for Precast Concrete Culvert Element Assembly. As the erection proceeds, the Contractor shall constantly monitor the assembly to ensure that the precast concrete culvert 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.
(b) 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.hThis 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.
(c) After all Precast Concrete Culvert 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 Culvert Elements has been accepted by the Engineer, the Contractor shall cut all lifting devices off below the surfaces of the elements. n

FILLING OF BLOCKOUTS FOR LIFTING DEVICES AND THREADED INSERTS.

If the blockouts in the Precast Concrete Culvert Elements where the lifting devices were located will be exposed and visible after assembly is complete, the Contractor shall fill these blockouts with Mortar (M4.04.5).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate measurement and payment will not be made for the work of this Special Provision. All costs for ITEM 906.1 PRECAST CONCRETE CULVERT ELEMENTS shall be considered incidental to ITEM 233.1 CULVERT AT MP 44.27 REPLACEMENT and ITEM 233.2 CULVERT AT MP 44.29 REPLACEMENT.

ITEM 942.124 H-PILE ANCHORS N/A

GENERAL

The work under this section shall conform to the requirements of all relevant Sections of the Standard Specifications including the Supplemental Specifications and the requirements below.

This work shall consist of furnishing and installing H-piles for anchorage of sheet piling.

SUBMITTALS

Submit the following for acceptance by the Engineer not less than ten days prior to the start of the respective work:

A. Shop Drawings
    1. Show typical details of size, weight, and tip construction.
B. Pile Schedule
    1. The Contractor shall submit to the Engineer, for approval, a schedule of the length of piles they propose to order, and the schedule shall designate the respective location of the piles. The scheduled length shall comprise the length expected to be left in the structure plus the length that might be necessary to provide fresh heading.
C. Pile Driving Sequential Layout
    1. Submit layout drawings showing the proposed sequence of driving the piles.
    2. On the sequential layout show each pile identification as indicated on the Contract Drawings, its driving sequence number, type, and size.
D. Equipment Review and Working Drawings
    1. Submit complete list of the equipment proposed for use, including a description of the characteristics of each piece of driving equipment.
    2. Submit working drawings of driving accessories showing compatibility with the size, configuration, handling, and driving requirements of each type of pile indicated on the Contract Drawings.

Maintain a pile driving record during pile driving and submit it to the Engineer upon completion of pile driving. On the record indicate, for each pile driven, the information specified, and the following: type and rating of driving equipment, blow count (if using an impact hammer), number of blows per inch penetration for the last 12 inches (if using an impact hammer), and any unusual conditions encountered during driving.

QUALITY ASSURANCE

A. Installation Tolerances
    1. Deviation from plumb: 1/4 inch per foot of pile length.
    2. Deviation from location of pile top: two inches.
B. If the location and/or alignment tolerances specified are exceeded, the extent of exceedance shall be investigated and if, in the judgement of the Engineer, corrective measures are necessary, suitable measures shall be designed and constructed by the Contractor at no cost to MassDOT. Pulling laterally on piles to correct misalignment shall not be permitted.
C. The Engineer will review the proposed driving equipment, accessories, and methods for adequacy for the conditions expected to be encountered. However, the adequacy of the equipment and accessories shall remain the responsibility of the Contractor. Should the equipment used by the Contractor prove inadequate to drive the scheduled types of piles in the locations shown, or should the use rate of accessories show damage to the piles, or should the Progress Schedule not be maintained, the Engineer may require replacement, or different types of expendable accessories, or additional equipment. Comply with such orders at no additional cost to MassDOT. Piles delivered to the site shall be visually inspected prior to installation. Piles which are cracked,

bowed, chipped, undersize, or which break under driving stresses will be rejected; remove such piles from the site and replace with sound piles at no additional cost to MassDOT.

MATERIALS

Steel H-piles shall consist of structural steel shapes of the section shown on the Contract Drawings. Steel H-piles shall comply with Subsection 960 of the Standard Specifications and as modified below:
Steel H-piles shall meet the requirements of ASTM A572, Grade 50. Pile steel shall be uncoated.

CONSTRUCTION METHODS

GENERAL

A. Piles shall be driven to the required penetration, as determined by the Engineer, and as specified in the Contract Drawings.
B. Contract Drawings show the required type of piling and the estimated pile tip elevation. The Contract Drawings also show the required locations of piles.

INSTALLATION OF PILES

A. Provide piling of the type indicated and of the length and configuration necessary to achieve the required penetration indicated on the Contract Drawings and determined by the Engineer.
B. Install piling to the required penetration as indicated on the Contract Drawings. Water jetting to obtain the required penetration will not be permitted.
C. Predrilled Holes: Pre-drilling is prohibited unless approved by the Engineer as necessary to achieve the required penetration.
D. Drive Piles
    1. Complete backfill to the required elevations in the area which piles are to occupy before starting to drive piles.
    2. Do not drive piles within 20 feet of concrete less than seven days old.
    3. If necessary, provide adequate lateral support for installed individual piles, to prevent excessive temporary flexural stresses or movement of the pile top out of tolerance.
    4. No piles shall be driven except in the presence of the Engineer. Where practicable, piles shall be driven continuously to the required penetration. When the continuous installation of a pile has been stopped for any reason, the pile advancement shall be started in a manner which will not damage the pile. Any pile which cannot be advanced or which is damaged in the process, shall be rejected and either cut-off and repaired or replaced at the discretion of the Engineer. Rejected piles shall be replaced or repaired at no additional cost to MassDOT. eIf using an impact hammer, maintain the hammer coaxial with the pile during the driving operation by using a combination of driving cap and leads. Piles shall be driven using methods approved by the Engineer.
    5. Investigate any sudden decrease in driving resistance for possible breakage of the pile. If sudden decrease in driving resistance cannot be correlated to boring data or some incident in the driving, and if the pile cannot be removed for inspection, such decrease in driving resistance will be cause for rejection of the pile.oRedrive any pile which is raised during driving of adjacent piles, to at least the original tip elevation, at no additional cost to MassDOT.
    6. Pile splices are prohibited. The pile shall be furnished in a single piece of the required length.
    7. Cut off piles at top elevation indicated on the Contract Drawings. Replace or repair, to the satisfaction of the Engineer, piles which are damaged when cut off, at no additional cost to MassDOT. Cutting of piles shall not be done until it is certain that further operations will have no effect on the previously driven piles.
E. Design the driving cap with grooves in the base that loosely conform to the shape of the pile. The bearing

surface of the grooves must be true, without roughness. The driving cap shall extend down the side of the pile at least four inches and be loosely attached to the hammer so that it will at all times rest squarely over the entire surface of the pile. Pile driving appurtenances shall comply with Subsection 940.52 of the Standard Specifications.

F. Remove piles not meeting the requirements specified and replace with acceptable piles, except as herein provided. The Engineer may accept piles which do not meet these tolerances, subject to acceptable redesign of the anchorage. Provide redesign and revised construction at no additional cost to MassDOT, except where the failure to meet tolerances is the result of changed conditions as specified in the General Conditions.nRepair or replace piles which are split, broken or otherwise damaged. Perform such repair at the discretion of the Engineer, subject to acceptance upon completion and at no additional cost to MassDOT.

METHOD OF MEASUREMENT SUBBALLAST/GRAVEL BORROW

Separate measurement and payment will not be made for the work of this Special Provision. All costs for ITEM 942.124 H-PILE ANCHORS shall be considered incidental to Item 996.01, RETAINING WALL STRUCTURE.

ITEM 952. STEEL SHEET PILES N/A

GENERAL

The work under this section shall conform to the requirements of all relevant Sections of the Standard Specifications including the Supplemental Specifications and the requirements below.

This work shall consist of furnishing and installing permanent steel sheet piling in accordance with these specifications and in conformity to the Contract Drawings or as directed by the Engineer.

PERFORMANCE REQUIREMENTS:

A. Furnish, install, monitor, and maintain steel sheet piling in accordance with these specifications and in conformity to the Contract Drawings or as directed by the Engineer.
    1. Install piling without damaging existing structures, utilities, or other facilities adjacent to installation location.
    2. Provide structure survey, monitoring, and maintenance as provided in Item 996.02 STRUCTURE MONITORING of the Special Provisions to ensure a stable sheet piling system throughout construction and backfilling operations.
    3. Prevent surface water from entering excavations by grading, dikes, or other means and provide necessary dewatering systems to maintain a dry and stable excavation throughout construction and backfilling operations.

SUBMITTALS

A. Prior to commencing work, the Contractor shall submit a construction procedure and equipment list to the Engineer for their approval. No work shall begin until this approval is received.
B. Submit detail drawings for sheet piling, including fabricated sections, complete sheet piling dimensions and details, driving sequence, and location of installed sheet piling.
    1. Detail drawings shall include dimensions of templates and other temporary guide structures for installing sheet piling.
    2. Detail drawings shall provide the method of handling sheet piling to prevent permanent deflection, distortion or damage to sheet piling interlocks.

DELIVERY, STORAGE, AND HANDLING

A. Sheet piling delivered to the site shall be new, undamaged, and be accompanied by certified test reports. The manufacturer's logo and mill identification mark shall be provided on the sheet piling, as required by the referenced specifications.
B. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks.
C. Storage of sheet piling should also facilitate required inspection activities.

MATERIALS

Steel sheet piling shall comply with Subsection 960 of the Standard Specifications and as modified below:
A. Steel sheet piling shall be hot-rolled steel sections conforming to ASTM A572, Grade 50. Sheet piling steel shall be uncoated.
B. Sheet piling shall be full-length sections of the dimensions shown on the Contract Drawings. Sheet piling shall be provided with standard pulling holes.

C. The sides for each piece of steel sheet piling shall be furnished with an interlock that is continuous for the full length of the steel sheet pile. The interlocks shall be free sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed. The interlocked joint strength in tension test shall conform to the sheet piling manufacturer's standard test.

CONSTRUCTION METHODS

A. If obstruction to driving is encountered, Contractor shall remove the obstruction without the use of impact hammers and as directed.
B. Any excavation required within the area where sheet piles are to be installed shall be completed prior to placing the sheet piles. Sheet piles shall be carefully located. Sheet piles shall be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to line.
C. Temporary wales, templates, or guide structures shall be provided to ensure that the sheet piles are placed and driven to the correct alignment. Sheet piles properly placed and driven shall be interlocked throughout their length with adjacent sheet piles to form a continuous diaphragm throughout the length or run of sheet piling wall.nSheet piles shall be driven with the proper size vibration equipment and by approved methods to ensure no damage to the sheet piles and proper interlocking throughout their lengths. Driving with impact hammers shall not be allowed.
    1. Caution shall be taken in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid interlock-melt or damages.
    2. Sheet piles damaged during driving or driven out of interlock shall be removed and replaced at the Contractor's expense.
D. Adequate precautions shall be taken to ensure that sheet piles are driven plumb. If the forward or leading edge of the sheet piling wall is found to be out-of-plumb, the sheet piling being driven shall be driven to the required depth and tapered sheet pilings shall be driven to interlock with the out-of-plumb leading edge. If approved, other corrective measures may be taken to ensure the plumbness of succeeding sheet pilings. The maximum permissible taper for any tapered sheet piling shall be 1/8 inch per foot of length. eSheet piles in each run or continuous length of sheet piling wall shall be driven alternately, in increments of depth, to the required elevation. No sheet piling shall be driven to a lower elevation than those behind it in the same run, except when the sheet piles behind it cannot be driven deeper. If the sheet pile next to the one being driven tends to follow below final elevation, it may be pinned to the next adjacent sheet pile.
    1. If a steel sheet pile is unable to be installed to the specified depth due to contact with an obstruction, the Contractor shall remove the steel sheet pile and attempt to remove the obstruction. eIf the Contractor demonstrates that removal or penetration is impractical, the Contractor shall make changes in the design alignment of the sheet piling structure as directed to ensure the adequacy and stability of the structure. All changes shall be approved by the Engineer prior to commencing the changes.
    2. Sheet piles shall be driven to depths shown on the Contract Drawings and shall extend up to the elevation indicated for the top of sheet pilings on the Contract Drawings.
E. No steel sheet piling sections will be spliced.
F. Steel sheet piling shall be left in place and cutoff as shown on the Contract Drawings.
G. Sheet piling shall be installed with front plane located 1.5 inches inside the railroad right-of-way. Sheet piling shall not be out of position specified by more than 0.5 inches in direction perpendicular to wall alignment. Sheet piling shall not be out of position specified by more than 2 inches in direction parallel to wall alignment.
H. All sheet pile wall components must be installed within the railroad right-of-way. No components are permitted to extend beyond the railroad right-of-way property line.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate measurement and payment will not be made for the work of this Special Provision. All costs for ITEM 952. STEEL SHEET PILES shall be considered incidental to Item 996.01, Retaining Wall Structure.

ITEM 991 CONTROL OF WATER N/A

The work to be done under these Items shall conform to the relevant provisions of Subsection 140 of the Standard Specifications and the following:

The work to be performed under this Item shall include all pumping, sandbagging, earth, and other measures, required for maintaining for sufficient water control, for retaining adjacent embankments, and for accomplishing the installation of new and demolition of the existing two culverts, the removal work and installation of pipes at the cattle passes, and installation of the sheet and anchor piles for the retaining wall.

Dewatering shall be conducted to ensure that all structural concrete and stone masonry mortar joints are placed and cured in the dry.

It is the responsibility of the Contractor to determine the need and extent of dewatering required and to submit methods and materials he proposes to use for the Engineer's approval.

The water flow through the existing culverts and cattle passes shall be maintained during construction.

The Contractor shall follow the guidelines of this specification for which dewatering is to be accomplished. However, except for payment, all work shall conform to the relevant requirements of Subsection 140 of the Standard Specifications, and to the allowed dewatering methods listed herein:

The Contractor shall submit complete working drawings and computation of his or her proposed dewatering system with supporting data, as necessary, to the Engineer for approval. These drawings shall be accompanied by design calculations. Both shall be prepared and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts. The Contractor shall make his or her own evaluation of existing conditions and water flow, and of the effects of his or her proposed temporary works and construction methods and shall provide in his or her design for all loads and construction conditions necessary to permit demolition and construction of the specified structure while maintaining public safety and protecting complete work and all third party property from damage resulting from construction operations.n
The Contractor shall use such equipment and shall perform his operations in such a manner that boiling or other 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 foundation material or supporting soils.

Measures to control the discharge of pollutants into water resource areas shall include, but not be limited to the following:

- Rigorous management of construction operations involving potentially hazardous materials, such as refueling and maintenance of construction equipment.
- Formulation of contingency plans to control accidental spillage from potentially hazardous materials.
- Siting of construction laydown and staging areas outside of the riverfront inner riparian area and Wetlands buffer zones and locating construction staging on relatively flat ground.
- Scheduling of work within the resource areas to avoid periods of high flood (e.g., spring floods) and inclement weather.
- Installation and continuous maintenance of sediment barrier fences to prevent sediment migration into adjacent downstream resource areas. Placement of erosion controls shall be as shown on the plans, as specified herein, or as required by the Engineer to accomplish maximum control of project related sediment mobilization. Additional erosion control measures shall be employed as necessary to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the Contract. All discharge resulting from dewatering activities shall be directed to temporary construction tanks for sedimentation/retention provided as necessary to control turbidity. At no time shall said

discharge be directly released into adjacent resource areas.

The Contractor shall provide temporary sandbagging, water barriers, filtering fabrics, silt fencing, sedimentation/retention basins, and/or other effective procedures or structures together with all labor, materials, and equipment necessary for controlling water in, under, and around the culvert and cattle passes. Such work shall be subject to the approval of the Engineer, but such approval will not relieve the Contractor of responsibility for the adequacy of construction, maintenance, operation, and safety of the water control system.t
Also included shall be all necessary permits that may be required in performing the work under this Item.

Upon completion of the work, temporary sandbagging, water barriers, and any other water control devices or constructions shall be removed from the site.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 991. CONTROL OF WATER is incidental to Item 233.1 Culvert at MP 44.27 Replacement, Item 233.2 Culvert at MP 44.29 Replacement, Item 234.1 Cattle Pass Retirement at MP 68.00, Item 234.2 Cattle Pass Retirement at MP 71.66, and Item 996.01 Retaining Wall Structure. No payment will be made under this Item.

ITEM 996.01 RETAINING WALL STRUCTURE LUMP SUM

The work under this section shall conform to the requirements of the Special Provisions, plans and all relevant Sections of the Standard Specifications including the Supplemental Specifications, and the requirements below. For those components Commuter Rail Standards shall apply except for payment. Work under this section shall include all materials, equipment and labor needed to complete the construction of the following:

- Sheet Pile Wall
- H-Pile Anchor Piles
- Chain Link Fence
- Structure Monitoring

For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

The work does not include any items listed separately in the contract. Payment for materials shown on the Plans as being part of this 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 section.

STRUCTURAL STEEL

The work under this heading shall be performed in accordance with requirements under Subsection 960 STRUCTURAL STEEL in the Standard Specifications and as modified below.

This Section specifies the following items:

1. Walers
2. Tie Rods
3. Sheet Pile Cap
4. Connection Plates and Bearing Plates
5. Bolts/Nuts/Washers

Materials shall be as follows or as indicated on the plans:

1. Channels (MC Shapes): ASTMA992 , Grade 50.
2. Plates and Bars: ASTM A572/A572M, Grade 50.
3. Tie Rods: ASTM A615, Grade 75.
4. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Type 1, heavy hex steel structural bolts; ASTM A563 Grade DH heavy hex carbon-steel nuts; and ASTM F 436, Type 1 hardened carbon-steel washers.

Coating shall be as follows or as indicated on the plans:

1. Walers, Sheet Pile Cap, Connection Plates and Bearing Plates, Bolts/Nuts/Washers: Painted in accordance with Subsection 960.63 of the Standard Specifications and as shown on the Plans.
2. Tie Rod: Shop coated with Coal Tar Epoxy in accordance with US Corps of Engineers C-200, C-200a and AWWA C-210-92.

Tie Rod Installation: Tie rod slack shall be removed and tie rod nuts shall be made snug.

CHAIN LINK FENCE

The work under this heading shall be performed in accordance with requirements under Subsection 644 CHAIN

LINK FENCE AND GATES in the Standard Specifications and as modified below.
Materials shall be as follows or as indicated on the plans:

1. All fence elements shall be Bonded Vinyl Coated with exception of post bases.
2. Post bases shall be plain steel and painted in accordance with Subsection 960.63. of the Standard Specifications.

Post bases shall be welded to the Sheet Pile Cap in accordance with Subsection 960. of the Standard Specifications.

STEEL SHEET PILES

The work under this heading shall be performed in accordance with requirements under ITEM 952 STEEL SHEET PILES in the Special Provisions.

H-PILE ANCHORS

The work under this heading shall be performed in accordance with requirements under ITEM 942.124 H-PILE ANCHORS in the Special Provisions.

STRUCTURE MONITORING

The work under this heading shall be performed in accordance with requirements under ITEM 996.02 STRUCTURE MONITORING in the Special Provisions.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described in this special provision shall be paid for at the Contract lump sum price for ITEM 996.01 RETAINING WALL STRUCTURE and shall include all necessary labor, equipment, materials and incidental work necessary for the completion of the work.

ITEM 996.02 STRUCTURE MONITORING N/A

GENERAL

The work under this section shall conform to the requirements of all relevant Sections of the Standard Specifications including the Supplemental Specifications and the requirements below.
This work shall consist of:

- Supplying and installing structure monitoring points on the retaining wall.
- Taking and recording structure monitoring measurements (both horizontal and vertical locations).
- Allowing access for the Engineer to verify the coordinates and elevations at all Structure Monitoring Points.

SUBMITTALS

A. Qualifications of the Registered Land Surveyor preparing and submitting measurements of monitoring points.
B. Submit field notes prepared by the surveyor when installing the monitoring points. Each monitoring point shall be given a unique identification number. Submit a 20-scale plan showing each monitoring point. For each point, provide point number, coordinates (MA state grid), initially surveyed elevation, description of point, and 3 ties to existing features.
C. Movement Mitigation Plan, developed for immediate implementation should movement of the retaining wall structure adjacent to the existing tracks exceed the specified criterion in these Special Provisions. The proposed Movement Mitigation Plan shall include, but not be limited to, additional anchorage/bracing, bracing slabs, and/or other measures. tWeekly logs of monitoring data (horizontal and vertical location) taken at monitoring points in accordance with the frequency of measurements described below.

QUALITY ASSURANCE

A. The Contractor shall use the services of a Registered Land Surveyor, licensed in the Commonwealth of Massachusetts, to set all structure monitoring points, to establish the grade at all monitoring points, and to take all measurements of the horizontal location and elevation at each monitoring point at these times:
    1. Prior to and during backfilling and backfill compaction of the retaining wall.
    2. Prior to, during, and following operation of heavy equipment related to culvert construction.
    3. Prior to and during installation of tierod anchors.

MATERIALS

Establish measurement points on top of retaining wall structure every 10 feet over the entire length of the structure.

CONSTRUCTION METHODS

LOCATING THE MONITORING POINTS:
A. The Engineer will determine the exact location of the monitoring points in the field.
B. The elevation of each point shall be based on at least two benchmarks approved by the Engineer.
C. The initial location and elevation of each monitoring point shall be established by three independent surveys and certified by a Registered Land Surveyor.
D. Monitoring points shall be located in a secured manner and protected as approved by the Engineer.
E. Protect all monitoring points from damage.
F. Replace all damaged monitoring points to the same standard as the initial installation, at no additional cost to MassDOT.

MEASUREMENTS AT MONITORING POINTS:

A. All measurements shall be taken by the Registered Land Surveyor as specified herein. All monitoring data must be submitted weekly for review by the Engineer. For documentation purposes, at the project's completion a final completed version of the monitoring data that is stamped by the Registered Land Surveyor shall be submitted to the Engineer.

B. Frequency of measurements:
   1. Prior to and during backfilling, backfill compaction, heavy equipment operations adjacent to retaining wall, and tierod anchor installation:
      i. When monitoring points are set
      ii. Monitoring points shall be surveyed/measured daily and at the same time each day.
   2. Upon completion of heavy equipment operations, the Contractor shall monitor the established monitoring points as follows:
      i. Weekly for the 1st month.
      ii. Once a month thereafter until Substantial Completion
   3. All elevations and horizontal locations shall be compared to the initial elevations and horizontal locations at each monitoring point. The monitoring logs shall note the surveyed elevation and horizontal location, the initial elevation and horizontal location, and the difference between each. Provide a sketch or plan showing where each monitoring point is located.
   4. Elevation and horizontal location readings shall show the date, time, weather conditions, and temperature. Each reading shall also indicate:
      i. Monitoring Point unique identification number
      ii. Station and offset, based on stationing of the track centerline
      iii. Coordinates (Mass State Grid)
      iv. Initial or base elevation (with date taken)
      v. Static elevation and horizontal location as surveyed
      vi. Change in elevation and horizontal location (in hundreds of feet and also in inches)
      vii. Total vertical and horizontal deflection in inches

C. Threshold and Limiting Values for Actions
   1. The Limiting Value for horizontal movement of the retaining wall structure in the outward direction is defined as $^1/_2$ inch at the top of the retaining wall at any time after installation.
   2. If the Limiting Value is approached or exceeded, the Contractor shall immediately notify the Engineer and shall implement the Contractor's approved Movement Mitigation Plan to take immediate steps to control any further movement, as required by the Engineer.
   3. If movement of the retaining wall structure reaches or exceeds the specified Limiting Values, or the Contractor's operations cause any damage to adjacent facilities including the existing track, the Engineer may direct the Contractor to temporarily terminate the work in the area where such movement is occurring and implement all necessary mitigation measures and/or repairs to the satisfaction of the Engineer. There shall be no claims for additional payment by the Contractor nor will there be an extension of the project Completion Dates for delays related to stopping work because of movements and/or damages, mitigating movements and/or repairing damages. rUpon completion of all work, perform a post-construction survey of all monitoring points.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate measurement and payment will not be made for the work of this Special Provision. All costs for ITEM 996.02 STRUCTURE MONITORING shall be considered incidental to Item 996.01 Retaining Wall Structure.

ITEM 1000.1 ENVIRONMENTAL ALLOWANCE ALLOWANCE

GENERAL

This section specifies environmental work to be performed as directed by the Engineer for work related to any required unforeseen environmental work encountered. Work to include all services, personnel, labor, materials, permits, equipment, machinery and tools necessary to address any unforeseen environmental issues. This includes the discovery of hazardous materials during excavation or construction. Contractor proposal(s) to perform work under this allowance item must be authorized by MassDOT prior to performing the work. No work shall be performed that is not within the scope of this Project unless explicitly directed by the Engineer.

SUBMITTALS

Prior to commencement of any directed work, Contractor shall submit a cost proposal for all required labor, equipment, and materials to complete the work. Subsequent technical submittals may be required for proposed methodology, equipment, and materials to be used.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for work will be based upon Time & Material costs utilizing Contractor load rates for the actual work performed. Contractor shall submit receipted copies of itemized invoices for such work to MassDOT for payments. Contractor will be reimbursed for the actual cost of performing work related to dealing with any unforeseen environmental issues as determined by Engineer.

Payment under this item will be made through the ALLOWANCE under ITEM 1000.1. ENVIRONMENTAL ALLOWANCE. No additional payment over the Contract Allowance amount will be made for any work that does not meet the requirements of this section.

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: _____

Project File Number: 614096
Contract Number: 130500
Project Description: **Cape Main Improvements at 44.27, 44.29, 68.00, and 71.66**

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 Project Manager at the MassDOT -Rail and Transit Division at the following email address:

Kevin McGrath
kevin.mcgrath@dot.state.ma.us
Attn: AutoCAD Files

Name of person requesting AutoCAD files: _____

Affiliation/Company: _____

Address: _____

_____

Telephone number: _____

Email address: _____

Signature/Date: _____

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00830

PERMIT APPLICATIONS

THIS PAGE IS INTENTIONALLY LEFT BLANK

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

APR 03 2025

MassDOT Rail and Transit Division
ATTN: Ms. Chalita Belfield
Director of Railroad Properties
10 Park Plaza, Room 3460
Boston, MA 02116

RE: **401 WATER QUALITY CERTIFICATION**
Application for: BRP WW 11
MINOR FILL AND EXCAVATION PROJECTS

AT: Cape Main Railroad Line MP 44.27
Culvert Replacement
Rochester

Transmittal No: 25-WW11-0001-APP
401 WQC Application Complete: 3/13/25

Dear Ms. Belfield:

The 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, Section 401 of the Federal Clean Water Act as amended (33 U.S.C. §1251 et seq.), and 314 CMR 9.00, 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 at 314 CMR 4.00.

The Cape Main railroad line in Rochester is owned by the MassDOT Rail and Transit Division. The proposed project involves the replacement of a failed equalizer culvert located beneath the railroad at mile post 44.27. The work qualifies as Footprint Bridge Exempt under Section 24 of the Transportation Bond Bill of 2014. Section 24 of the 2014 Transportation Bond Bill (Chapter 79 Acts) exempts bridge projects of the Massachusetts Department of Transportation from the requirements of MGL Chapter 30, sections 61 - 62A (MEPA), MGL Chapter 91 (Public Waterfront Act), and MGL 131, section 40 (WPA) if the design is substantially the functional equivalent of, and in similar alignment to, the structure to be reconstructed or replaced. As stated in the regulation, a "bridge" shall include any structure spanning and providing passage over water, railroad right-of-way, public or private way, other vehicle facility or other area. As a culvert meets the definition of a bridge, the exemption is applicable and eliminates the need

for review under the Massachusetts Environmental Policy Act, Wetlands Protection Act, and Public Waterfront Act (Chapter 91).

The project includes the replacement of a partially failed 24 x 48-inch stone box culvert with 42-inch corrugated metal pipe (CMP) extension with a new 67-foot long 48-inch precast reinforced concrete pipe (RCP) and precast headwalls with rip rap velocity dissipation pads at mile post 44.27, and the construction of a sheet pile wall. The proposed replacement culvert is substantially the functional equivalent of, and in similar alignment to the existing failed culvert.

The culvert is located approximately 1,400 feet west of the MTBA facility located at 45 Kings Highway and 500 feet east of the Southeastern Massachusetts Resource Recovery Facility (SEMASS) located at 141 Cranberry Highway. The culvert connects an unnamed shrub swamp on the northern side of the railroad embankment with a deep marsh system on the southern side. The railroad embankment carries the Cape Main Track, the SEMASS Lead Track, and the Rochester Siding Track.

The existing culvert includes an approximate 45-degree bend near the center of the railbed. The bend will be eliminated in the new design which will improve flow, minimize failure points, and improve the ease of any future maintenance. As such the proposed 48-inch culvert will be a straight alignment and embedded sufficiently to maintain the existing invert elevations.

To safely gain access to the culvert, and to minimize impacts to the vegetated wetland approximately 1,150 linear feet of steel sheet pile wall will be installed along the northern edge of the right of way (ROW) from the MBTA facility. The MBTA facility will also serve as the equipment staging area. The sheet pile wall finish grade will match the top of the existing rail tie elevation.

The new culvert will be constructed adjacent to the existing culvert which will allow for the existing culvert to continue to equalize flows during construction eliminating the need to construct a water bypass system between the wetland systems. Following construction, the old culvert will be sealed on either end and abandoned in place with flowable fill.

Total bordering vegetated wetland impacts are estimated to be 2,969 square feet. Of the 2,969 square feet 2,325 will be permanent, and 644 square feet will be temporary.

The top of the railroad embankment at the culvert is approximately seven (7) feet higher in elevation than the adjacent bordering vegetated wetlands. Flow within the wetland system is generally from north to south.

The culvert work will permanently impact 472 square feet of bordering vegetated wetland which is mostly attributed to the construction of the headwalls, dissipation pads, and armor stone. Of the 472 square feet of permanent wetland impact 438 square feet will occur on the north side of the embankment and 34 square feet will occur on the south side.

Installation of the sheet pile wall will permanently impact 1,854 square feet of bordering vegetated wetland. A defined construction methodology included in the application sequences work in such a way as to eliminate any disturbance to vegetated wetland beyond the limit of the wall and eliminates temporary impacts.

The work associated with the culvert will temporarily impact associated 644 square feet of vegetated wetland from the installation and removal of temporary support of excavation and erosion controls as well as adjustments of armor stone, ballast, and the dissipation pads at the inlet and outlet ends of the culvert.

Water within the culvert excavation will be pumped to a treatment system located within the railbed in an upland area. Treated water from the dewatering system will then gravity flow through the ballast before discharging at the toe of the railbed. After the culvert has been installed and the construction zone has been stabilized, the existing failed culvert will be plugged and filled with flowable fill.

It is proposed that the excavation and installation of the new culvert will be completed within a five (5) day construction period.

Mitigation for the impacts to bordering vegetated wetland will be created on the southern side of the railbed adjacent to the southern end of the new culvert. This replication area will also include mitigation for a nearby culvert at MP 44.29 which is currently being reviewed by MassDEP. Mitigation planting will include the installation of 145 plants including red maple, silver maple, pussy willow, sweet pepperbush, lowbush blueberry, steeplebush, and tussock sedge over an area of 2,325 square feet. In addition, a new England wetmix will spread in areas at a seed rate of 2,500 square feet per pound.

The project site is not located in an Area of Critical Environmental Concern (ACEC), Outstanding Resource Water (ORW), Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife, and there are no mapped certified or potential vernal pools. Additionally, the Division of Marine Fisheries (DMF) did not identify any Time of Year (TOY) restrictions for the work.

Alternatives were evaluated to avoid and minimize impacts. The alternatives included a no build alternative, rehabilitation of the existing stone box culvert, replacement of the culvert without building the retaining wall, and the full culvert replacement with retaining wall. The no build alternative was quickly dismissed as the structure is in poor condition and is likely to fail causing a serious threat to public health, safety, and the environment. The rehabilitation alternative, which would include excavating over the sinkhole and placing a steel plate over the failure point was also dismissed as it would only provide a short-term repair. Replacement of the culvert without building the retaining wall would require the work be accessed through the SEMASS property located 500 feet to the north. This option was dismissed because it would require an access agreement, would disrupt the SEMASS rail siding that feeds waste to the plant, would require offsite staging and multiple truck/rail trips across private property and an active rail track. The selected alternative that includes the retaining wall represents the best alternative.

Public notice was provided in the Environmental Monitor on January 8, 2025, and in the Sippican Week on January 30, 2025. The Department did not receive any public comments during the 21-day public comment periods which ended on January 29, 2025, and February 20, 2025, respectively.

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.

MassDEP 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.

Therefore, based on information currently in the record, the Department grants a 401 Water Quality Certification 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.

1. All work shall conform to the plans entitled:

    - WW11-401 Minor Fill and Excavation Project Application dated January 22, 2025.
    - Section 401 Water Quality Certification Application, Cape Main MP 44.27 Culvert Replacement Project, prepared for Massachusetts Department of Transportation Rail and Transit Division, prepared by WSP USA Energy and Environment Inc., dated March 2025.
    - Figure 1 Existing Conditions MassDOT Rail and Transit Cape Main 44.27 Rochester, Massachusetts, prepared by WSP USA Energy and Environment Inc.
    - Massachusetts Department of Transportation Rail & Transit Division, Plan and Profile Details of Culvert Replacement at Cape Main MP 44.27, Sheets 1 through 23, prepared by WSP USA Energy and Environment Inc., dated March 10, 2025

2. To the extent that the following conditions modify or differ from the plans, specifications or other proposals referenced in Condition 1, the conditions of this Certification shall control.

3. A copy of this Certification and referenced plans and other documents shall be provided to the contractor prior to the start of construction.

4. Prior to the start of work, the applicant shall provide MassDEP with the name, address, and phone number(s) of the person responsible for ensuring that all work complies with the conditions of this Water Quality Certification.

5. Prior to the start of work, the applicant shall submit a site-specific dewatering and turbidity control plan for review and approval by MassDEP.

6. Prior to the start of work and installation of erosion control measures, the applicant shall provide MassDEP with the name, address and phone number(s) of the following:

    - Environmental Monitor(s)
    - Wetland Specialist(s)

    The Environmental Monitor and the Wetland Specialist may be the same person.

7. A minimum of twenty-one (21) days prior to the commencement of construction of the retaining wall, the applicant or their representative shall contact MassDEP (mark.bartow@mass.gov) to schedule a pre-construction consultation meeting to review the plans, specifications and terms and conditions of this Water Quality Certificate (WQC). In addition to the applicant/representative attendees shall include the Environmental Monitor and Wetland Specialist unless MassDEP deems attendance is not necessary for any individual.

8. A minimum of twenty-one (21) days prior to the commencement of construction of the culvert, the applicant or their representative shall contact MassDEP (mark.bartow@mass.gov) to schedule a pre-construction consultation meeting to review the plans, specifications and terms and conditions of this Water Quality Certificate (WQC). In addition to the applicant/representative attendees shall include the Environmental Monitor and Wetland Specialist unless MassDEP deems attendance is not necessary for any individual.

9. Prior to the commencement of construction, adequate erosion control measures shall be installed to protect all wetland resource areas.

10. An Environmental Monitor (EM) with experience in wetland science, erosion and sedimentation control, and experience in Railroad/Roadway/Bridge/linear construction, shall be available for the duration of the project. The EM will be responsible for assuring compliance with the permit conditions, plans, and specifications, maintaining limit of work, proper maintenance of the erosion and sedimentation controls, as well as determining if additional erosion and sedimentation controls are necessary. The EM shall assure that dewatering measures are properly implemented and maintained and that the discharge is adequately filtered prior to discharge to wetlands and waterways. The EM may conduct inspections during construction and shall provide MassDEP with a Monitoring Report (MR) at the end of construction summarizing work activities, and compliance with the conditions of this permit.

11. The EM shall coordinate with the contractor and anyone else responsible for maintaining the erosion control and sedimentation control measures prior to forecasted significant storm events to assure that the erosion and sedimentation control measures will adequately protect resource areas. The EM shall have the authority to direct responsible parties to install additional or alternative erosion and sedimentation control measures.

12. In instances where an EM directs the installation of additional or alternative erosion and sedimentation control measures, MassDEP shall be notified via email with photographs and a description of measures.

13. A stockpile of erosion control measures shall be kept on-site for emergency and routine replacement. The materials may include but are not limited to silt fence, hay bales, stone rip rap, filter dikes, compost filter tubes, filter bags, or any other devices planned for use during construction.

14. No more than 2,969 square feet of bordering vegetated wetland will be impacted cumulatively, 2,325 square feet of which will be permanently impacted.

15. The surface area of the vegetated wetland mitigation area as shown on the Culvert at MP 44.27 Wetland Impact Plan 1 (Sheet 17 of 23) and Culvert at MP 44.27 Wetland Impact Plan 2 (Sheet 18 of 23) and described in the Section 401 Water Quality Certificate Application shall be at least 75% evenly distributed with indigenous wetland vegetation within two growing seasons. This determination shall be made by the wetland scientist selected by the applicant or his/her designee and approved by MassDEP. Should the mitigation area fail to meet this standard, MassDEP may require additional measures necessary to achieve compliance.

16. At the end of each growing season, a progress report of the relative success or failure of the mitigation effort shall be submitted to this office by the wetland scientist. The report shall include percent of vegetation cover, a list of the type of plants growing in the mitigation area, coverage of wetland plants as a percentage of all plants and relative vigor of the plants. The report shall also include recommendations for improvement of poorly established wetland areas.

17. The progress report shall also document the restoration efforts associated with the mitigation and restoration areas impacted during construction. Should the temporary impact areas not be adequately restored, MassDEP may require additional measures to achieve compliance.

18. It shall be the responsibility of the applicant, and/or any successor(s) in title to ensure that within the wetland mitigation and restoration areas, non-native invasive plant species such as *Phragmites australis* do not expand because of the project.

19. Staff of the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Certification at reasonable hours to evaluate compliance with the conditions stated in this Certification and may require the submittal of any data deemed necessary by the Department for that evaluation.

20. No Special Condition set forth herein shall be constructed or operate to prohibit the Department from taking enforcement against the applicant or its contractors for any failure to comply with the terms and requirements of this 401 Water Quality Certification.

21. No activity authorized by this Water Quality Certification may begin prior to expiration of the 21-day appeal period or until a final decision is issued by MassDEP if an appeal is filed.

22. This Certification remains in effect for the same duration as the federal permit that requires it or five years from the date of issuance of this Certification whichever comes first.

23. The applicant may request an amendment or extension of this Certification in accordance with 314 CMR 9.09(2) and (3), respectively.

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:

Department of Environmental Protection
Case Administrator
Office of Appeals and Dispute Resolution
100 Cambridge Street, Suite 900
Boston, MA 02114

A copy of the request shall at the same time be sent by certified mail or hand delivery to the issuing office of the Wetlands and Waterways Program at:

Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
Lakeville, Massachusetts 02347

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):

(a) the 401 Certification Transmittal Number;
(b) the complete name of the applicant and address of the project;
(c) 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;
(d) 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;
(e) a clear and concise statement that an adjudicatory hearing is being requested;
(f) 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

(g) 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 Environmental Management (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 Mark Bartow at mark.bartow@mass.gov or (857) 207-0621.

Sincerely,

Maissoun Reda

Maissoun E. Reda, Chief
Wetlands Program
Bureau of Water Resources

MER/mnb

cc: Rochester Conservation Commission

Regulatory Division
The New England District
U.S. Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

Kimberly Degutis
WSP USA Energy and Environment Inc
100 Summer Street, 13th Floor
Boston, MA 02110

Massachusetts Department of Environmental Protection

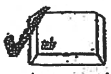
Adjudicatory Hearing Fee Transmittal Form

IMPORTANT! This form is intended for fee transmittal only. The contents of a request for an adjudicatory appeal (Notice of Claim) are established at 310 CMR 1.01(6) and the substantive statutes and regulations governing the Department's action.

A. Person/Party Making Request

1. Name and address of person or party making request:

Important: When filling out forms on the computer, use only the tab key to move your cursor – do not use the return key.





Name - If appropriate, name group representative

Street Address

City | State | Zip Code

2. Project Information:

Street Address

City | State | Zip Code

DEP File or ID Number | $ Amount of filing fee attached

Email Address

B. Applicant (if applicable)

1. Name and address of applicant:

Name - If appropriate, name group representative

Street Address

City | State | Zip Code

Email Address

C. Instructions

1. Send this form and check or money order of $100.00 payable to the Commonwealth of Massachusetts to the MassDEP Lockbox at:

   Department of Environmental Protection
   P.O. Box 4062
   Boston, MA 02211

2. Send a **copy** of this form and a **copy** of the check or money order with the Request for Adjudicatory Appeal (Notice of Claim) to:

   Case Administrator
   Office of Appeals and Dispute Resolution
   One Winter Street
   Boston, MA 02108

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
ហើយគប្បីតួរត្រូវបានបកប្រែភ្លាមៗ។.
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)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
RAIL & TRANSIT DIVISION

PLAN AND PROFILE AND DETAILS OF

CULVERT REPLACEMENT AT CAPE MAIN MP 44.27

IN THE TOWN OF

ROCHESTER

PLYMOUTH COUNTY

PRELIMINARY - ENVIRONMENTAL PERMITS

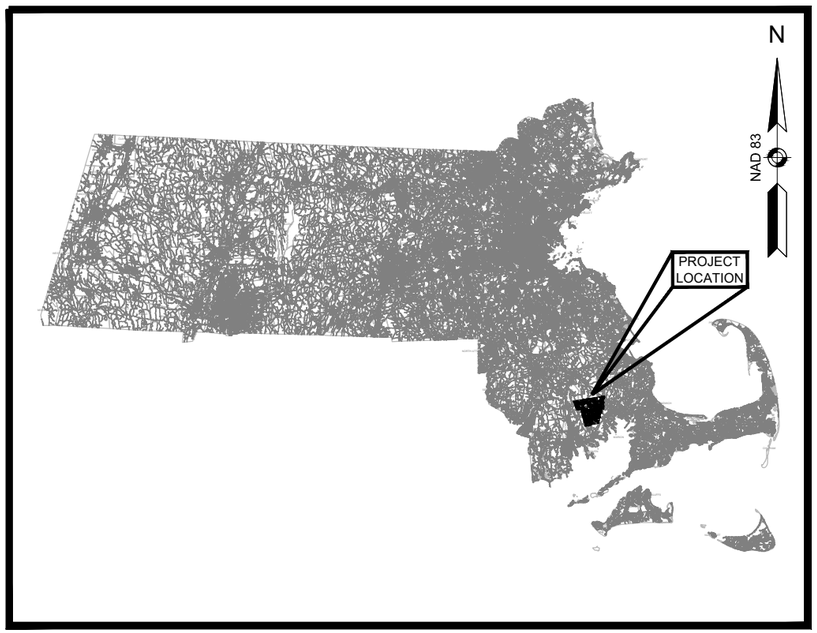
MARCH 10, 2025

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		1	23
PROJECT FILE NO.			

TITLE SHEET & INDEX

INDEX	
SHEET NO.	**DESCRIPTION**
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	GENERAL NOTES
4	CULVERT AT MP 44.27 EXISTING CONDITIONS PLAN 1
5	CULVERT AT MP 44.27 EXISTING CONDITIONS PLAN 2
6	CULVERT AT MP 44.27 EXISTING CONDITIONS PLAN 3
7	CULVERT AT MP 44.27 EXISTING CONDITIONS PLAN 4
8	CULVERT AT MP 44.27 CONSTRUCTION PLAN 1
9	CULVERT AT MP 44.27 CONSTRUCTION PLAN 2
10	CULVERT AT MP 44.27 CONSTRUCTION PLAN 3
11	CULVERT AT MP 44.27 CONSTRUCTION PLAN 4
12	CULVERT AT MP 44.27 SECTION
13	CULVERT AT MP 44.27 EROSION CONTROL PLAN 1
14	CULVERT AT MP 44.27 EROSION CONTROL PLAN 2
15	CULVERT AT MP 44.27 EROSION CONTROL PLAN 3
16	CULVERT AT MP 44.27 EROSION CONTROL PLAN 4
17	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 1
18	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 2
19	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 3
20	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 4
21	EROSION PROTECTION AND WETLAND MITIGATION DETAILS
22	EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES
23	CULVERT AT MP 44.27 SHEET PILE RETAINING WALL



0 10,000 20,000 30,000 40,000

SCALE: 1" = 10,000 FEET

LENGTH OF PROJECT = 1,223 FEET = .23 MILES

PERMIT PLANS NOT FOR CONSTRUCTION

DATE	DESCRIPTION	REV #

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

WSP USA Inc.
100 SUMMER STREET
BOSTON, MA 02110

CHIEF ENGINEER **DATE**

Plotted on 11-Mar-2025 4:40 PM
Last Saved by: USDM682745 on: Mar 11, 2025 3:55 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondi\d10060431TO3-MP44.27_PERMIT(TITLE-SHEET).dwg

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
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
		OVERHEAD CABLE/WIRE
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
x		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT BARRIER
		COIR LOG SEDIMENT BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		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

ABBREVIATIONS

GENERAL	
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
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
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
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
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
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
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW

ABBREVIATIONS (cont.)

GENERAL	
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
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
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		2	23
PROJECT FILE NO.			

LEGEND & ABBREVIATIONS

Plotted on 11-Mar-2025 4:40 PM

Last Saved by: USDM682745 on: Mar 10, 2025 8:49 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondad\10080431TO3-MP44.27_PERMIT\ABBREVS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		3	23
PROJECT FILE NO.			

GENERAL NOTES

DESIGN CRITERIA:

DESIGN STANDARDS AND CODES OF PRACTICE
• AREMA MANUAL FOR RAILWAY ENGINEERING, 2024 EDITION
• DESIGN LOAD: AREMA COOPER E-80

GENERAL NOTES:

1. ALL WORK AT EACH CULVERT SHALL BE COMPLETED WITHIN ONE OR MORE WEEKEND SHUTDOWN WINDOWS IN COORDINATION WITH MASSDOT RAIL AND TRANSIT DIVISION AND MASS COASTAL RAILROAD.
2. THE CONTRACTOR SHALL CONDUCT A PRECONSTRUCTION SURVEY AND VERIFY ALL EXISTING DIMENSIONS AND MATERIAL TYPES IN THE FIELD BEFORE COMMENCING WORK AND IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES. WHERE THE CLEAR INTENT OF THE PROPOSED WORK IS TO MATCH EXISTING CONDITIONS, THE FIELD DATA SHALL GOVERN.
3. THE RAILROAD CENTERLINE SHALL BE ESTABLISHED AS THE CONSTRUCTION BASELINE.
4. ALL ITEMS NOT REFERENCED FOR MODIFICATION WILL BE "EXISTING TO REMAIN" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. ALL WORK PERFORMED, AND MATERIALS INSTALLED IN THE EXECUTION OF THE WORK SHALL BE UNDERTAKEN IN STRICT ADHERENCE TO ALL MCRR AND MASSDOT RAIL DIVISION APPLICABLE CODES, STANDARDS, REGULATIONS, AND ORDINANCES OF GOVERNMENTAL AGENCIES HAVING JURISDICTION AT THE WORK SITE.
6. AT THE END OF EACH WORK DAY, THE CONTRACTOR WILL MAKE REASONABLE EFFORTS TO KEEP THE WORK AREA CLEAN AND FREE OF CONSTRUCTION DEBRIS, RUBBISH, SPOILS, TRASH, AND OTHER FOREIGN MATERIALS. ALL SUCH RUBBISH, DEBRIS AND LIKE MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL ORDINANCES, RULES AND REGULATIONS OF THE JURISDICTIONAL AUTHORITY, INCLUDING ENVIRONMENTAL REGULATIONS.
7. THE CONTRACTOR SHALL SUPERVISE AND EXECUTE THE WORK USING THE HIGHEST QUALITY CONSTRUCTION SKILLS AND ATTENTION TO DETAIL. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR, AND HAVE CONTROL OVER THE CONSTRUCTION MEANS, METHODS, TECHNOLOGIES, SEQUENCES, AND PROCEDURES.
8. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO MASSDOT STANDARDS AND AREMA SPECIFICATIONS FOR CONSTRUCTION, WHICHEVER IS MORE STRINGENT.
9. THE STRUCTURAL DRAWINGS REPRESENT THE FINAL COMPLETED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR DESIGNING AND PROVIDING ALL SHORING, BRACING, OR OTHER TEMPORARY SUPPORTS REQUIRED TO PERFORM THE WORK.
10. EXTREME CARE SHALL BE EXERCISED TO PREVENT ANY DEMOLITION AND CONSTRUCTION DEBRIS FROM FALLING INTO WETLAND RESOURCES. IF ANY MATERIAL/EQUIPMENT FALLS IN WETLAND RESOURCES, IT SHALL BE IMMEDIATELY REMOVED.

SURVEY DATUM:

VERTICAL ELEVATIONS: NAVD 88
COORDINATES: MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83

CULVERT NOTES:

1. ALL CONCRETE SHALL BE PRECAST FOR THE CULVERT SEGMENTS. ALL REINFORCEMENT AND CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR. ALL DESIGN CALCULATIONS, DETAILS, PLANS AND PRODUCT LITERATURE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. THE PRECAST CONCRETE SEGMENTS ARE SHOWN FOR REFERENCE ONLY. THE ACTUAL DIMENSIONS WILL BE DEPENDENT ON THE FABRICATOR. ALL UNITS SHALL BE THE SAME LENGTH AND SHAPE. THE INSIDE DIMENSIONS SHALL BE AS PER PLANS.
3. TWO LAYERS OF A TWO (2) FOOT WIDE STRIP OF FILTER FABRIC SHALL BE APPLIED AT EACH JOINT (TOP & SIDES). FABRIC SHALL BE CENTERED ON THE JOINT.
4. CONCRETE FOR PROPOSED PRECAST HEADWALLS SHALL BE 4,000 PSI.
5. WELDED WIRE FABRIC REINFORCEMENT SHALL BE GRADE 60 KSI, UNCOATED.
6. COVER FOR PRECAST CONCRETE HEADWALLS REINFORCEMENT SHALL BE $1\frac{1}{2}$".
7. LIFTING ANCHORS FOR PRECAST CONCRETE HEADWALLS SHALL BE DESIGNED BY THE CONTRACTOR. ALL LIFTING HOLES AND CONNECTION POCKETS SHALL BE FILLED WITH 5,000 PSI GROUT AFTER BEING SET IN THEIR FINAL POSITION.
8. PROPOSED RCP SHALL BE CLASS V WITH JOINTS TREATED WITH GASKET JOINTS.
9. ALL CORNERS OF PRECAST CONCRETE HEADWALL SHALL RECEIVE A $\frac{3}{4}$" CHAMFER.

SUGGESTED CONSTRUCTION SEQUENCE:

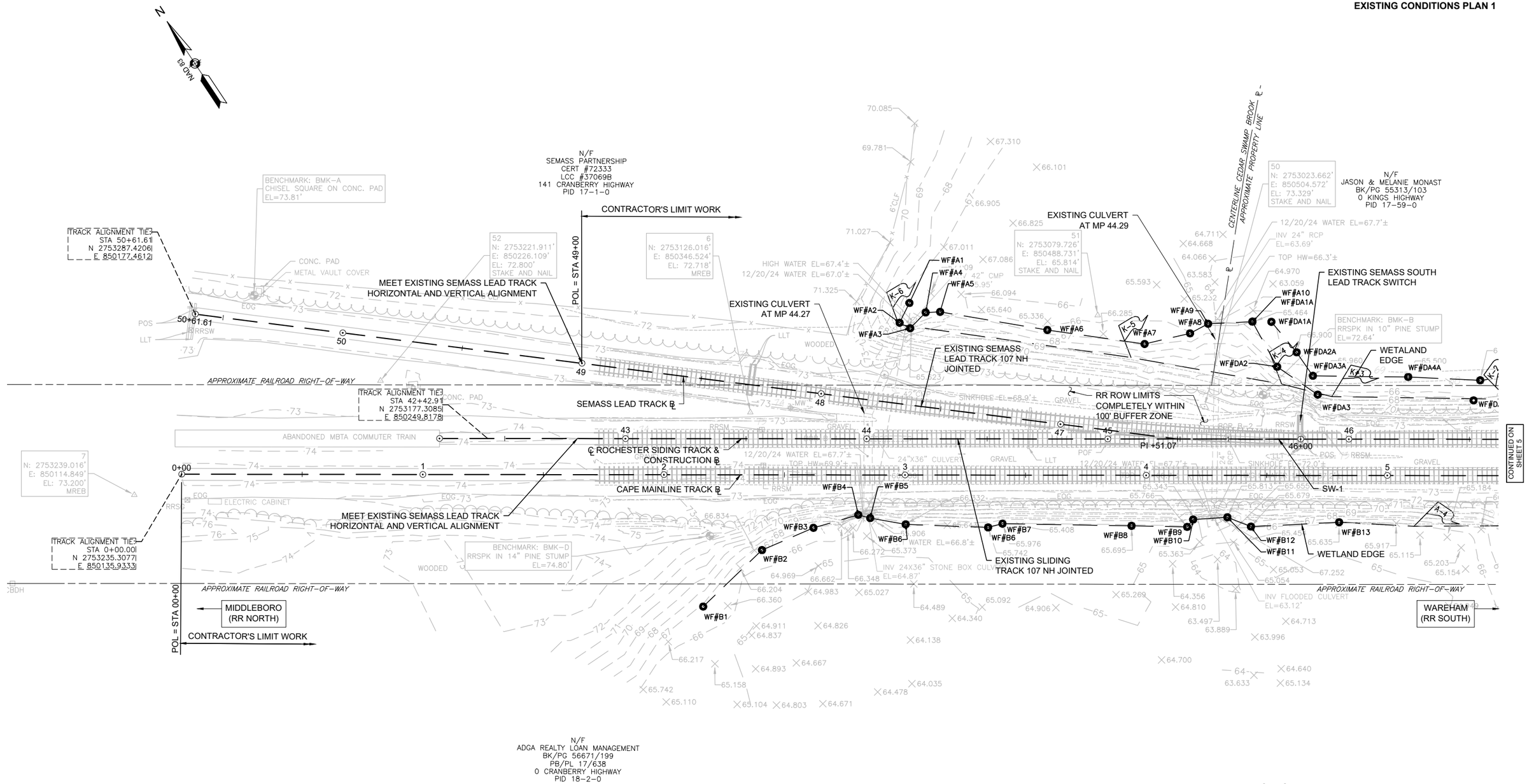
1. INSTALL DEWATERING EQUIPMENT, COFFERDAMS AND EROSION CONTROL MEASURES AS REQUIRED FOR CONSTRUCTION.
2. UPON REMOVAL OF EXISTING TRACK WORK, REMOVE AND STOCKPILE EXISTING OVERBURDEN AS REQUIRED FOR CONSTRUCTION.
3. REMOVE AND DISPOSE OF EXISTING CULVERTS AND HEADWALLS.
4. PREPARE PIPE BEDDING AND RIPRAP APRON.
5. INSTALL PROPOSED HEADWALL, CULVERT PIPE AND INLET STRUCTURE.
6. INSTALL (PLACE AND COMPACT) BACKFILL IN LIFTS, FINE GRADE, AND INSTALL REMAINING RIPRAP.
7. ALL EMBANKMENTS SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING TWELVE (12) INCHES (AFTER COMPACTION) AND SHALL BE COMPACTED AS SPECIFIED BEFORE THE NEXT LAYER IS PLACED.
8. PREPARE TRACK BEDDING FOR REINSTALLATION OF STOCKPILED TIES AND TRACK.
9. REMOVE DEWATERING EQUIPMENT AND COFFERDAMS.
10. INSTALL AND COMPACT EIGHT (8) INCHES OF SUBBALLAST.
11. INSTALL TRACK, TIES AND REMAINING BALLAST.
12. TAMP, LIFT AND SURFACE TO FINAL ELEVATION AND ALIGNMENT.
13. REMOVE DEWATERING EQUIPMENT AND COFFERDAMS.
14. CONTRACTOR TO STOCKPILE EXISTING STREAM BED SUBSTRATE FOR PLACEMENT INSIDE OF 60" DIA PIPE TO ELEVATIONS INDICATED ON THE CONTRACT PLANS.

Plotted on 11-Mar-2025 4:41 PM
Last Saved by: USDM682745 on: Mar 7, 2025 4:38 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondald1006043\TO3-MP44.27_PERMIT(NOTES).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		4	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
EXISTING CONDITIONS PLAN 1



N/F
ADGA REALTY LOAN MANAGEMENT
BK/PG 56671/199
PB/PL 17/638
0 CRANBERRY HIGHWAY
PID 18-2-0

SCALE: 1" = 20'

NOTES:

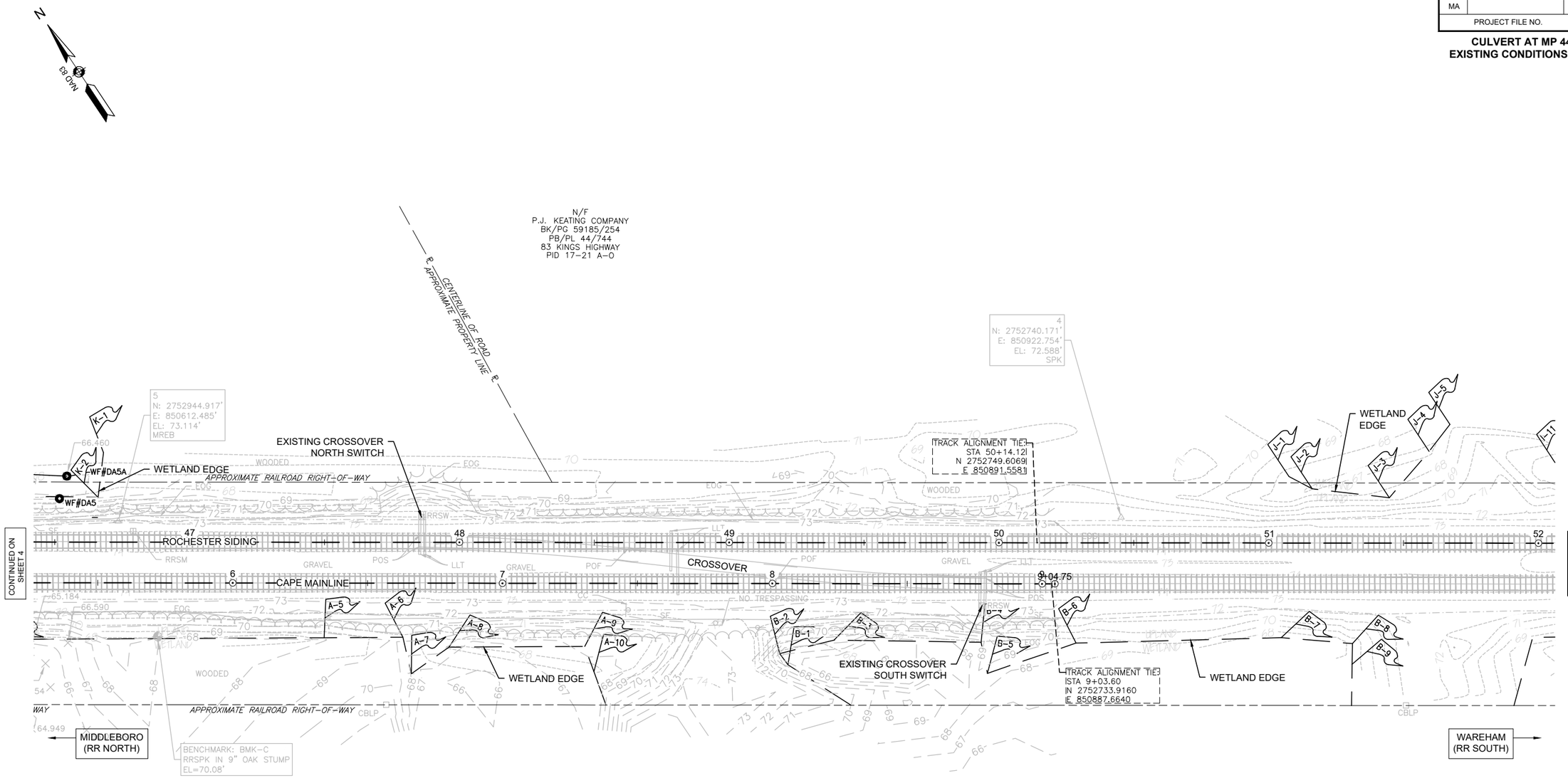
1. TOPOGRAPHIC SURVEY PERFORMED BY WSP BETWEEN DECEMBER 10 AND 20, 2024.
2. WETLAND DELINEATION WAS PERFORMED BY WSP ON NOVEMBER 19, 2024.

Last Saved by: USDM682745 on: Mar 11, 2025 4:14 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaId1006043\T03-MP44.27_PERMIT\EXCOND-PLAN(S).dwg
Plotted on 11-Mar-2025 4:41 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		5	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
EXISTING CONDITIONS PLAN 2



0 20 50 100
SCALE: 1" = 20'

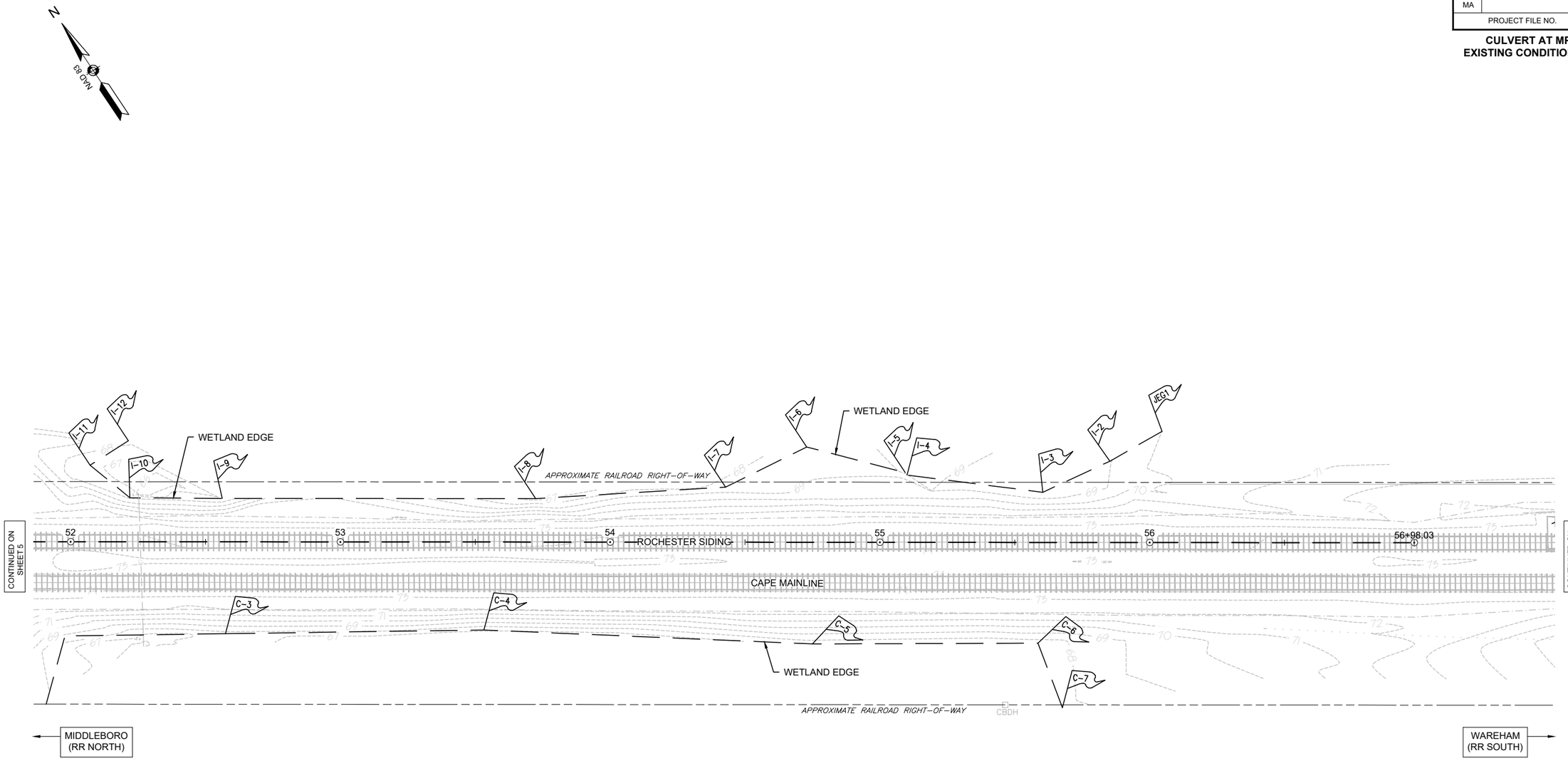
Plotted on 11-Mar-2025 4:41 PM

Last Saved by: USDM682745 on: Mar 11, 2025 4:14 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondal\d10060431\T03-MP44.27_PERMIT\EXCOND-PLAN(S).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		6	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
EXISTING CONDITIONS PLAN 3



0 20 50 100
SCALE: 1" = 20'

Plotted on 11-Mar-2025 4:41 PM

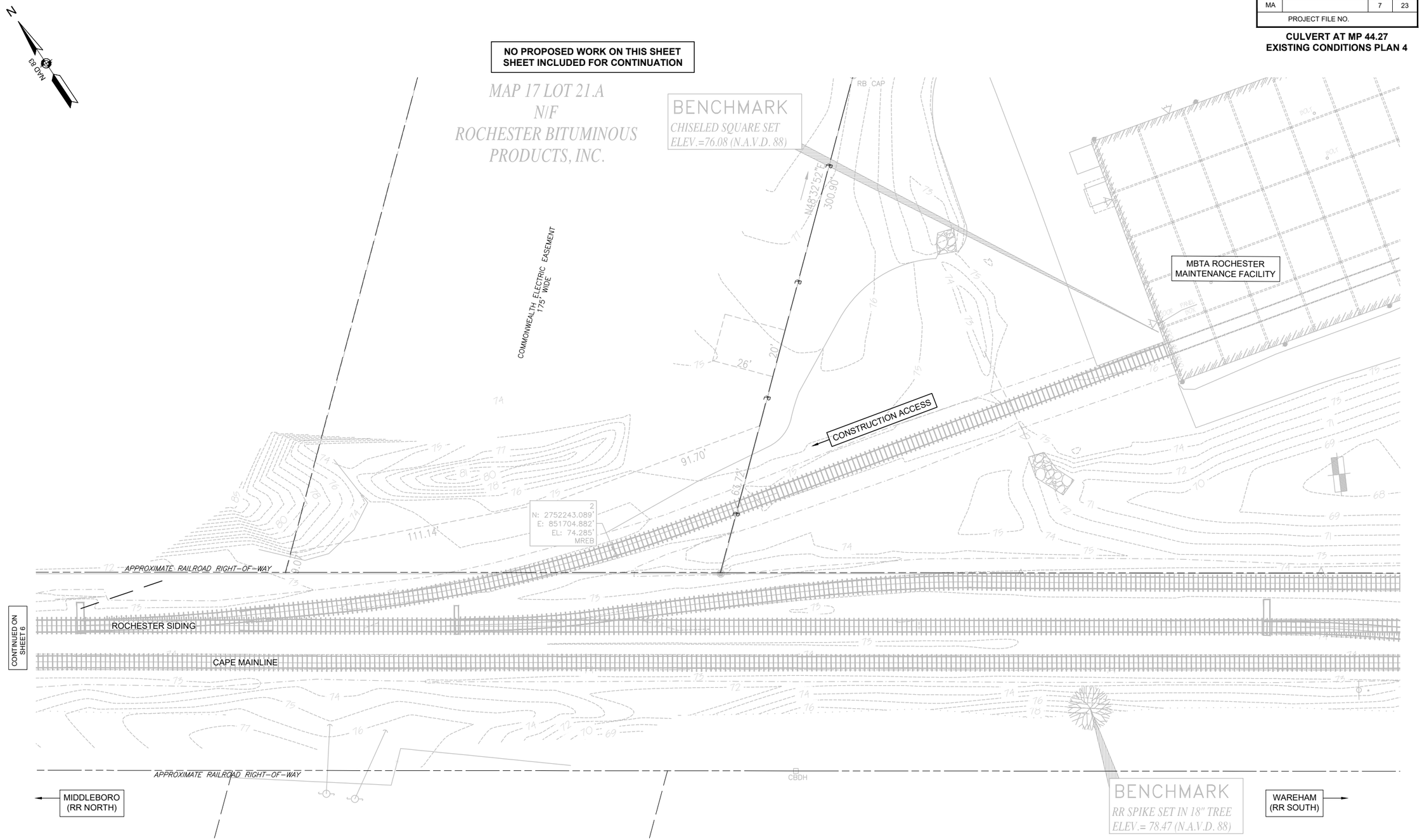
Last Saved by: USDM682745 on: Mar 11, 2025 4:14 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid1006043\TO3-MP44.27_PERMIT(EXCOND-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		7	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
EXISTING CONDITIONS PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



0 20 50 100

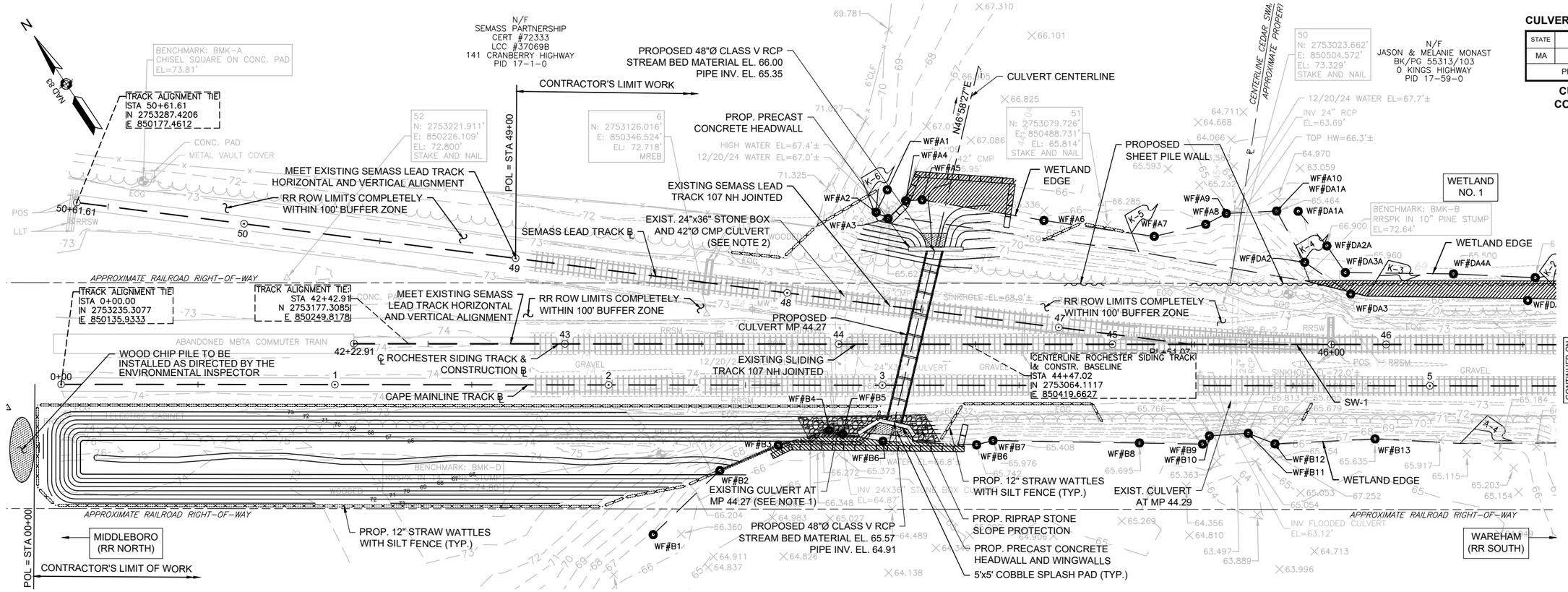
SCALE: 1" = 20'

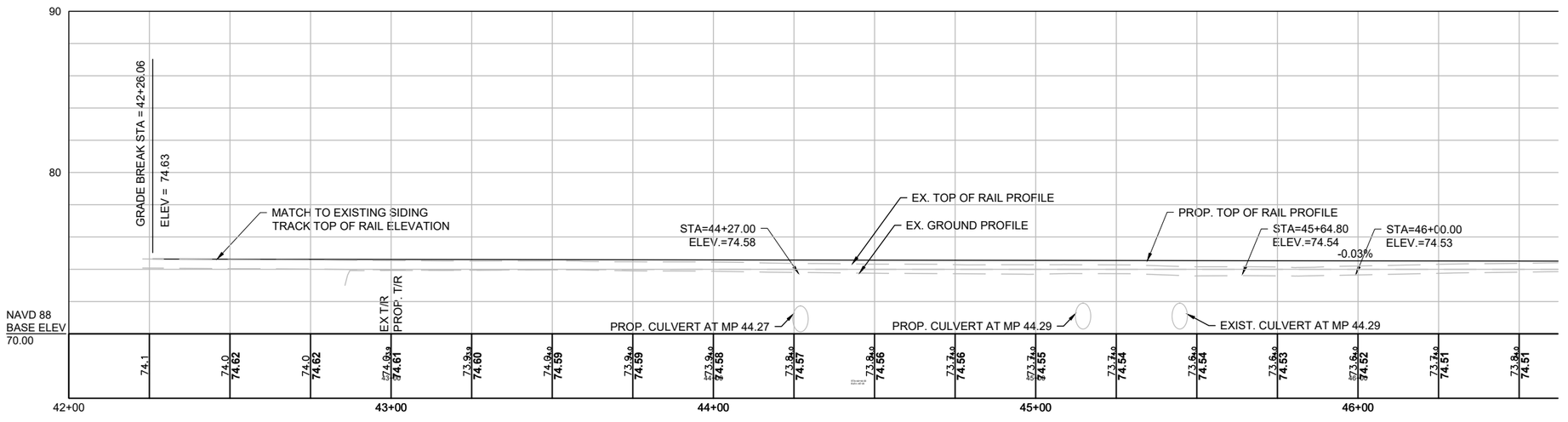
Last Saved by: USDM682745 on: Mar 11, 2025 4:14 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\D0060431\T03-MP44.27_PERMIT(EXCOND-PLANS).dwg
Plotted on 11-Mar-2025 4:41 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		8	
PROJECT FILE NO.			

CULVERT AT MP 44.27
CONSTRUCTION PLAN 1





0 20 50 100

SCALE: 1" = 20'

NOTES:

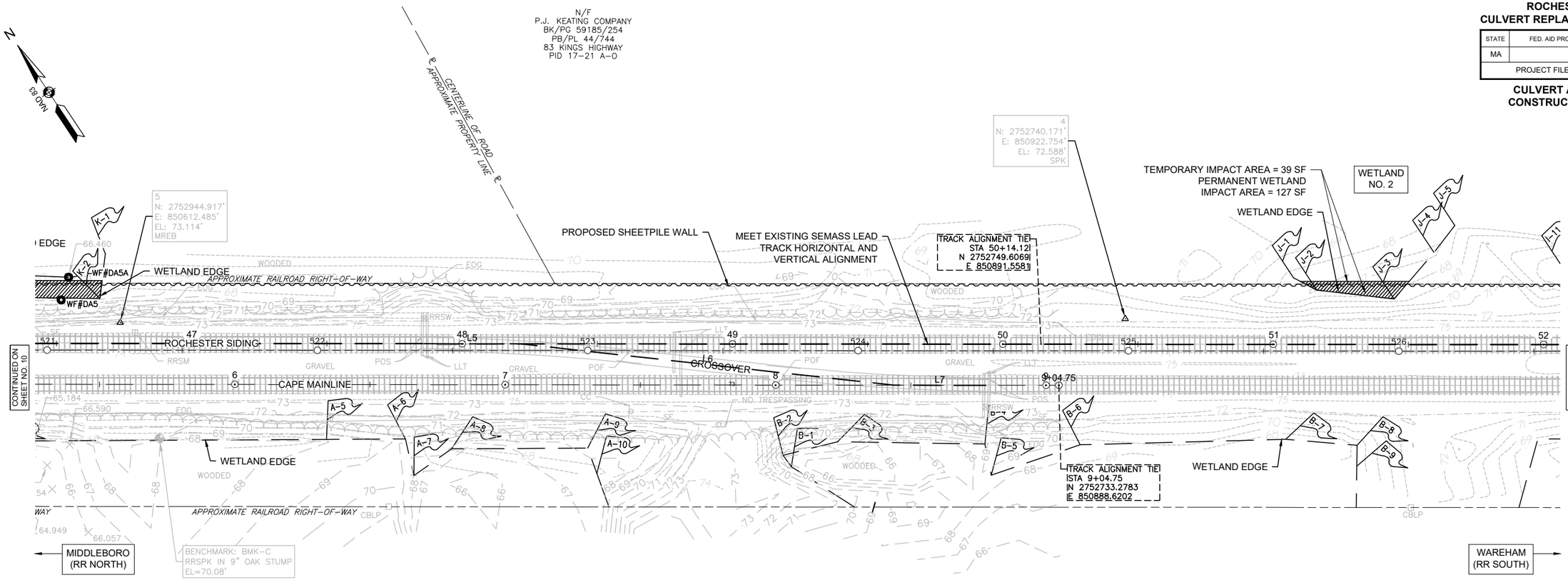
1. CONTRACTOR SHALL INSPECT PIPE OPENINGS DAILY FOR DURATION OF CONSTRUCTION TO ASSURE PIPE FLOW IS NOT BLOCKED.
2. EXISTING CULVERTS AT MP 42.27 AND MP 44.29 TO BE FILLED-IN WITH FLOWABLE FILL AND RETIRED ONCE THE PROPOSED CULVERT HAS BEEN CONSTRUCTED AND IS IN ACTIVE USE.

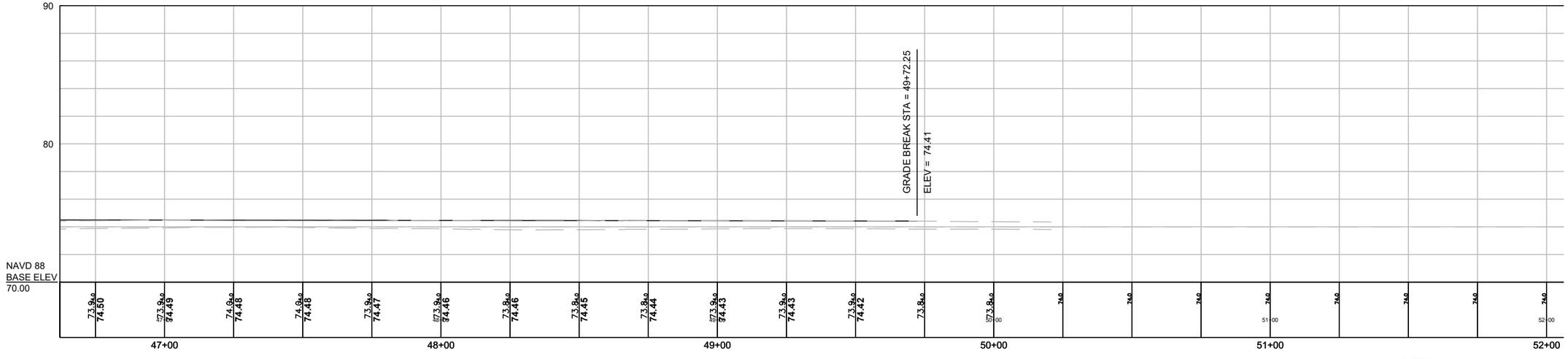
Plotted on 13-Mar-2025 10:31 AM
Last Saved by: USDM682745 on: Mar 13, 2025 10:27 AM File: c:\bms\wsp-pb-us-pw-02\wsp__manny.bravo\d1006043\TO3-MP44.27_PERMIT\(CONST-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		9	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
CONSTRUCTION PLAN 2





0 20 50 100
SCALE: 1" = 20'

NOTES:

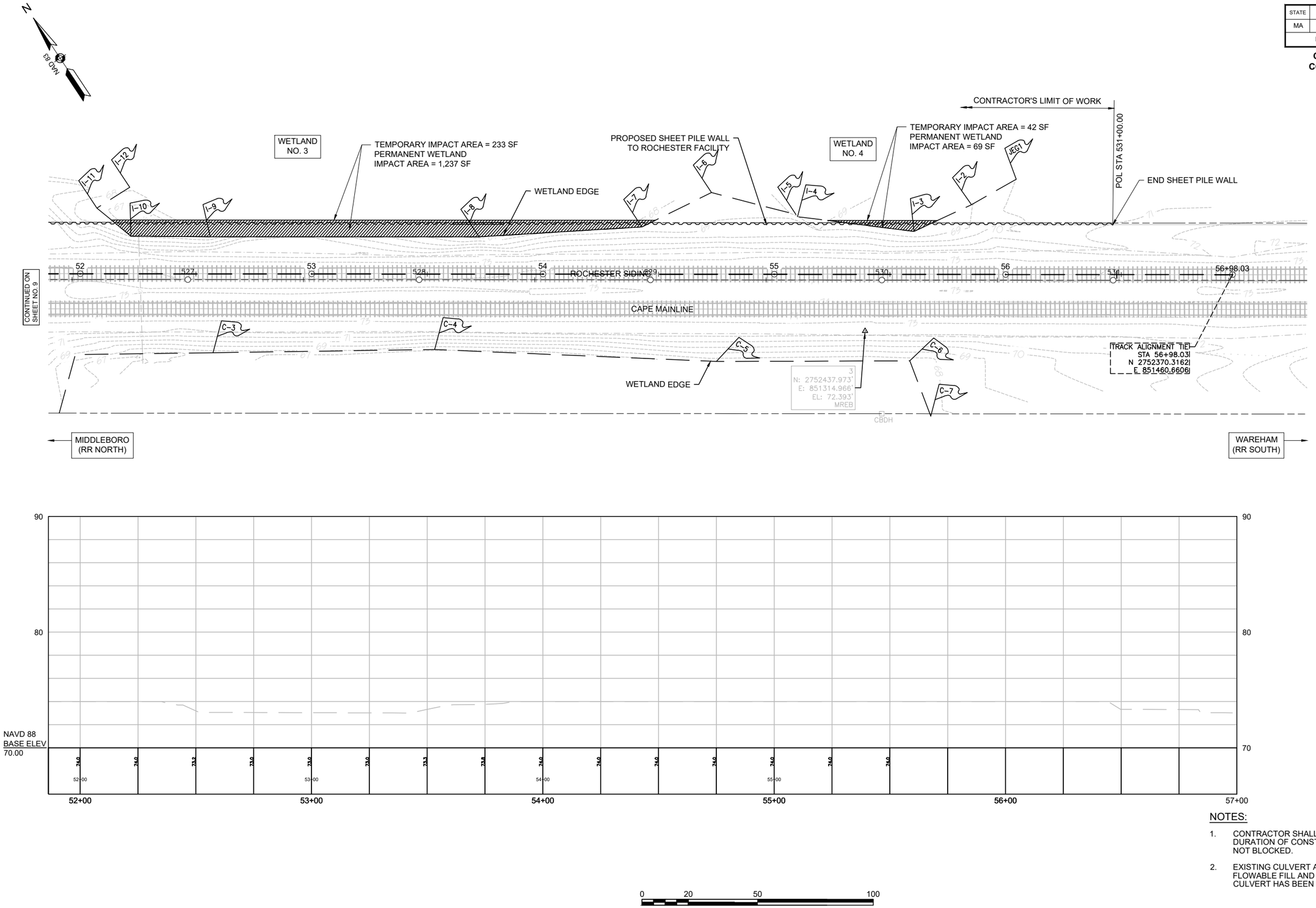
1. CONTRACTOR SHALL INSPECT PIPE OPENINGS DAILY FOR DURATION OF CONSTRUCTION TO ASSURE PIPE FLOW IS NOT BLOCKED.
2. EXISTING CULVERT AT MP 44.27 TO BE FILLED-IN WITH FLOWABLE FILL AND RETIRED ONCE THE PROPOSED CULVERT HAS BEEN CONSTRUCTED AND IS IN ACTIVE USE.

Plotted on 11-Mar-2025 4:41 PM
Last Saved by: USDM682745 on: Mar 11, 2025 4:27 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.27_PERMIT(CONST-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		10	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
CONSTRUCTION PLAN 3



NOTES:

1. CONTRACTOR SHALL INSPECT PIPE OPENINGS DAILY FOR DURATION OF CONSTRUCTION TO ASSURE PIPE FLOW IS NOT BLOCKED.
2. EXISTING CULVERT AT MP 44.27 TO BE FILLED-IN WITH FLOWABLE FILL AND RETIRED ONCE THE PROPOSED CULVERT HAS BEEN CONSTRUCTED AND IS IN ACTIVE USE.

0 20 50 100
SCALE: 1" = 20'

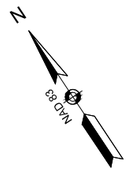
Plotted on 11-Mar-2025 4:41 PM
Last Saved by: USDM682745 on: Mar 11, 2025 4:27 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondald10060431T03-MP44.27_PERMIT(CONST-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		11	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
CONSTRUCTION PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



MAP 17 LOT 21.A
N/F
ROCHESTER BITUMINOUS
PRODUCTS, INC.

BENCHMARK
CHISELED SQUARE SET
ELEV.=76.08 (N.A.V.D. 88)

RB CAP

COMMONWEALTH ELECTRIC EASEMENT
175' WIDE

N48°32'52"E
300.90'

MBTA ROCHESTER
MAINTENANCE FACILITY

CONSTRUCTION ACCESS

91.70'

111.14'

2
N: 2752243.089'
E: 851704.882'
EL: 74.285'
MREB

APPROXIMATE RAILROAD RIGHT-OF-WAY

CONTINUED ON SHEET 10

532 ROCHESTER SIDING 533 534 535+30.18

CAPE MAINLINE

WOOD CHIP PILE TO BE INSTALLED AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR

APPROXIMATE RAILROAD RIGHT-OF-WAY

CBDH

MIDDLEBORO
(RR NORTH)

BENCHMARK
RR SPIKE SET IN 18" TREE
ELEV.= 78.47 (N.A.V.D. 88)

WAREHAM
(RR SOUTH)

0 20 50 100
SCALE: 1" = 20'

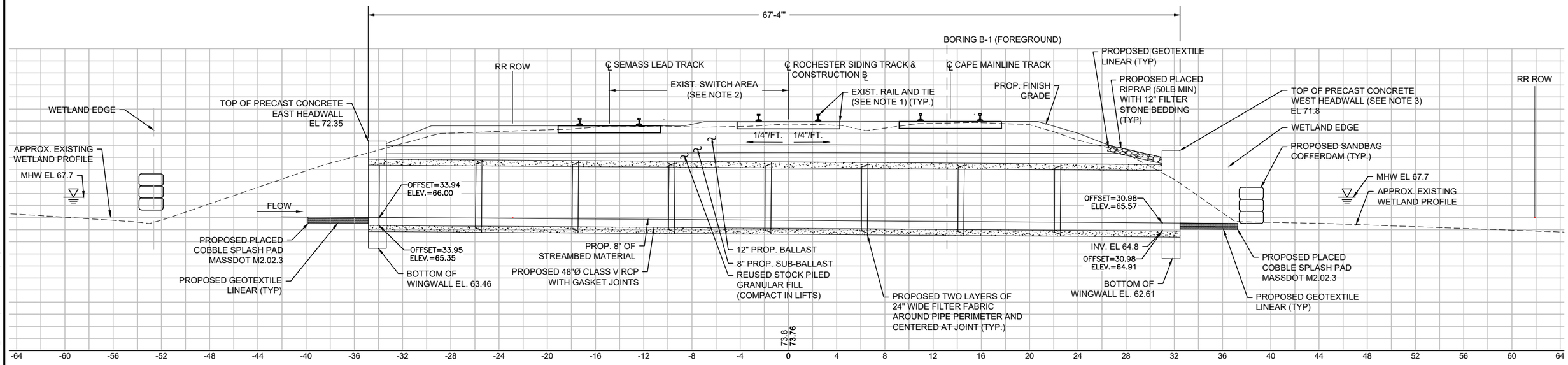
Plotted on 11-Mar-2025 4:41 PM

Last Saved by: USDM682745 on: Mar 11, 2025 4:27 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid10060431\T03-MP44.27_PERMIT(CONST-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		12	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
SECTION



NOTES:

1. EXISTING TRACKS (RAILS AND TIES) TO BE REMOVED AND RESET AS NECESSARY FOR CULVERT CONSTRUCTION.
2. EXISTING TRACK SWITCH TO BE REMOVED AND RESET AS NECESSARY FOR CULVERT CONSTRUCTION.
3. PROPOSED WINGWALLS NOT SHOWN FOR CLARITY.

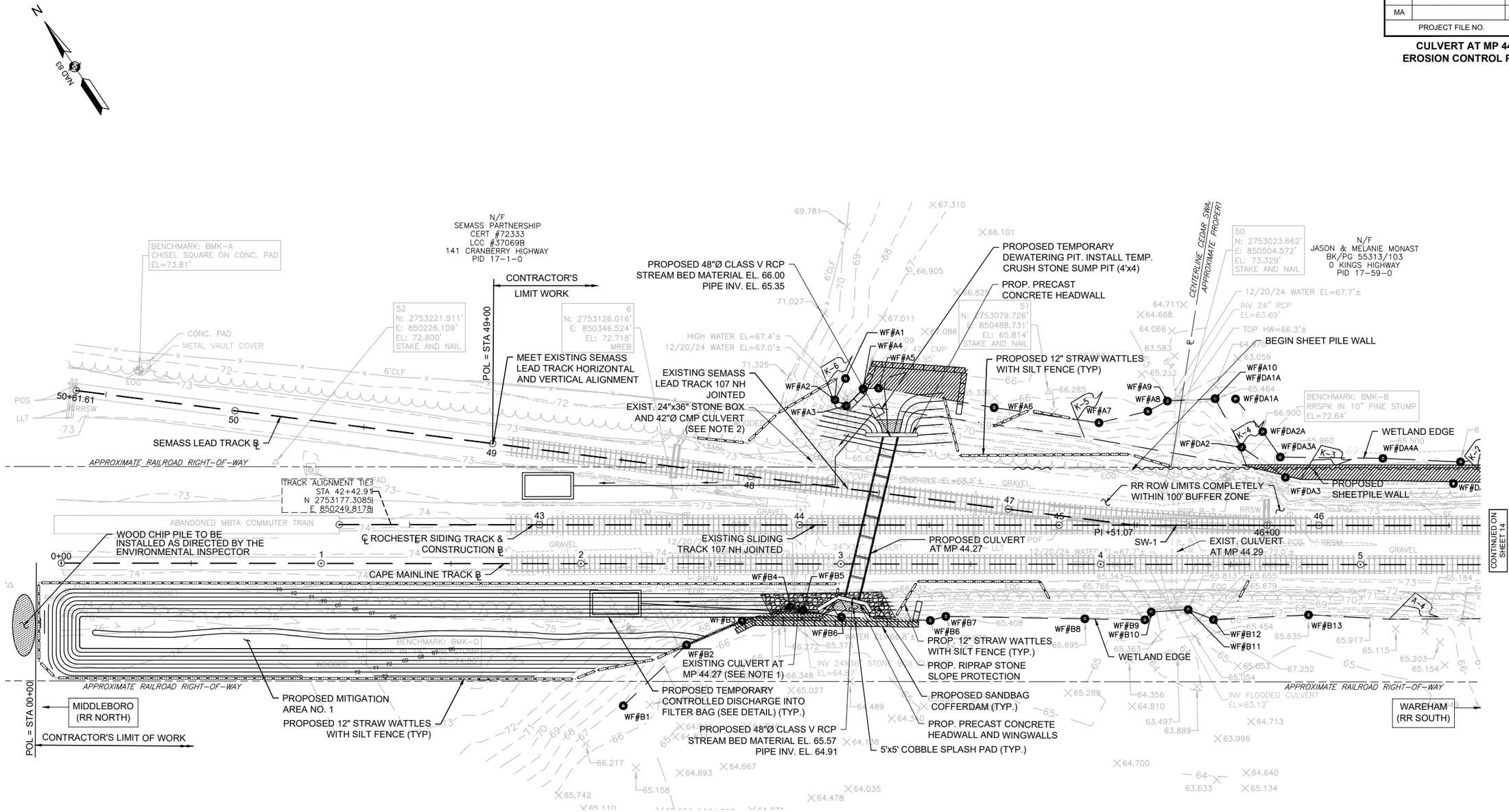
HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

Plotted on 11-Mar-2025 4:41 PM
Last Saved by: USDM682745 on: Mar 11, 2025 3:39 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.27_PERMIT(CLVRT-SECT)\dwg (CLVRT-SECT).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		13	
PROJECT FILE NO.			

CULVERT AT MP 44.27
EROSION CONTROL PLAN 1



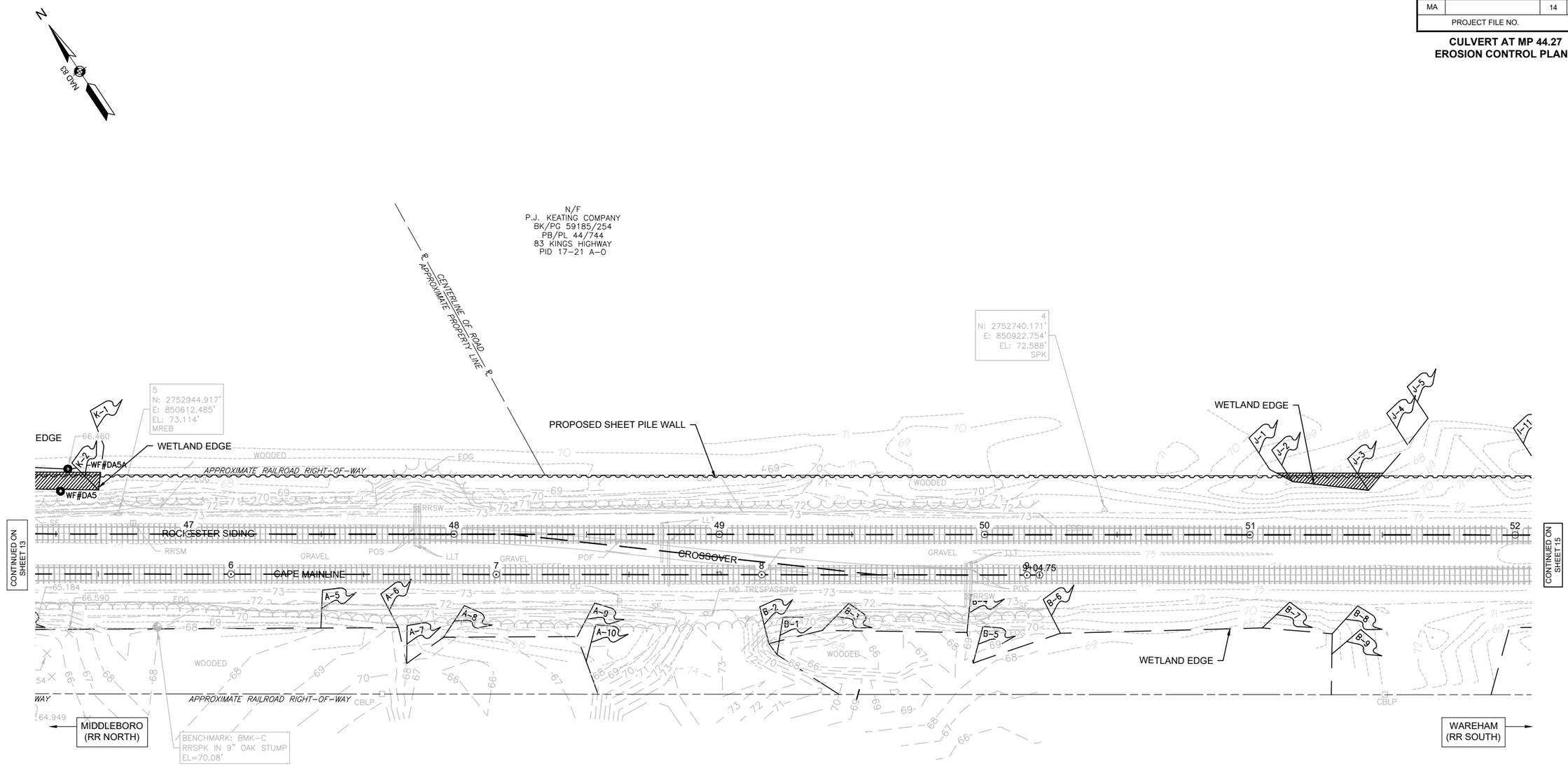
Last Saved by: USMB682635 on: Mar 13, 2025 10:20 AM File: c:\bms\wsp-pb-us-pw-02\wsp__manny.bravo\d10060431T03-MP44.27_PERMIT\EC-PLANS\.dwg

Plotted on 13-Mar-2025 10:31 AM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		14	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
EROSION CONTROL PLAN 2



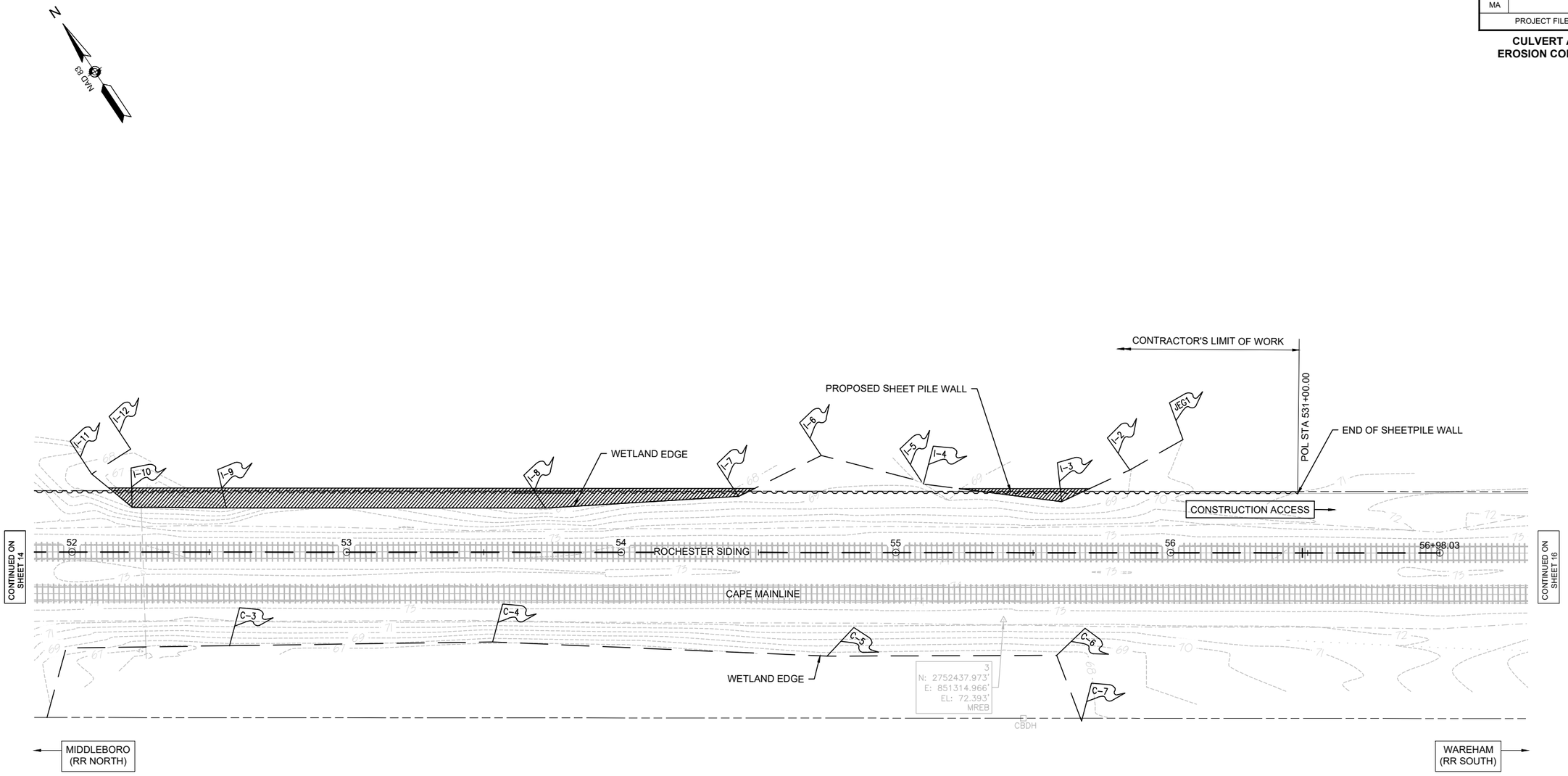
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 11, 2025 4:32 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondad1\0060431T\03-MP44.27_PERMIT\EC-PLANS).dwg
Plotted on 11-Mar-2025 4:41 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		15	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
EROSION CONTROL PLAN 3



0 20 50 100

SCALE: 1" = 20'

Plotted on 11-Mar-2025 4:41 PM

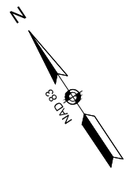
Last Saved by: USDM682745 on: Mar 11, 2025 4:32 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d100604311\TO3-MP44.27_PERMIT(EC-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		16	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
EROSION CONTROL PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



MAP 17 LOT 21.A
N/F
ROCHESTER BITUMINOUS
PRODUCTS, INC.

BENCHMARK
CHISELED SQUARE SET
ELEV.=76.08 (N.A.V.D. 88)

RB CAP

N48°32'52"E
300.90'

COMMONWEALTH ELECTRIC EASEMENT
175' WIDE

MBTA ROCHESTER
MAINTENANCE FACILITY

CONSTRUCTION ACCESS

91.70'

63.51'

111.14'

2
N: 2752243.089'
E: 851704.882'
EL: 74.285'
MREB

APPROXIMATE RAILROAD RIGHT-OF-WAY

ROCHESTER SIDING

CAPE MAINLINE

CONTINUED ON SHEET 15

WOOD CHIP PILE TO BE INSTALLED AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR

APPROXIMATE RAILROAD RIGHT-OF-WAY

CBDH

MIDDLEBORO
(RR NORTH)

WAREHAM
(RR SOUTH)

BENCHMARK
RR SPIKE SET IN 18" TREE
ELEV.= 78.47 (N.A.V.D. 88)

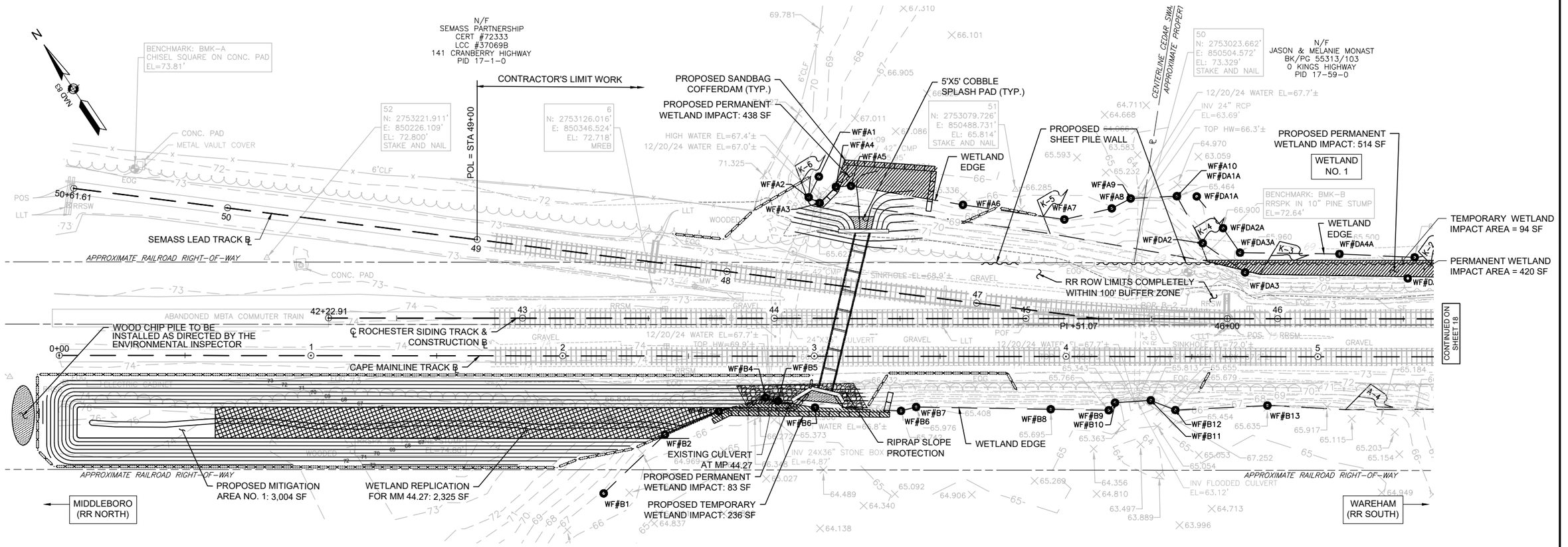
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 11, 2025 4:32 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaId1006043\T03-MP44.27_PERMIT(EC-PLANS).dwg
Plotted on 11-Mar-2025 4:41 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		17	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
WETLAND IMPACT PLAN 1



WETLAND REPLICATION AREA PLANTING SCHEDULE				
Common Name	Scientific Name	Type	Spacing	Number
Red Maple	Acer rubrum	Bag n Ball	10 ft	15
Silver Maple	Acer saccharum	Bag n Ball	10 ft	15
Pussy Willow	Salix discolor	Tube	10 ft	20
Sweet pepperbush	Clethra alnifolia	1-gallon	8 ft	15
Lowbush blueberry	Vaccinium angustifolium	1-gallon	8 ft	15
Highbush blueberry	Vaccinium corymbosum	1-gallon	8 ft	15
Steeplebush	Spiraea tomentosa	1-gallon	8 ft	20
Tussock sedge	Carex stricta	Plug	12 in	30
New England Wetmix		Seed rate: 2500 sf/lb		

0 20 50 100
SCALE: 1" = 20'

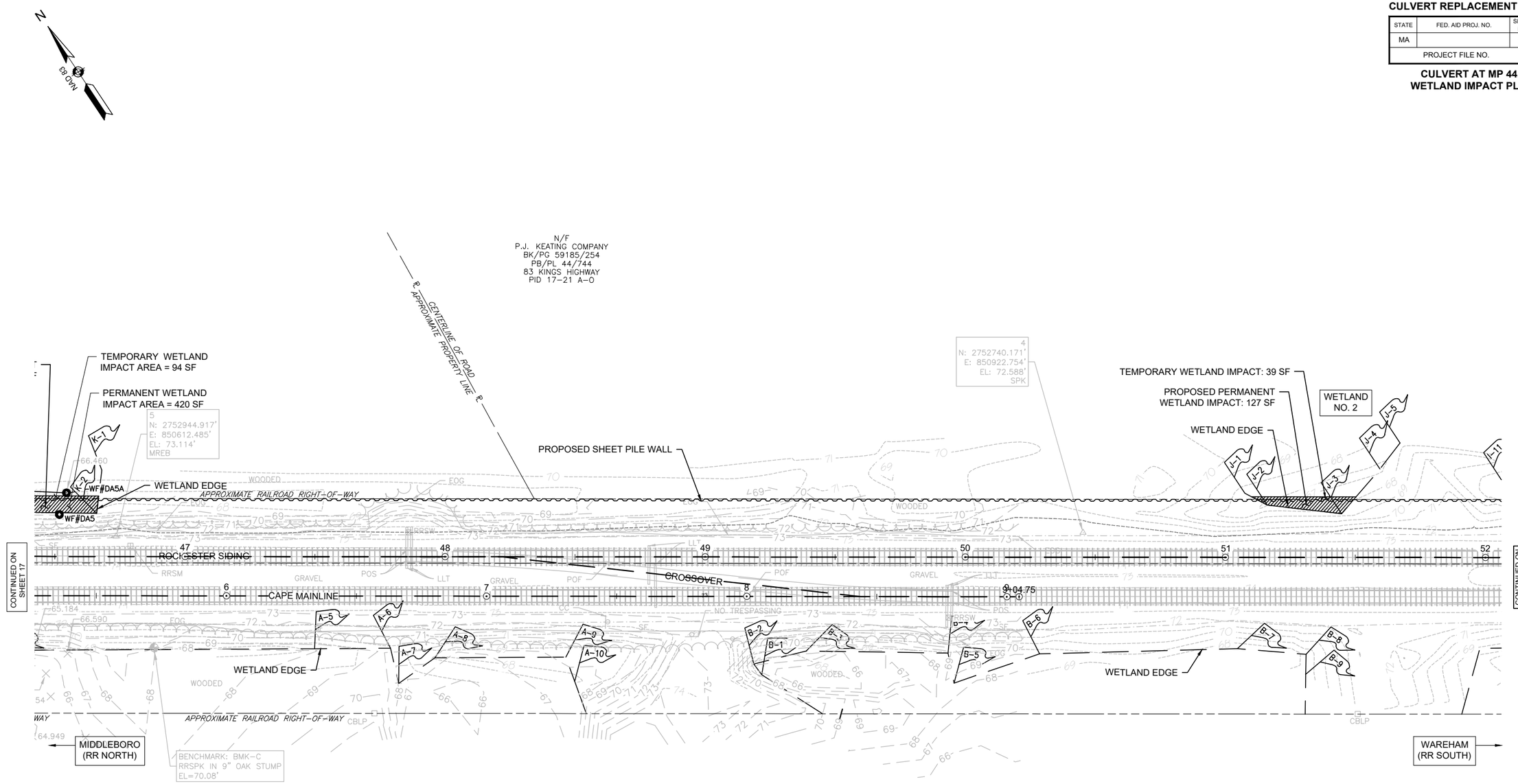
Plotted on 11-Mar-2025 4:41 PM

Last Saved by: USDM682745 on: Mar 11, 2025 4:39 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaId1006043\T03-MP44.27_PERMIT\[WET-IMPACT-PLNR1).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		18	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
WETLAND IMPACT PLAN 2



0 20 50 100
SCALE: 1" = 20'

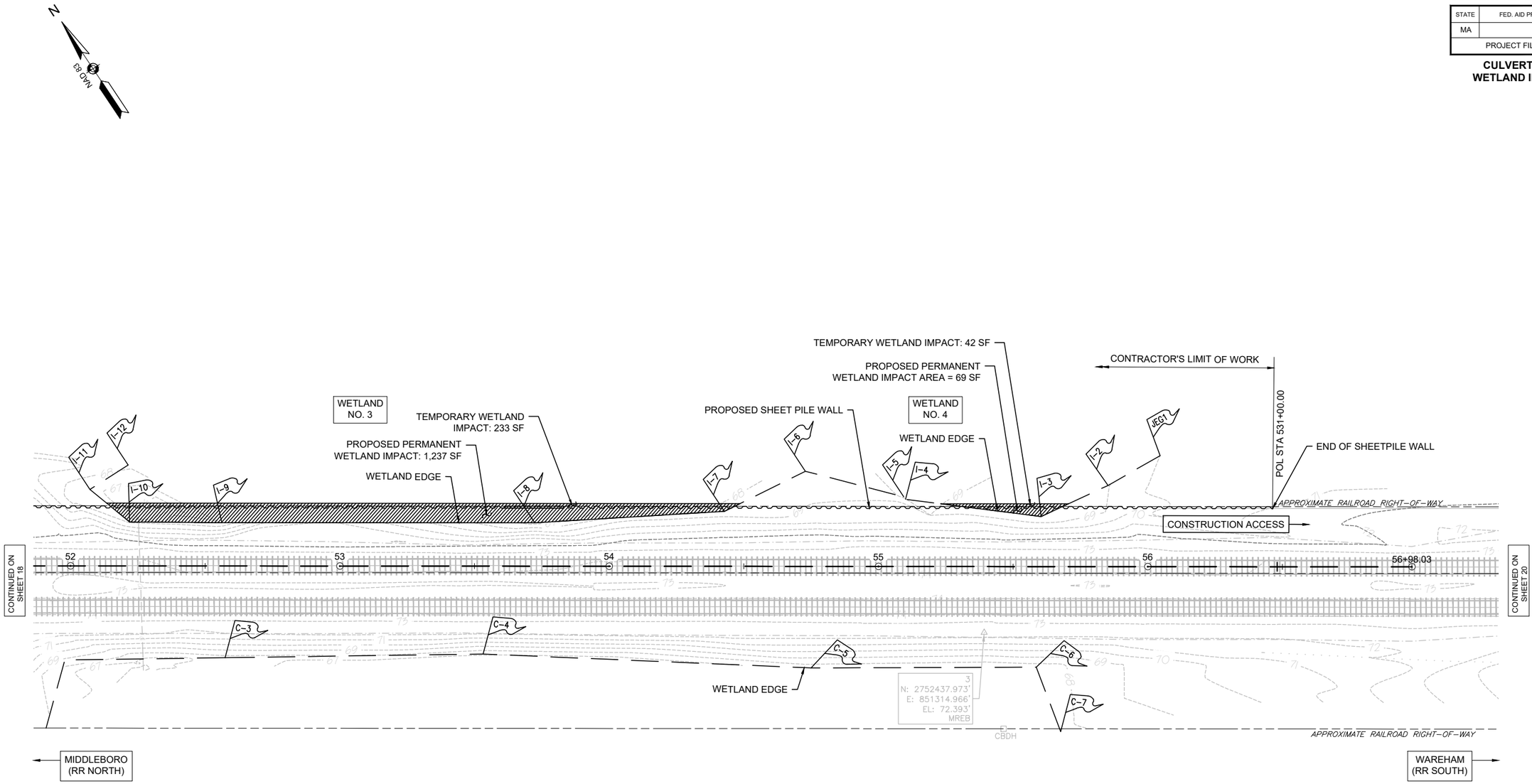
Last Saved by: USDM682745 on: Mar 11, 2025 4:39 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondad1\00\60431\TO3-MP44.27_PERMIT\WET-IMPACT-PLNR1).dwg

Plotted on 11-Mar-2025 4:41 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		19	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
WETLAND IMPACT PLAN 3



0 20 50 100
SCALE: 1" = 20'

Plotted on 11-Mar-2025 4:41 PM

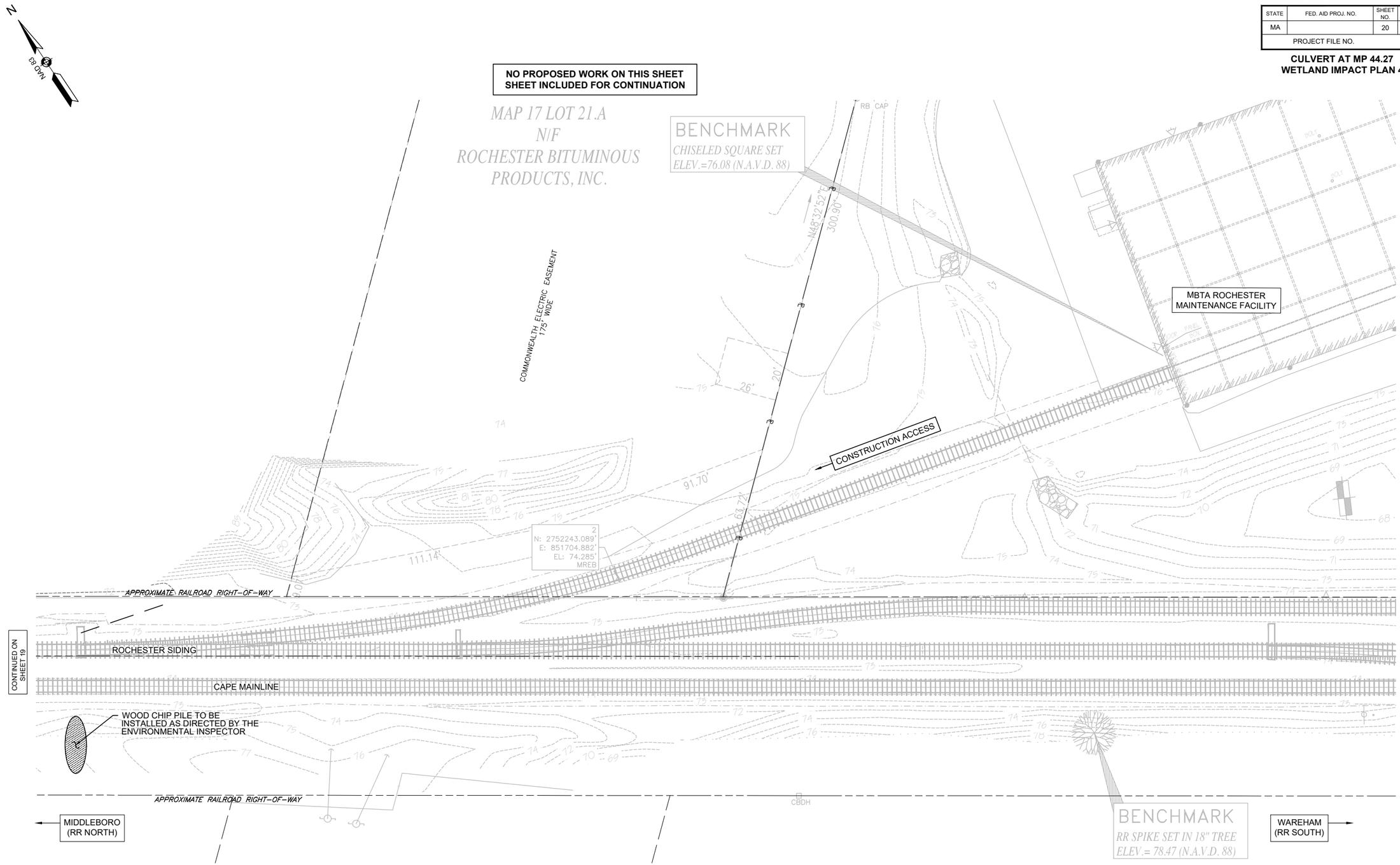
Last Saved by: USDM682745 on: Mar 11, 2025 4:39 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d10060431\TO3-MP44.27_PERMIT\WET-IMPACT-PLNR1).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		20	23
PROJECT FILE NO.			

CULVERT AT MP 44.27
WETLAND IMPACT PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



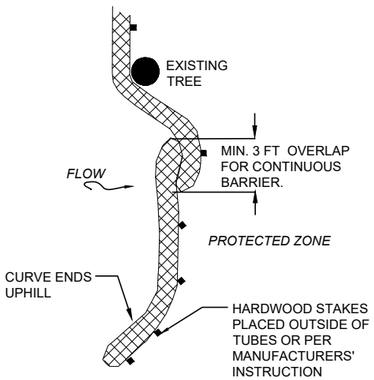
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 11, 2025 4:39 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaId100604311O3-MP44.27_PERMIT(WET-IMPACT-PLNR1).dwg
Plotted on 11-Mar-2025 4:41 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		21	23
PROJECT FILE NO.			

EROSION PROTECTION AND WETLAND MITIGATION DETAILS

Plotted on 11-Mar-2025 4:42 PM



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE.

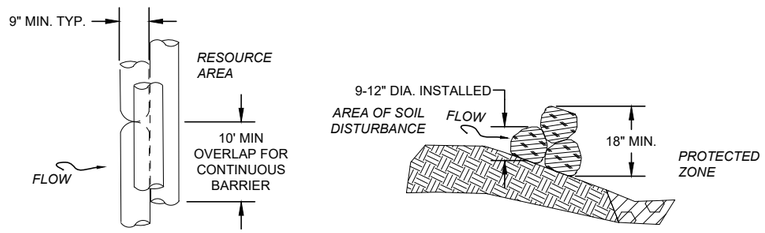
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

SEDIMENT BARRIERS

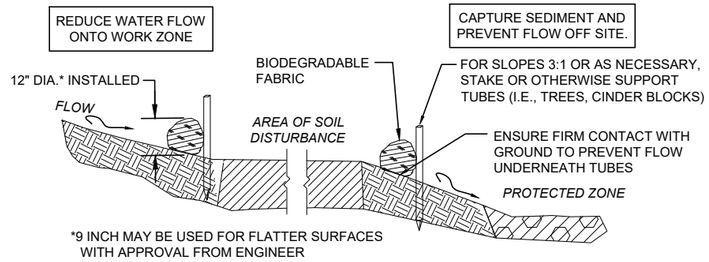
NOT TO SCALE



PLAN VIEW SECTION

PROP. SEDIMENTATION CONTROL BARRIER BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE



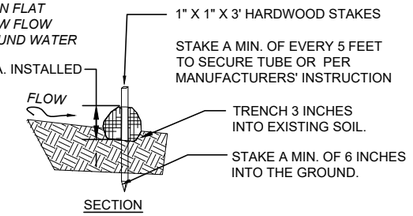
SECTION

SEDIMENT BARRIERS - PROP. SEDIMENTATION CONTROL BARRIERS

NOT TO SCALE

12 INCH STRAW WATTLE

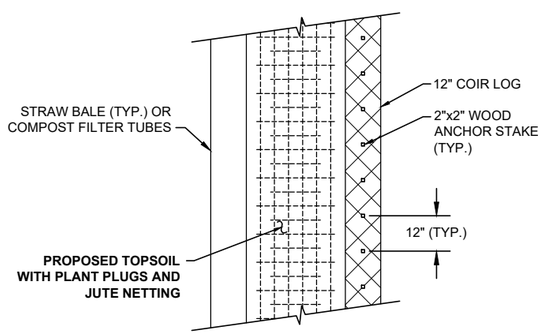
TO BE USED ONLY ON FLAT SURFACES WITH LOW FLOW TO DIVERT OR IMPOUND WATER FLOW



SECTION

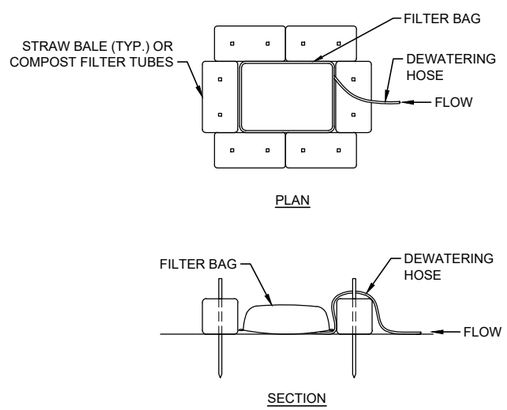
SEDIMENT BARRIERS - STRAW WATTLE

NOT TO SCALE



WETLAND MITIGATION DETAIL

NOT TO SCALE



DEWATERING CONTAINMENT AREA DETAIL

NOT TO SCALE

NOTES:

1. SEE SHEETS 2 AND 3 FOR GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS.
2. SEE SHEET 13 FOR THE EROSION CONTROL PLAN AND SHEET ## FOR THE WETLAND IMPACT PLAN.
3. SEE SHEET 22 FOR EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES.
4. ALL EROSION AND SEDIMENT CONTROLS SHALL BE PLACED AND MAINTAINED IN ACCORDANCE WITH MASSDOT STANDARDS.
5. SEDIMENT BARRIERS SHALL BE PLACED AT LOCATIONS SHOWN ON EROSION CONTROL PLANS AND/OR AS DIRECTED BY THE ENGINEER.

Last Saved by: USDM682745 on: Mar 10, 2025 1:48 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid100606431TO3-MP44.27_PERMIT(EC-DETAILS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		22	23
PROJECT FILE NO.			

EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES

WETLAND REPLICATION AREA NOTES:

1. WETLAND REPLICATION WORK SHALL BE PERFORMED VIA LOW-INTENSITY METHODS INCLUDING THE USE OF HAND TOOLS AND LIMITED PERSONNEL.
2. FINAL GRADES IN THE REPLICATION AREA SHALL CONFORM TO TARGET ELEVATIONS AS SHOWN ON THE PLANS AND AS APPROVED BY THE WETLAND SPECIALIST. THE FINISHED GRADE SHALL BE AT AN ELEVATION THAT WILL PROVIDE A HYDROLOGIC CONNECTION BETWEEN THE REPLACEMENT AREA AND ADJACENT RESOURCE AREAS. THE CONTRACTOR SHALL VERIFY THAT THIS ELEVATION IS NOT AT A LEVEL THAT COULD ALTER THE HYDROLOGY OF AN ADJACENT WETLAND. RESTORATION AREAS SHALL CONFORM TO EXISTING AND/OR ADJACENT GRADES.
3. THE REPLICATION AREA SHALL BE STAKED AND GRADES SET FOR APPROVAL BY THE WETLAND SPECIALIST PRIOR TO EXCAVATION. TO THE EXTENT POSSIBLE, LIMITS SHALL BE A MINIMUM OF 6 FEET FROM TRUNK OF TREES. ACTUAL LIMITS OF THE REPLICATION AREA MAY BE ADJUSTED IN THE FIELD TO PROTECT ROOT SYSTEMS OF EXISTING TREES. HOWEVER, THE TOTAL AREA OF THE REPLICATION AREA REQUIRED BY ALL PERMITS SHALL NOT BE REDUCED.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY EXISTING AREAS OF ESTABLISHED INVASIVE PLANTS AND NOTIFY THE ENGINEER AND WETLAND SCIENTIST OF THE CONDITION. SOIL CONTAINING INVASIVE PLANT MATERIAL SHALL BE EXCAVATED AND DISPOSED OF OFF-SITE AT AN APPROVED FACILITY.
5. ALL CUT TREES, STUMPS, BRUSH, WRACK OR VEGETATION NOT SPECIFIED TO REMAIN SHALL BE REMOVED FROM THE REPLICATION AREA UNLESS DIRECTED OTHERWISE BY THE ENGINEER. MATERIALS SHALL NOT TO BE STOCKPILED IN THE RESOURCE AREAS OR BUFFER ZONE WHILE AWAITING DISPOSAL.
6. SEQUENCE AND EXECUTION OF WORK SHALL ENSURE MINIMAL COMPACTION AND HEAVY EQUIPMENT MOVING OVER PLACED PLANTING SOIL. IF HEAVY EQUIPMENT IS REQUIRED TO TRAVEL OVER EXISTING WETLAND SOILS, WOOD MATS SHALL BE PLACED TO MINIMIZE IMPACTS. UPON ACCEPTANCE OF FINAL GRADES, NO HEAVY EQUIPMENT SHALL TRAVEL ACROSS PLACED SOIL. DO NOT WORK WITH WET OR MOIST SOILS. WORK THAT RESULTS IN COMPACTION OF SOILS SHALL RESULT IN REPLACEMENT OF WETLAND SOILS AT NO ADDITIONAL COST TO THE CONTRACT.

ENVIRONMENTAL NOTES:

1. VEGETATED WETLAND RESOURCE AREAS WITHIN THE PROJECT AREA WERE IDENTIFIED AND FIELD DELINEATED BY WSP IN DECEMBER 2024. THE DELINEATION WAS COMPLETED IN CONFORMANCE WITH THE STANDARDS AND METHODS OUTLINED IN THE U.S. ARMY CORPS OF ENGINEERS (USACE) 1987 WETLANDS DELINEATION MANUAL AND ASSOCIATED NORTHEAST AND NORTHCENTRAL REGIONAL SUPPLEMENT (USACE 2012).
2. ALL PLANS REFERENCE MASSACHUSETTS STATE PLANE, MAINLAND STANDARD COORDINATION SYSTEM.

EROSION CONTROL NOTES:

1. PRIOR TO PROJECT IMPLEMENTATION, THE CONTRACTOR SHALL SUBMIT FOR ACCEPTANCE A GENERAL WORK SCHEDULE, CONSTRUCTION SEQUENCE AND PLAN WHICH INDICATES PLANNING IMPLEMENTATION OF TEMPORARY AND PERMANENT EROSION CONTROL MEASURES. THIS PLAN SHALL INCLUDE PROPOSED METHODS OF SOILS MANAGEMENT AND DISPOSAL OF WASTE MATERIALS.
2. BEFORE CONSTRUCTION BEGINS, AN EROSION CONTROL BARRIER WILL BE ERECTED AROUND THE ENTIRE PROPOSED WETLAND REPLACEMENT SITE, EXCEPT THE UPGRADIENT EDGE TO ALLOW MACHINERY ACCESS TO THE SITE. THE EROSION CONTROL BARRIER PREVENTS EROSION OF DISTURBED SOILS AND SEDIMENTATION INTO THE ADJACENT EXISTING WETLAND AREAS.
3. EROSION CONTROLS SHALL BE FINALIZED BASED ON ACTUAL FIELD CONDITIONS.
4. NO SEDIMENT OR SILT SHALL BE DISCHARGED TO THE WETLAND AT ANY TIME.
5. NO DEWATERING IS PERMITTED UNLESS THE CONTRACTOR PREPARES A DEWATERING PLAN THAT INCLUDES PUMPING WATER TO AN UPLAND SITE WITH ADEQUATE SILTATION CONTROLS, AND THAT PLAN IS APPROVED BY THE DEP. CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING ALL TEMPORARY SEDIMENTATION AND EROSION CONTROLS.
6. FOR EROSION CONTROL INSTALLATION REQUIREMENTS, REFER TO EROSION PROTECTION PLAN. TEMPORARY TREATMENTS SHALL CONSIST OF COMPOST FILTER TUBE, SILT FENCE, FIBER MULCH OR PROTECTIVE COVER SUCH AS FABRIC MATS.
7. THE TOE OF ANY SLOPE IS TO REMAIN AT LEAST ONE FOOT INSIDE OF ALL EROSION CONTROLS. UNDER NO CIRCUMSTANCE SHALL THE CONTRACTOR COVER ANY PORTION OF THE EROSION CONTROLS WITH MATERIAL. ANY MATERIAL THAT IS PLACE ON ANY EROSION CONTROLS BY THE CONTRACTOR, OR ANY AGENT OF THE CONTRACTOR, SHALL BE IMMEDIATELY REMOVED BY THE CONTRACTOR, AND ANY NECESSARY REPAIRS TO THE EROSION CONTROLS ACCOMPLISHED, AT NO COST TO THE OWNER.
8. ADDITIONAL EROSION CONTROLS SHALL BE INSTALLED AS CONDITIONS WARRANT, OR AS DIRECTED BY THE ENGINEER.
9. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EROSION CONTROL MAINTENANCE AND SHALL INSPECT AND/OR REPLACE ALL CONTROLS AS NEEDED. MAINTENANCE WILL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS AND PERMIT CONDITIONS. THE CONTRACTOR IS RESPONSIBLE FOR CARRYING OUT NECESSARY MAINTENANCE DURING ALL PHASES OF PROJECT COMPLETION.
10. SEDIMENTATION CONTROL DEVICES SHALL BE INSPECTED CLOSELY AND MAINTAINED PROMPTLY AS DESCRIBED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES ON A WEEKLY BASIS AND WITHIN 24 HOURS OF EACH STORM EVENT.
11. DISTURBED SLOPES ALONG THE EMBANKMENT WITHIN THE WORK ZONE SHALL BE STABILIZED WITH LOAM AND SEED.
12. UPON PROJECT COMPLETION, IMPACTED WETLANDS SHALL BE RESTORED TO EXISTING CONDITIONS. THE CONTRACTOR MUST REPAIR AND/OR RESEED ANY AREAS THAT DO NOT DEVELOP WITHIN ONE YEAR OF PLANTING.

PLANTING AND SEEDING NOTES:

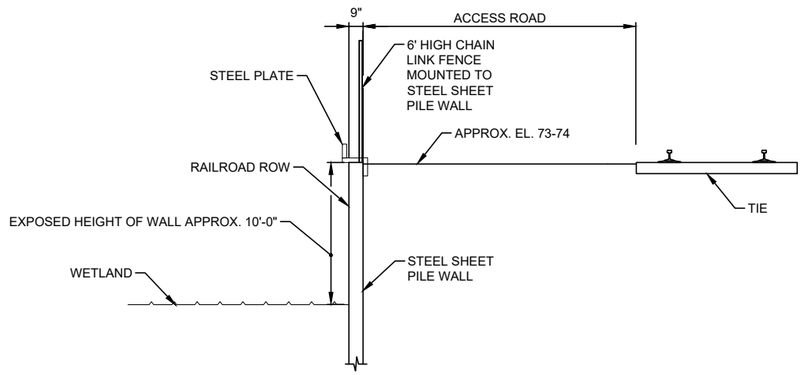
1. SEEDING WITHIN THE WETLAND REPLICATION AREA AND ADJACENT UPLANDS WILL CONFORM TO THE PLANS OR WILL BE COMPLETED IN ACCORDANCE WITH DIRECTIONS PROVIDED IN THE FIELD. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION WILL BE USED. USE OF CULTIVARS WILL BE PROHIBITED. SPECIES NOT SPECIFIED IN THE FINAL SEEDING PLAN WILL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE WETLAND SCIENTIST AND PERMITTING AGENCY.
2. MANUFACTURED HYDRIC SOIL SHALL BE PLACED WITHIN THE WETLAND REPLICATION AREA. WETLAND SOILS ARE CREATED FROM A MIXTURE OF ORGANIC AND MINERAL MATERIALS, WITH THE FINAL PRODUCT CONTAINING AT LEAST 12 PERCENT ORGANIC MATTER CONTENT BY WEIGHT. THE CONTRACTOR MUST PROVIDE ANALYSIS OF THE PREPARED TOPSOIL TO THE WETLAND SCIENTIST FOR APPROVAL PRIOR TO INSTALLATION. WHERE EMPIRICAL DATA ARE LACKING, COMPOST TO SOIL RATIO SHALL BE 1:1 BY VOLUME. SOIL MUST BE FREE OF SEEDS, ROOTS, STEMS OR OTHER VIABLE PARTS OF INVASIVE PLANT SPECIES. SOIL SHALL NOT CONTAIN KILN-DRIED WOOD OR CONSTRUCTION DEBRIS. SOIL SHALL BE FREE OF SOLID MATERIALS LARGER THAN 4-INCHES IN DIAMETER.
3. COMPOST SHALL BE COMPOST MEETING THE REQUIREMENTS FOR ORGANIC SOIL ADDITIVES, SECTION M 1.06.0 OF THE STANDARD SPECIFICATIONS AND THE FOLLOWING:
4. MOISTURE CONTENT SHALL BE 40-60 PERCENT AS MEASURED BY ASTM D2216 STANDARD TEST METHOD FOR LABORATORY DETERMINATION OF WATER CONTENT OF SOIL AND ROCK AND ASTM D2974 (CITED ABOVE).
5. NO SOIL FROM ANY AREA SUPPORTING INVASIVE SPECIES SHALL BE USED IN THE REPLICATION AREA.
6. CONTRACTOR SHALL SPREAD APPROXIMATELY SIX (6) INCHES OF MANUFACTURED WETLAND SOIL WITHIN THE REPLICATION AREA, RAKE IN SEED AND INSTALL ROLLED EROSION CONTROL PRODUCT TO SLOPES ACCORDING TO THE DETAIL. AN APPROVED, NATIVE CONSERVATION SEED MIX SHALL BE USED IN UPLANDS AND AN APPROVED, NATIVE WETLAND MIX SHALL BE USED IN WETLAND AREAS.
7. THE SUPERVISING WETLAND SCIENTIST WILL INSPECT PLANTING STOCK TO ENSURE THAT THE SPECIMENS ARE HEALTHY, FREE FROM PESTS AND ANY INVASIVE PLANT MATERIAL, AND SUITABLE FOR USE WITHIN THE WETLAND RESTORATION SITE. UNSUITABLE SPECIMENS WILL BE REJECTED AND REPLACED WITH SUITABLE SPECIMENS. THE SUPERVISING WETLAND SCIENTIST MUST APPROVE ANY PLANTING SUBSTITUTIONS. WOODY PLANT STOCK WILL BE EITHER BARE ROOT STOCK OR CONTAINER GROWN.
8. TRANSPLANTS AND PLANT MATERIAL COLLECTED FROM THE WILD IS PROHIBITED UNLESS APPROVED IN WRITING BY THE WETLAND SCIENTIST. ALL PLANT MATERIAL USED SHALL BE NURSERY-GROWN AND HEALTHY, SOUND AND FREE OF DISEASE, INSECT PESTS, EGGS OR LARVAE AND DISCOLORATIONS.
9. CONTAINER-GROWN STOCK SHALL NOT HAVE WILTING OR CURLING LEAVES OR WEEDS. CONTAINTER-GROWN STOCK SHALL HAVE BEEN GROWN IN A CONTAINER LONG ENOUGH FOR THE ROOT SYSTEM TO HAVE DEVELOPED SUFFICIENTLY TO HOLD ITS SOIL AFTER REMOVAL FROM THE CONTAINER. ROOTS SHALL VISIBLY EXTEND TO THE INSIDE FACE OF THE GROWING CONTAINER BUT SHALL NOT BE ROOT-BOUND OR GIRDLING.
10. ALL PLANTS SHALL BE DELIVERED TO THE SITE AS LIVE, ACTIVELY GROWING, OR JUST BREAKING DORMANCY, AND ARRIVE TO THE PROJECT SITE READY FOR PLANTING. THE WETLAND SCIENTIST MAY REJECT PLANTS DAMAGED IN HANDLING OR TRANSPORT. PLANT MATERIAL SHALL BE INSTALLED AS SOON AS POSSIBLE AFTER IT HAS BEEN DELIVERED TO THE SITE. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
11. SOIL AND ROOTMASS SHALL BE WATERED AND MOIST ON DELIVERY TO THE JOB SITE. PLANTS WITH DRY SOIL AND ROOTS SHALL NOT BE ACCEPTABLE. ALL PLANT MATERIALS TEMPORARILY STORED AT THE SITE PRIOR TO PLANTING SHALL BE STORED OUT OF DIRECT EXPOSURE TO SUN AND WIND, SHALL BE MAINTAINED BY CAREFUL WATERING, AND SHALL BE PROTECTED FROM DAMAGE DUE TO CONSTRUCTION ACTIVITIES AND ADVERSE WEATHER.
12. TREE AND SHRUB PLANTING TO OCCUR BETWEEN MAY 1 AND JUNE 15 (SPRING SEASON) OR SEPTEMBER 1 AND NOVEMBER 15 (FALL SEASON).
13. UPON COMPLETION OF PLANTING, THE AREAS AROUND EACH TREE OR SHRUB PLANT WILL BE MULCHED WITH A 3-INCH-THICK LAYER OF LEAF LITTER OR OTHER NATURAL ORGANIC MATERIAL (NOT FRESH WOOD CHIPS). THE LEAF LITTER OR OTHER NATURAL ORGANIC MATERIAL SHALL BE SPREAD TO THE WIDEST EXTENT OF THE PLANT DRIP LINE.
14. CONTRACTOR SHALL SUPPLY A WETLAND SEED MIX INCLUDING A MAJORITY OF THE SPECIES LISTED IN THE WETLAND SEED MIX TABLE. 75% OF THE SEED MIX, BY WEIGHT, SHALL BE INDIGENOUS GRASSES AND SEDGES. SEEDS MUST BE FROM PLANTS GROWN WITHIN 200 MILES OF THE MITIGATION SITE.
15. CONTRACTOR SHALL PROVIDE A WRITTEN ANALYSIS OF THE SEED MIXTURE TO THE WETLAND SCIENTIST. NO SEEDING IS PERMITTED WITHOUT APPROVAL OF THE WETLAND SCIENTIST.
16. CONTRACTOR SHALL SUPPLY AN UPLAND SEED MIX INCLUDING A MAJORITY OF THE SPECIES LISTED IN THE UPLAND SEED MIX TABLE. 75% OF THE SEED MIX, BY WEIGHT, SHALL BE INDIGENOUS GRASSES AND, SEEDS MUST BE FROM PLANTS GROWN WITHIN 200 MILES OF THE MITIGATION SITE, CONTRACTOR SHALL PROVIDE A WRITTEN ANALYSIS OF THE SEED MIXTURE TO THE WETLAND SCIENTIST. NO SEEDING IS PERMITTED WITHOUT APPROVAL OF THE WETLAND SCIENTIST.
17. THE UPLAND SEED MIX SHALL BE APPLIED TO ALL DISTURBED SOILS WITHIN UPLANDS ADJACENT TO THE WETLAND MITIGATION AREA, 5, THE SEED MIXES SHALL BE APPLIED AT A RATE OF 1 LB PER 2,500 SQUARE FEET.
18. WATERING SHALL BE REQUIRED DURING THE GROWING SEASON (MAY 1 - NOV 1) WHEN NATURAL RAINFALL IS BELOW ONE INCH PER WEEK. WATER SHALL BE APPLIED IN SUFFICIENT QUANTITY TO THOROUGHLY SATURATE THE SOIL IN THE ROOT ZONE OF EACH PLANT. FOLLOWING THE FIRST MONTH OF PLANTING, WATERING WILL BE LIMITED TO PERIODS OF DECLARED DROUGHT. WATER SHALL BE PROVIDED BY THE CONTRACTOR AND NOT BE SOURCED FROM WATERWAYS ON SITE.
19. THE EROSION CONTROL BARRIERS WILL BE DISASSEMBLED AND PROPERLY DISPOSED OF BEFORE NOVEMBER 1 OF THE THIRD FULL GROWING SEASON AFTER PLANTING OF THE WETLAND REPLICATION AREA. SEDIMENT COLLECTED BY THE BARRIERS WILL BE REMOVED AND DISPOSED OF IN A MANNER THAT PREVENTS EROSION AND TRANSPORT TO A WETLAND OR WATERWAY. IF MINOR GRADING IS REQUIRED IN THE IMMEDIATE ZONE AROUND THE EROSION CONTROL BARRIER TO PROVIDE SURFACE HYDROLOGIC CONNECTION BETWEEN THE WETLAND ESTABLISHMENT SITE AND THE EXISTING WETLAND AREA, IT WILL BE DONE BY HAND AND STABILIZED BY MULCH.

Plotted on 11-Mar-2025 4:42 PM
Last Saved by: USDM682745 on: Mar 8, 2025 3:37 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\d100694\3TO3-MP44.27_PERMIT(TEC-NOTES).dwg

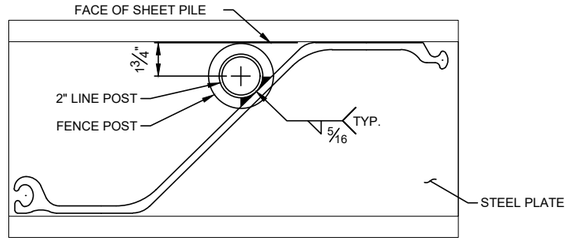
MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.27

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		23	23
PROJECT FILE NO.			

CULVERT AT MP 44.27 SHEET PILE RETAINING WALL SECTIONS AND DETAILS



A S-321 SECTION
SCALE: 1/4"=1'-0"



2 - DETAIL
SCALE: 3"=1'-0"

NOTES:

1. FOR GENERAL CULVERT NOTES, SEE SHEET 3.
2. FOR CHAIN LINK FENCE DETAILS, SEE CIVIL PLANS.

Plotted on 11-Mar-2025 4:42 PM

Last Saved by: USDM682745 on: Mar 8, 2025 3:37 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondald1006043\TO3-MP44.27_PERMIT(WALL-DETAILS).dwg

MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

APR 23 2025

MassDOT Rail and Transit Division
ATTN: Ms. Chalita Belfield
Director of Railroad Properties
10 Park Plaza, Room 3460
Boston, MA 02116

RE: **401 WATER QUALITY CERTIFICATION**
Application for: BRP WW 11
MINOR FILL AND EXCAVATION PROJECTS

AT: Cape Main Railroad Line MP 44.29
Culvert Replacement
Rochester

Transmittal No: 25-WW11-0004-APP
401 WQC Application Complete: 3/21/25

Dear Ms. Belfield:

The 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, Section 401 of the Federal Clean Water Act as amended (33 U.S.C. §1251 et seq.), and 314 CMR 9.00, 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 at 314 CMR 4.00.

The Cape Main railroad line in Rochester is owned by the MassDOT Rail and Transit Division. The proposed project involves the replacement of a failed culvert located beneath the railroad at mile post 44.29. The work qualifies as Footprint Bridge Exempt under Section 24 of the Transportation Bond Bill of 2014. Section 24 of the 2014 Transportation Bond Bill (Chapter 79 Acts) exempts bridge projects of the Massachusetts Department of Transportation from the requirements of MGL Chapter 30, sections 61 - 62A (MEPA), MGL Chapter 91 (Public Waterfront Act), and MGL 131, section 40 (WPA) if the design is substantially the functional equivalent of, and in similar alignment to, the structure to be reconstructed or replaced. As stated in the regulation, a "bridge" shall include any structure spanning and providing passage over water, railroad right-of-way, public or private way, other vehicle facility or other area. As a culvert meets the definition of a bridge, the exemption is applicable and eliminates the need for review

under the Massachusetts Environmental Policy Act, Wetlands Protection Act, and Public Waterfront Act (Chapter 91).

The existing failed culvert includes a 24 x 36-inch stone box culvert with a 30-inch reinforced concrete pipe (RCP) extension. The culvert has failed at the joint between the box culvert and RCP extension which has created a sink hole within the railbed. The replacement culvert is to be offset approximately 30 feet north of the existing and will be larger in size using a 48-inch precast RCP with precast headwalls with rip rap velocity dissipation pads. The overall length of the new culvert will be approximately 54 feet long which is approximately the length of the existing culvert. The proposed replacement culvert is substantially the functional equivalent of, and in similar alignment to the existing failed culvert.

The culvert is located approximately 1,400 feet west of the MTBA facility located at 45 Kings Highway and 500 feet east of the Southeastern Massachusetts Resource Recovery Facility (SEMASS) located at 141 Cranberry Highway. The culvert carries Cedar Swamp Brook which is a tributary to the East Branch of the Sippican River. The railroad embankment carries the Cape Main Track, the SEMASS Lead Track, and the Rochester Siding Track.

The culvert replacement will occur during the same construction period as that of the nearby equalizer culvert located at MP 44.27 (25-WW11-0001-APP) which was approved in a 401 Water Quality Certification by MassDEP on April 3, 2025. Worker and equipment access will be along the northern edge of the right of way (ROW) from the MBTA facility within the same accessway that is to be constructed for the work associated with the equalizer culvert at MP 44.27. The MBTA facility will also serve as the equipment staging area.

The existing culvert will remain in place until the new culvert is completed. This will allow for the existing culvert to continue to flow during construction, eliminating the need to construct a water bypass system. Following construction, the old culvert will be sealed at either end and abandoned in place with flowable fill.

The elevation of the top of the railroad embankment is approximately six (6) feet higher than the adjacent bordering vegetated wetlands at the new culvert location. Flow within the brook is from north to south.

The project has been designed to meet the Massachusetts Stream Crossing Standards to the maximum extent feasible. The type of crossing is limited by the stream invert elevations and the engineering standards for structures set forth in the American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering. The AREMA Manual requires the use of specific materials and structures for the passage of rail traffic over waterways and the proposed Class V Reinforced Concrete Pipe conforms to the required AREMA standards. The geometry of the wetland crossing and the skew crossing angle precludes the use of a three-sided bridge structure, which would require additional vegetated wetland impact to support foundations and other structural elements necessary to meet the AREMA standards. The 48-inch diameter RCP culvert design has a greater openness ratio than existing, minimizes vegetated wetland impacts, and improves the hydraulic opening size. This design has been calculated to pass the 100-year flood event, and headwalls and wingwalls have been incorporated into the design to accommodate anticipated future flood events making the design more resilient. The design also incorporates 12 inches of natural streambed material in the RCP to match existing invert elevations to improve wildlife passage.

A larger 60-inch RCP was also considered; however, it would require raising the profile of the track to accommodate the minimum depth of overburden required by the AREMA standards which would affect over 300 linear feet of approach track in both directions requiring increasing the height of the railbed, which would necessitate widening the railbed ultimately resulting in significant permanent vegetated

wetland impact. A hydraulic analysis of the 60-inch culvert indicates that the wetland systems upstream could become dewatered and have negative downstream effects on cranberry bogs to the south.

Total bordering vegetated wetland impacts are estimated to be 1,259 square feet. Of the 1,259 square feet 587 will be permanent, and 672 square feet will be temporary. Of the 587 square feet of permanent impact approximately 504 square feet is attributed to the realignment of the northern portion of the brook. The remaining permanent impact of 83 square feet of bordering vegetated wetland will occur on the southern side of the culvert and is mostly attributed to the rip rap stone slope protection. The temporary impacts occur on the northern and southern ends of the culvert and are mostly attributed to temporary support of excavation and erosion controls, including pedestrian impacts, manual adjustment of armor stone and ballast, the installation of the rip-rap dissipation pads. Impacts to Land Under water will be limited to regrading a small portion of the upstream channel into the new culvert.

During construction water within the culvert excavation will be pumped to a treatment system located within the railbed in an upland area. Treated water from the dewatering system will then gravity flow through the ballast before discharging at the toe of the railbed. After the culvert has been installed and the construction zone has been stabilized, the existing failed culvert will be plugged and filled with flowable fill.

It is proposed that the excavation and installation of the new culvert will be completed within a five (5) day construction period.

Mitigation for the impacts to bordering vegetated wetland will be created on the southern side of the railbed adjacent to the mitigation area being created for the work associated with the equalizer culvert at MP 44.29. Mitigation plantings will include the installation of red maple, silver maple, pussy willow, sweet pepperbush, lowbush blueberry, steeplebush, and tussock sedge over an area of 587 square feet. In addition, a new England wetmix will spread in areas at a seed rate of 2,500 square feet per pound.

The project site is not located in an Area of Critical Environmental Concern (ACEC), Outstanding Resource Water (ORW), Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife, and there are no mapped certified or potential vernal pools. Additionally, the Division of Marine Fisheries (DMF) did not identify any Time of Year (TOY) restrictions for the work.

Alternatives were evaluated to avoid and minimize impacts. The alternatives included a no build alternative, rehabilitation of the existing stone box culvert, replacement with a larger diameter pipe, and the selected 48-inch culvert replacement. The no build alternative was quickly dismissed as the structure is in poor condition and is likely to fail causing a serious threat to public health, safety, and the environment. The rehabilitation alternative, which would include excavating over the sinkhole and placing a steel plate over the failure point was also dismissed as it would only provide a short-term repair. The larger diameter pipe alternative was also dismissed for constructability and hydraulic concerns previously stated. The selected alternative that includes a full replacement with a 48-inch RCP represents the best alternative.

Public notice was provided in the Environmental Monitor on January 24, 2025, and in the Sippican Week on March 6, 2025. The Department did not receive any public comments during the 21-day public comment periods which ended on February 11, 2025, and March 27, 2025, respectively.

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.

MassDEP 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.

Therefore, based on information currently in the record, the Department grants a 401 Water Quality Certification 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.

1. All work shall conform to the plans entitled:

    - WW11-401 Minor Fill and Excavation Project Application dated March 21, 2025.
    - Section 401 Water Quality Certification Application, Cape Main MP 44.29 Culvert Replacement Project, prepared for Massachusetts Department of Transportation Rail and Transit Division, prepared by WSP USA Energy and Environment Inc., dated February 28, 2025.
    - Massachusetts Department of Transportation Rail & Transit Division, Plan and Profile Details of Culvert Replacement at Cape Main MP 44.29, Sheets 1 through 23, prepared by WSP USA Energy and Environment Inc., dated March 10, 2025.

2. To the extent that the following conditions modify or differ from the plans, specifications or other proposals referenced in Condition 1, the conditions of this Certification shall control.

3. A copy of this Certification and referenced plans and other documents shall be provided to the contractor prior to the start of construction.

4. Prior to the start of work, the applicant shall provide MassDEP with the name, address, and phone number(s) of the person responsible for ensuring that all work complies with the conditions of this Water Quality Certification.

5. Prior to the start of work, the applicant shall submit a site-specific dewatering and turbidity control plan for review and approval by MassDEP.

6. Prior to the start of work and installation of erosion control measures, the applicant shall provide MassDEP with the name, address and phone number(s) of the following:

    - Environmental Monitor(s)
    - Wetland Specialist(s)

    The Environmental Monitor and the Wetland Specialist may be the same person.

7. A minimum of twenty-one (21) days prior to the commencement of construction of the retaining wall, the applicant or their representative shall contact MassDEP (mark.bartow@mass.gov) to schedule a pre-construction consultation meeting to review the plans, specifications and terms and conditions of this Water Quality Certificate (WQC). In addition to the applicant/representative attendees shall include the Environmental Monitor and Wetland Specialist unless MassDEP deems attendance is not necessary for any individual.

8. A minimum of twenty-one (21) days prior to the commencement of construction of the culvert, the applicant or their representative shall contact MassDEP (mark.bartow@mass.gov) to schedule a pre-construction consultation meeting to review the plans, specifications and terms and conditions of this Water Quality Certificate (WQC). In addition to the applicant/representative attendees shall include the Environmental Monitor and Wetland Specialist unless MassDEP deems attendance is not necessary for any individual.

9. Prior to the commencement of construction, adequate erosion control measures shall be installed to protect all wetland resource areas.

10. An Environmental Monitor (EM) with experience in wetland science, erosion and sedimentation control, and experience in Railroad/Roadway/Bridge/linear construction, shall be available for the duration of the project. The EM will be responsible for assuring compliance with the permit conditions, plans, and specifications, maintaining limit of work, proper maintenance of the erosion and sedimentation controls, as well as determining if additional erosion and sedimentation controls are necessary. The EM shall assure that dewatering measures are properly implemented and maintained and that the discharge is adequately filtered prior to discharge to wetlands and waterways. The EM may conduct inspections during construction and shall provide MassDEP with a Monitoring Report (MR) at the end of construction summarizing work activities, and compliance with the conditions of this permit.

11. The EM shall coordinate with the contractor and anyone else responsible for maintaining the erosion control and sedimentation control measures prior to forecasted significant storm events to assure that the erosion and sedimentation control measures will adequately protect resource areas. The EM shall have the authority to direct responsible parties to install additional or alternative erosion and sedimentation control measures.

12. In instances where an EM directs the installation of additional or alternative erosion and sedimentation control measures, MassDEP shall be notified via email with photographs and a description of measures.

13. A stockpile of erosion control measures shall be kept on-site for emergency and routine replacement. The materials may include but are not limited to silt fence, hay bales, stone rip rap, filter dikes, compost filter tubes, filter bags, or any other devices planned for use during construction.

14. No more than 1,259 square feet of bordering vegetated wetland will be impacted cumulatively, 587 square feet of which will be permanently impacted.

15. The surface area of the vegetated wetland mitigation area as shown on the Culvert at MP 44.29 Wetland Impact Plan 1 (Sheet 17 of 23) and described in the Section 401 Water Quality Certificate Application shall be at least 75% evenly distributed with indigenous wetland vegetation within two growing seasons. This determination shall be made by the wetland scientist selected by the applicant or his/her designee and approved by MassDEP. Should the mitigation area fail to meet this standard, MassDEP may require additional measures necessary to achieve compliance.

16. At the end of each growing season, a progress report of the relative success or failure of the mitigation effort shall be submitted to this office by the wetland scientist. The report shall include percent of vegetation cover, a list of the type of plants growing in the mitigation area, coverage of wetland plants as a percentage of all plants and relative vigor of the plants. The report shall also include recommendations for improvement of poorly established wetland areas.

17. The progress report shall also document the restoration efforts associated with the mitigation and restoration areas impacted during construction. Should the temporary impact areas not be adequately restored, MassDEP may require additional measures to achieve compliance.

18. It shall be the responsibility of the applicant, and/or any successor(s) in title to ensure that within the wetland mitigation and restoration areas, non-native invasive plant species such as *Phragmites australis* do not expand because of the project.

19. Staff of the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Certification at reasonable hours to evaluate compliance with the conditions stated in this Certification and may require the submittal of any data deemed necessary by the Department for that evaluation.

20. No Special Condition set forth herein shall be constructed or operate to prohibit the Department from taking enforcement against the applicant or its contractors for any failure to comply with the terms and requirements of this 401 Water Quality Certification.

21. No activity authorized by this Water Quality Certification may begin prior to expiration of the 21-day appeal period or until a final decision is issued by MassDEP if an appeal is filed.

22. This Certification remains in effect for the same duration as the federal permit that requires it or five years from the date of issuance of this Certification whichever comes first.

23. The applicant may request an amendment or extension of this Certification in accordance with 314 CMR 9.09(2) and (3), respectively.

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:

Department of Environmental Protection
Case Administrator
Office of Appeals and Dispute Resolution
100 Cambridge Street, Suite 900
Boston, MA 02114

A copy of the request shall at the same time be sent by certified mail or hand delivery to the issuing office of the Wetlands and Waterways Program at:

Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
Lakeville, Massachusetts 02347

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):

(a) the 401 Certification Transmittal Number;
(b) the complete name of the applicant and address of the project;
(c) 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;
(d) 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;
(e) a clear and concise statement that an adjudicatory hearing is being requested;
(f) 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

(g) 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 Environmental Management (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 Mark Bartow at mark.bartow@mass.gov or (857) 207-0621.

Sincerely,

Maissoun Reda

Maissoun E. Reda, Chief
Wetlands Program
Bureau of Water Resources

MER/mnb

cc: Rochester Conservation Commission

Regulatory Division
The New England District
U.S. Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

Kimberly Degutis
WSP USA Energy and Environment Inc
100 Summer Street, 13th Floor
Boston, MA 02110

Massachusetts Department of Environmental Protection

Adjudicatory Hearing Fee Transmittal Form

IMPORTANT! This form is intended for fee transmittal only. The contents of a request for an adjudicatory appeal (Notice of Claim) are established at 310 CMR 1.01(6) and the substantive statutes and regulations governing the Department's action.

A. Person/Party Making Request

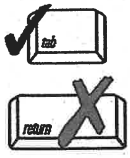
1. Name and address of person or party making request:

Name - If appropriate, name group representative

Street Address

City | State | Zip Code

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



2. Project Information:

Street Address

City | State | Zip Code

DEP File or ID Number | $ Amount of filing fee attached

Email Address

B. Applicant (if applicable)

1. Name and address of applicant:

Name - If appropriate, name group representative

Street Address

City | State | Zip Code

Email Address

C. Instructions

1. Send this form and check or money order of $100.00 payable to the Commonwealth of Massachusetts to the MassDEP Lockbox at:

   Department of Environmental Protection
   P.O. Box 4062
   Boston, MA 02211

2. Send a **copy** of this form and a **copy** of the check or money order with the Request for Adjudicatory Appeal (Notice of Claim) to:

   MassDEP Office of Appeals and Dispute Resolution
   Case Administrator
   100 Cambridge Street, Suite 900
   Boston, MA 02114



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
ហើយគប្បីគួរត្រូវបានបកប្រែភ្លាមៗ។.
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)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
RAIL & TRANSIT DIVISION

PLAN AND PROFILE AND DETAILS OF

CULVERT REPLACEMENT AT CAPE MAIN MP 44.29

IN THE TOWN OF

ROCHESTER

PLYMOUTH COUNTY

PRELIMINARY - ENVIRONMENTAL PERMITS

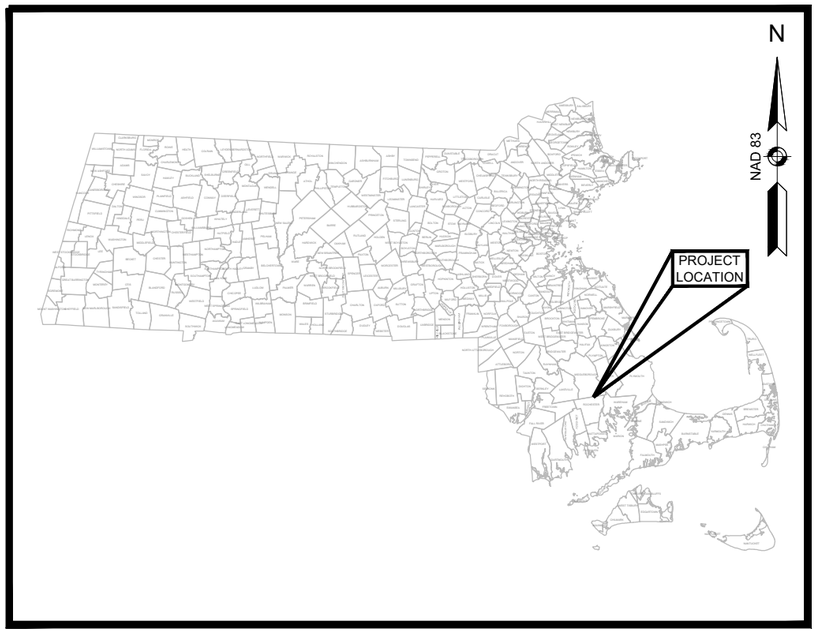
MARCH 10, 2025

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		1	23
PROJECT FILE NO.			

TITLE SHEET & INDEX

INDEX	
SHEET NO.	**DESCRIPTION**
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	GENERAL NOTES
4	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 1
5	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 2
6	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 3
7	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 4
8	CULVERT AT MP 44.29 CONSTRUCTION PLAN 1
9	CULVERT AT MP 44.29 CONSTRUCTION PLAN 2
10	CULVERT AT MP 44.29 CONSTRUCTION PLAN 3
11	CULVERT AT MP 44.29 CONSTRUCTION PLAN 4
12	CULVERT AT MP 44.29 SECTION
13	CULVERT AT MP 44.29 EROSION CONTROL PLAN 1
14	CULVERT AT MP 44.29 EROSION CONTROL PLAN 2
15	CULVERT AT MP 44.29 EROSION CONTROL PLAN 3
16	CULVERT AT MP 44.29 EROSION CONTROL PLAN 4
17	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 1
18	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 2
19	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 3
20	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 4
21	EROSION PROTECTION AND WETLAND MITIGATION DETAILS
22	EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES
23	CULVERT AT MP 44.29 SHEET PILE RETAINING WALL



0 10,000 20,000 30,000 40,000

SCALE: 1" = 10,000 FEET

PERMIT PLANS NOT FOR CONSTRUCTION

2/28/2025	PRELIM. PERMITS	
DATE	DESCRIPTION	REV #

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

WSP USA Inc.
100 SUMMER STREET
BOSTON, MA 02110

CHIEF ENGINEER **DATE**

Plotted on 13-Mar-2025 2:27 PM
Last Saved by: USDM6682745 on: Mar 13, 2025 11:56 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\d1006043\TO3-MP44.29_PERMIT(TITLE-SHEET).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		2	23
PROJECT FILE NO.			

LEGEND & ABBREVIATIONS

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB		JERSEY BARRIER
CB		CATCH BASIN
		CATCH BASIN CURB INLET
FP		FLAG POLE
GP		GAS PUMP
MB		MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL		WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG		GAS GATE
BHL #		BORING HOLE
MW #		MONITORING WELL
TP #		TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
C		CABLE MANHOLE
D		DRAINAGE MANHOLE
E		ELECTRIC MANHOLE
G		GAS MANHOLE
M		MISC MANHOLE
S		SEWER MANHOLE
T		TELEPHONE MANHOLE
W		WATER MANHOLE
MHB		MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
△		TRAVERSE OR TRIANGULATION STATION
TPL or GUY		TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB		UTILITY POLE W/ FIREBOX
UPDL		UTILITY POLE WITH DOUBLE LIGHT
ULT		UTILITY POLE W / 1 LIGHT
UPL		UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		SWAMP / MARSH
WG		WATER GATE
PM		PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
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)
E E E		UNDERGROUND ELECTRICAL
C C C		UNDERGROUND COMMUNICATIONS
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
x		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION CONTROLS (COIR LOGS)
		TREE LINE
		SAWCUT LINE
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
BLSF BLSF		BORDERING LAND SUBJECT TO FLOODING (BLSF) FEMA 100 YEAR FLOOD (TEXT UNDERLINE INDICATES SIDE OF LINE WHERE BLSF EXISTS)
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
E		PROPERTY LINE OR APPROXIMATE PROPERTY LINE

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
646		RECORD BASELINE
		EASEMENT
	FO	BURIED INNERDUCT & FIBER (PLOW OR TRENCH)
		INNERDUCT & FIBER INSTALLED IN EXISTING CONDUIT
		INNERDUCT & FIBER INSTALLED IN NEW CONDUIT/CASING PIPE OVER UTILITIES OR STRUCTURES BELOW GRADE
	I-F	INNERDUCT & FIBER INSTALLED IN NEW SURFACE MOUNTED CONDUIT
	UC	FIBER INSTALLED IN NEW UNDERGROUND CONDUIT
		EXISTING CONDUIT WITH PROPOSED FIBER

Plotted on 13-Mar-2025 2:27 PM
Last Saved by: USDM682745 on: Mar 13, 2025 8:46 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.29_PERMIT(LEGEND).dwg

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		3	23
PROJECT FILE NO.			

GENERAL NOTES

Plotted on 13-Mar-2025 2:27 PM

DESIGN CRITERIA:

DESIGN STANDARDS AND CODES OF PRACTICE
• AREMA MANUAL FOR RAILWAY ENGINEERING, 2024 EDITION
• DESIGN LOAD: AREMA COOPER E-80

GENERAL NOTES:

1. ALL WORK SHALL BE PERFORMED DURING SCHEDULED RAILROAD SHUTDOWN PERIODS NOT TO EXCEED 4 DAYS (MAXIMUM) UNLESS A LONGER SHUTDOWN IS AUTHORIZED BY MCRR. ALL WORK SHALL BE COORDINATED AT LEAST 30 DAYS IN ADVANCE WITH MCRR.
2. THE CONTRACTOR SHALL CONDUCT A PRECONSTRUCTION SURVEY AND VERIFY ALL EXISTING DIMENSIONS AND MATERIAL TYPES IN THE FIELD BEFORE COMMENCING WORK AND IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES. WHERE THE CLEAR INTENT OF THE PROPOSED WORK IS TO MATCH EXISTING CONDITIONS, THE FIELD DATA SHALL GOVERN.
3. THE RAILROAD CENTERLINE SHALL BE ESTABLISHED AS THE CONSTRUCTION BASELINE.
4. ALL ITEMS NOT REFERENCED FOR MODIFICATION WILL BE "EXISTING TO REMAIN" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. ALL WORK PERFORMED, AND MATERIALS INSTALLED IN THE EXECUTION OF THE WORK SHALL BE UNDERTAKEN IN STRICT ADHERENCE TO ALL MCRR AND MASSDOT RAIL DIVISION APPLICABLE CODES, STANDARDS, REGULATIONS, AND ORDINANCES OF GOVERNMENTAL AGENCIES HAVING JURISDICTION AT THE WORK SITE.
6. AT THE END OF EACH WORK DAY, THE CONTRACTOR WILL MAKE REASONABLE EFFORTS TO KEEP THE WORK AREA CLEAN AND FREE OF CONSTRUCTION DEBRIS, RUBBISH, SPOILS, TRASH, AND OTHER FOREIGN MATERIALS. ALL SUCH RUBBISH, DEBRIS AND LIKE MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL ORDINANCES, RULES AND REGULATIONS OF THE JURISDICTIONAL AUTHORITY, INCLUDING ENVIRONMENTAL REGULATIONS.
7. THE CONTRACTOR SHALL SUPERVISE AND EXECUTE THE WORK USING THE HIGHEST QUALITY CONSTRUCTION SKILLS AND ATTENTION TO DETAIL. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR, AND HAVE CONTROL OVER THE CONSTRUCTION MEANS, METHODS, TECHNOLOGIES, SEQUENCES, AND PROCEDURES.
8. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO MASSDOT STANDARDS AND AREMA SPECIFICATIONS FOR CONSTRUCTION, WHICHEVER IS MORE STRINGENT.
9. THE STRUCTURAL DRAWINGS REPRESENT THE FINAL COMPLETED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR DESIGNING AND PROVIDING ALL SHORING, BRACING, OR OTHER TEMPORARY SUPPORTS REQUIRED TO PERFORM THE WORK.
10. EXTREME CARE SHALL BE EXERCISED TO PREVENT ANY DEMOLITION AND CONSTRUCTION DEBRIS FROM FALLING INTO WETLAND RESOURCES. IF ANY MATERIAL/EQUIPMENT FALLS IN WETLAND RESOURCES, IT SHALL BE IMMEDIATELY REMOVED.

SURVEY DATUM:

VERTICAL ELEVATIONS: NAVD 88
COORDINATES: MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83

CULVERT NOTES:

1. ALL CONCRETE SHALL BE PRECAST FOR THE CULVERT SEGMENTS. ALL REINFORCEMENT AND CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR. ALL DESIGN CALCULATIONS, DETAILS, PLANS AND PRODUCT LITERATURE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. THE PRECAST CONCRETE SEGMENTS ARE SHOWN FOR REFERENCE ONLY. THE ACTUAL DIMENSIONS WILL BE DEPENDENT ON THE FABRICATOR. ALL UNITS SHALL BE THE SAME LENGTH AND SHAPE. THE INSIDE DIMENSIONS SHALL BE AS PER PLANS.
3. TWO LAYERS OF A TWO (2) FOOT WIDE STRIP OF FILTER FABRIC SHALL BE APPLIED AT EACH JOINT (TOP & SIDES). FABRIC SHALL BE CENTERED ON THE JOINT.
4. CONCRETE FOR PROPOSED PRECAST HEADWALLS SHALL BE 4,000 PSI.
5. WELDED WIRE FABRIC REINFORCEMENT SHALL BE GRADE 60 KSI, UNCOATED.
6. COVER FOR PRECAST CONCRETE HEADWALLS REINFORCEMENT SHALL BE $1\frac{1}{2}$".
7. LIFTING ANCHORS FOR PRECAST CONCRETE HEADWALLS SHALL BE DESIGNED BY THE CONTRACTOR. ALL LIFTING HOLES AND CONNECTION POCKETS SHALL BE FILLED WITH 5,000 PSI GROUT AFTER BEING SET IN THEIR FINAL POSITION.
8. PROPOSED RCP SHALL BE CLASS V WITH JOINTS TREATED WITH GASKET JOINTS.
9. ALL CORNERS OF PRECAST CONCRETE HEADWALL SHALL RECEIVE A $\frac{3}{4}$" CHAMFER.

SUGGESTED CONSTRUCTION SEQUENCE:

1. INSTALL DEWATERING EQUIPMENT, COFFERDAMS AND EROSION CONTROL MEASURES AS REQUIRED FOR CONSTRUCTION.
2. UPON REMOVAL OF EXISTING TRACK WORK, REMOVE AND STOCKPILE EXISTING OVERBURDEN AS REQUIRED FOR CONSTRUCTION.
3. REMOVE AND DISPOSE OF EXISTING CULVERTS AND HEADWALLS.
4. PREPARE PIPE BEDDING AND RIPRAP APRON.
5. INSTALL PROPOSED HEADWALL, CULVERT PIPE AND INLET STRUCTURE.
6. INSTALL (PLACE AND COMPACT) BACKFILL IN LIFTS, FINE GRADE, AND INSTALL REMAINING RIPRAP.
7. ALL EMBANKMENTS SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING TWELVE (12) INCHES (AFTER COMPACTION) AND SHALL BE COMPACTED AS SPECIFIED BEFORE THE NEXT LAYER IS PLACED.
8. PREPARE TRACK BEDDING FOR REINSTALLATION OF STOCKPILED TIES AND TRACK.
9. REMOVE DEWATERING EQUIPMENT AND COFFERDAMS.
10. INSTALL AND COMPACT EIGHT (8) INCHES OF SUBBALLAST.
11. INSTALL TRACK, TIES AND REMAINING BALLAST.
12. TAMP, LIFT AND SURFACE TO FINAL ELEVATION AND ALIGNMENT.
13. REMOVE DEWATERING EQUIPMENT AND COFFERDAMS.
14. CONTRACTOR TO STOCKPILE EXISTING STREAM BED SUBSTRATE FOR PLACEMENT INSIDE OF 60" DIA PIPE TO ELEVATIONS INDICATED ON THE CONTRACT PLANS.

CULVERT NOTES:

1. ALL LIFTING HOLES AND CONNECTIONS POCKETS SHALL BE FILLED WITH 5000 PSI GROUT AFTER BEING SET IN THEIR FINAL POSITION.
2. THE CONTRACT PLANS REPRESENT THE FINAL COMPLETED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR DESIGNING AND PROVIDING ALL SHORING, BRACING, AND ALL OTHER TEMPORARY SUPPORTS NECESSARY TO PERFORM THE WORK.
3. ALL WORKING POINTS ARE SHOWN AT THE CENTERLINE OF THE CULVERT.

TRACK NOTES:

1. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL SUBMIT A PHASING PLAN FOR TRACK CONSTRUCTION TO MCRR/MASSDOT FOR APPROVAL.
2. FLAGGING, AS REQUIRED BY MASS COASTAL RAILROAD (MCRR), LLC SHALL BE ARRANGED BY THE CONTRACTOR, AND AT THE EXPENSE OF THE MCRR AND MASSDOT. THESE SERVICES WILL BE PROVIDED AS SPECIFIED HEREIN AND AS APPROVED BY THE MCRR AND MASSDOT TO ALLOW THE CONTRACTOR TO CARRY OUT THEIR REGULAR WORK ACTIVITIES SAFELY AND WITHOUT UNACCEPTABLE IMPACTS TO RAILROAD OPERATIONS.

ENVIRONMENTAL NOTES:

1. IF ANY UNKNOWN HAZARDOUS MATERIALS ARE ENCOUNTERED IN THE SOILS DURING EXCAVATION OPERATIONS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SUSPEND EXCAVATION OPERATIONS UNTIL THE SITUATION CAN BE PROPERLY EVALUATED.
2. IN ORDER TO PROTECT FISH LIFE WITHIN THE STREAM, WORK ACTIVITIES WITHIN THE STREAM MAY BE LIMITED BY A TIME OF YEAR RESTRICTION AS SPECIFIED IN THE PROJECT PERMITS.

CULVERT DESIGN DATA:

1. DESIGN SPECIFICATIONS: AREMA MANUAL OF RAILWAY ENGINEERING, DATED 2015.
2. DESIGN LIVE LOADS: AREMA COOPER E-80 LOCOMOTIVE WITH FULL IMPACT. STRESSES INDUCED BY TRANSPORTATION AND HANDLING.
3. SEISMIC DESIGN DATA: SEISMIC ANALYSIS AND DESIGN SHALL BE IN ACCORDANCE WITH THE AREMA MANUAL OF RAILWAY ENGINEERING.
4. GEOTECHNICAL DATA:
   - MINIMUM LATERAL EARTH PRESSURE COEFFICIENT = 0.33.
   - MAXIMUM LATERAL EARTH PRESSURE COEFFICIENT = 1.00.
   - MOIST UNIT WEIGHT OF SOIL = 120 PCF
   - ALLOWABLE BEARING CAPACITY:
   - AREMA LOAD GROUP I: 8.6 KSF (F.S. = 3)
   - AREMA LOAD GROUP II:12.9 KSF (F.S. = 2)

CULVERT MATERIALS:

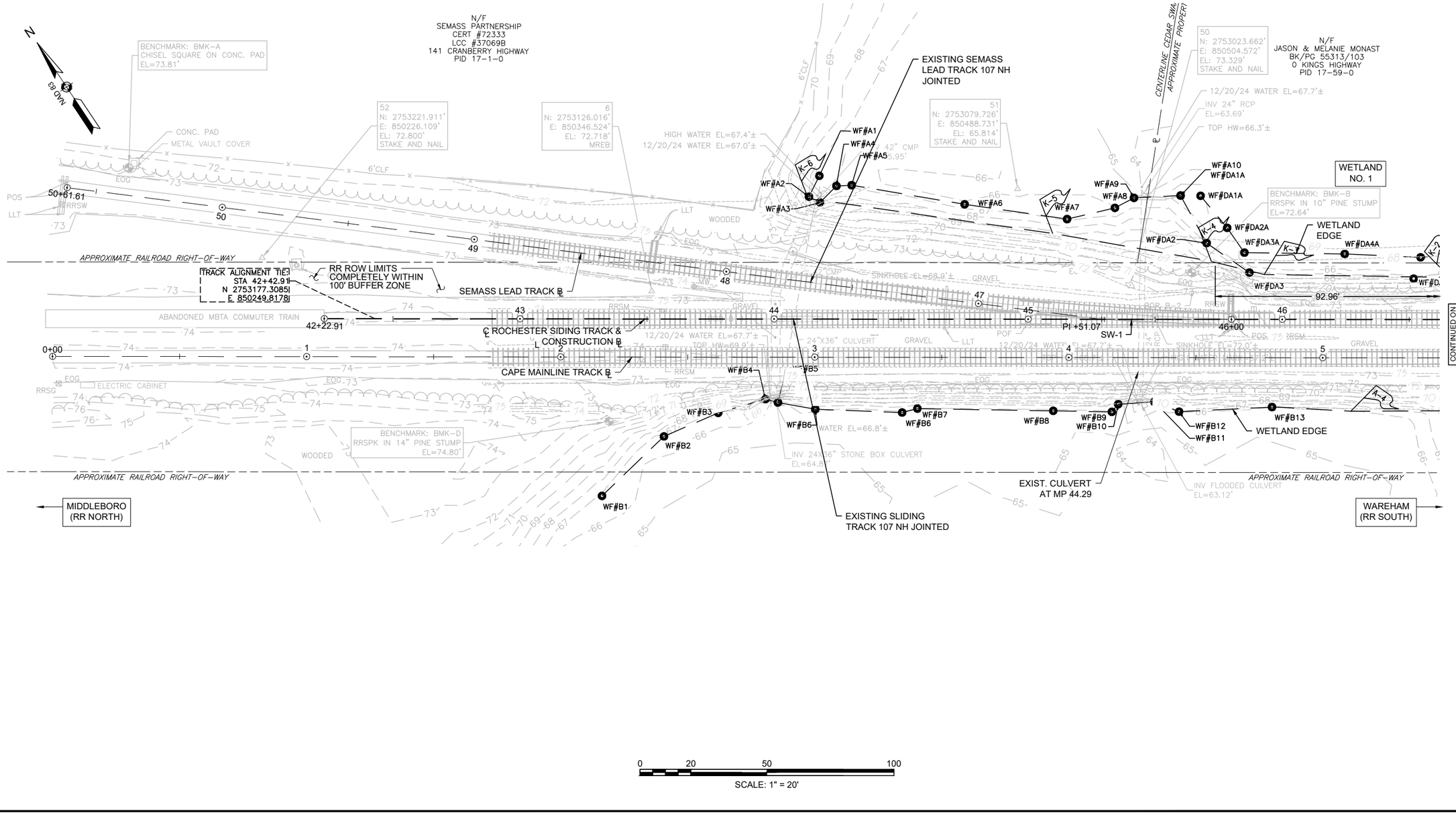
1. PRECAST CONCRETE PIPE - CLASS V:
2. PIPE BEDDING:
3. FOR ADDITIONAL MATERIAL REQUIREMENTS, SEE THE CONTRACT SPECIFICATIONS.

Last Saved by: USDM682745 on: Mar 13, 2025 8:47 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\10060431TO3-MP44.29_PERMIT\NOTES).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		4	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 1



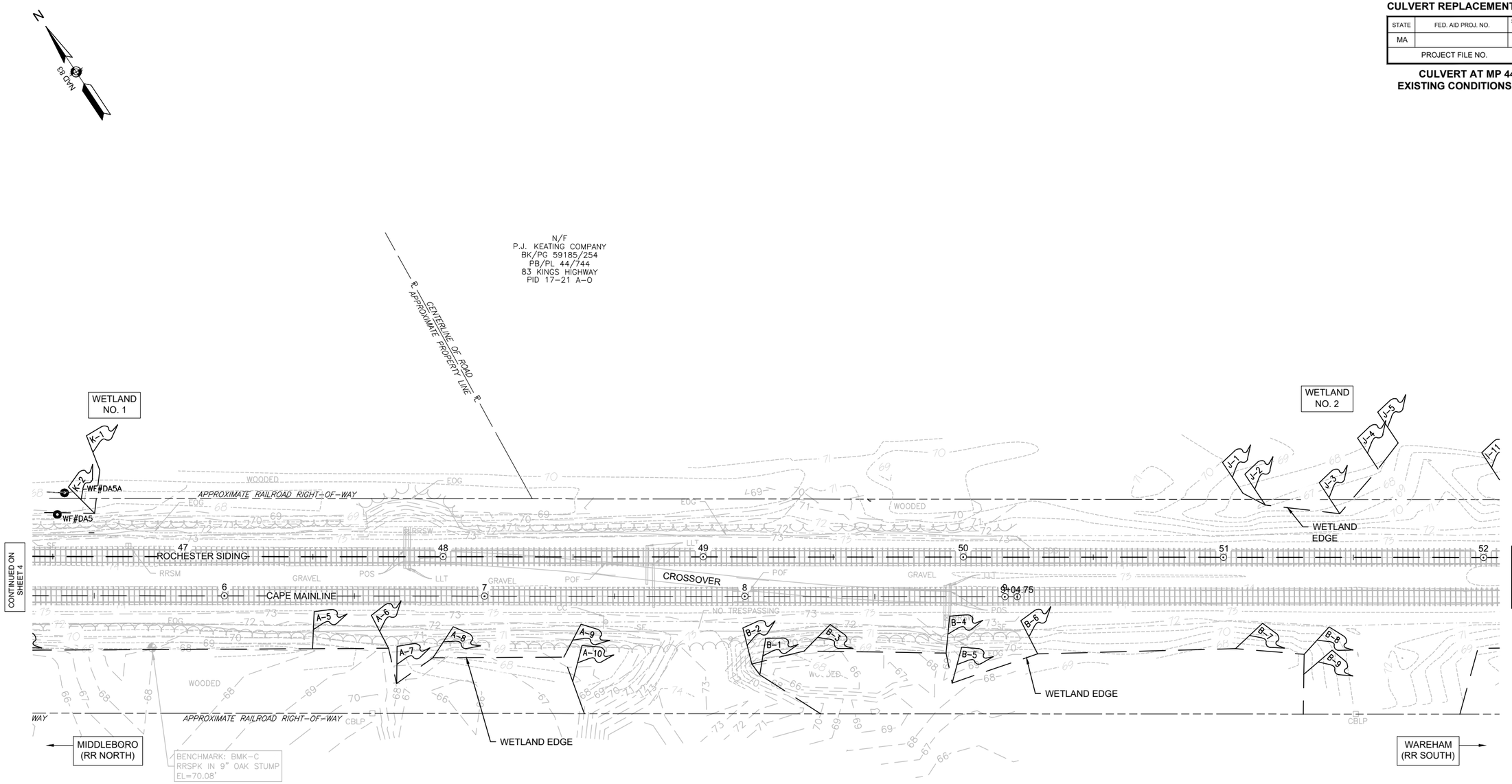
Last Saved by: USDM682745 on: Mar 13, 2025 10:40 AM File: c:\bms\wsp-pb-us-pw-02\wsp__data\david.melchionda\d1006043\TO3-MP44.29_PERMIT(EXCOND-PLANS).dwg

Plotted on 13-Mar-2025 2:27 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		5	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 2



0 20 50 100
SCALE: 1" = 20'

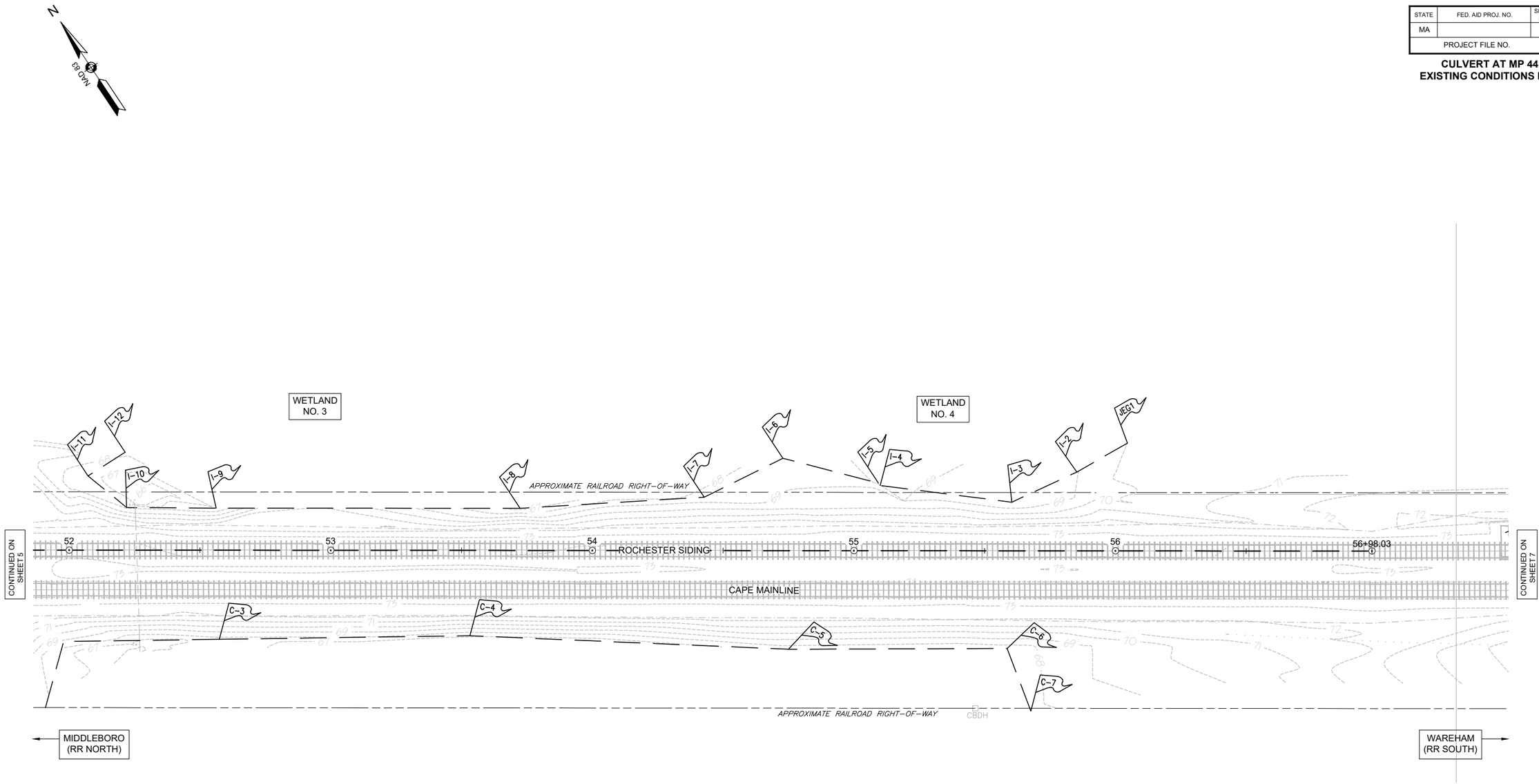
Plotted on 13-Mar-2025 2:28 PM

Last Saved by: USDM6682745 on: Mar 13, 2025 10:40 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.29_PERMIT(EXCOND-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		6	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 3



0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 10:40 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondald1006043\TO3-MP44.29_PERMIT\(EXCOND-PLANS).dwg

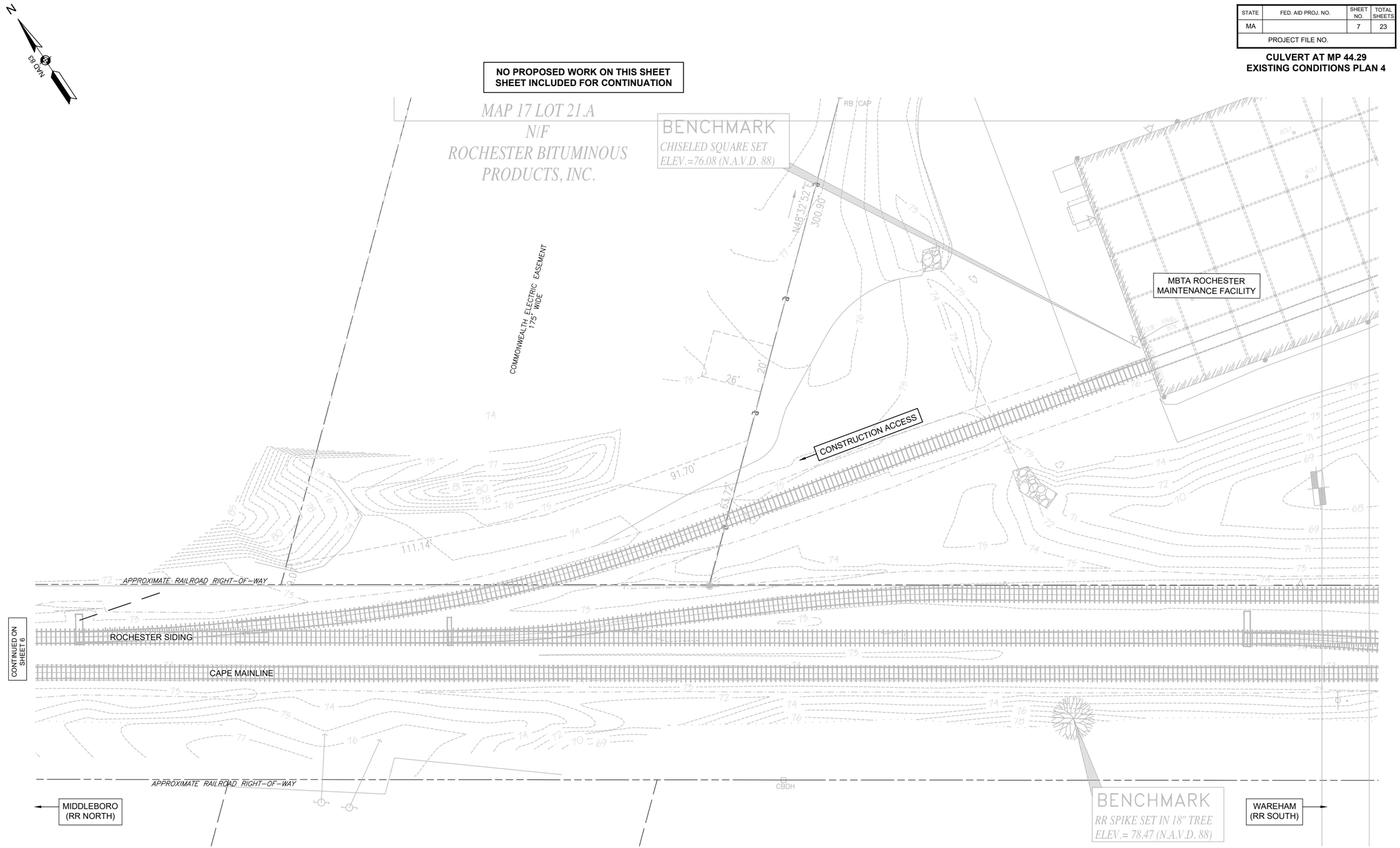
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		7	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



0 20 50 100
SCALE: 1" = 20'

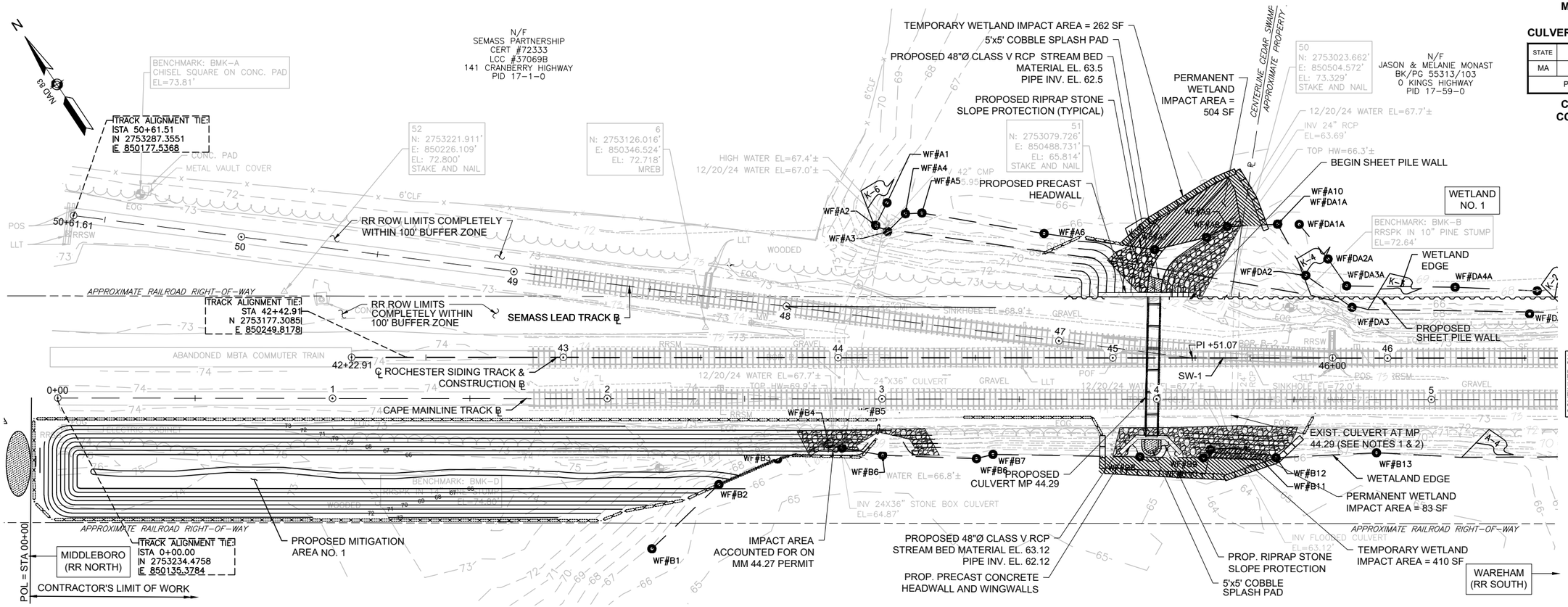
Last Saved by: USDM682745 on: Mar 13, 2025 10:40 AM File: c:\bmswsp-pb-us-pw-02\wsp__data\david.melchionda\d1006043\TO3-MP44.29_PERMIT(EXCOND-PLANS).dwg

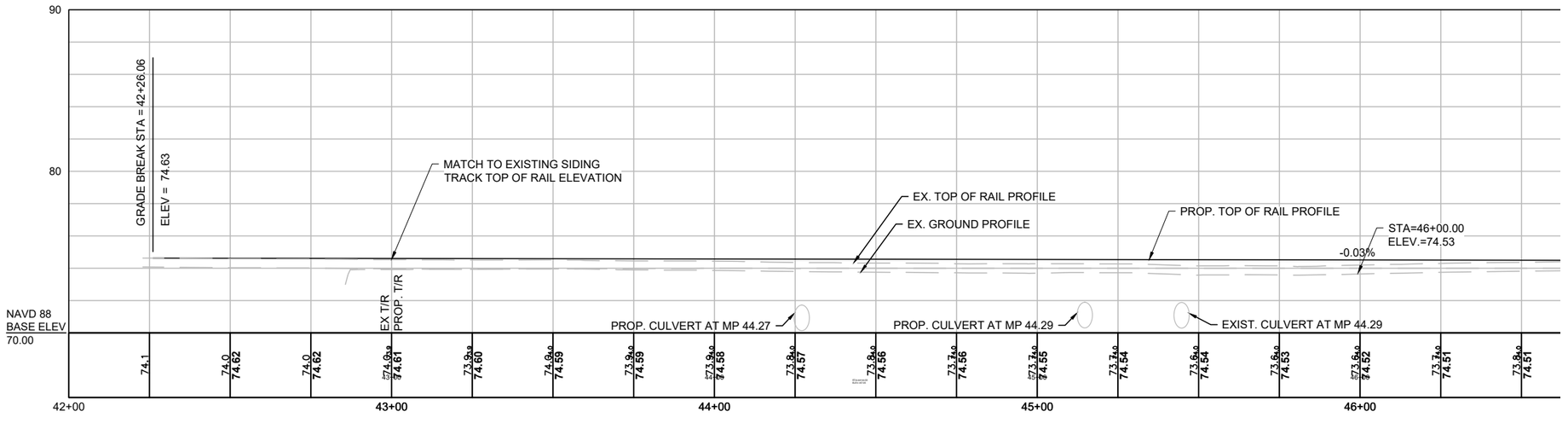
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		8	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 1





0 20 50 100

SCALE: 1" = 20'

NOTES:

1. CONTRACTOR SHALL INSPECT PIPE OPENINGS DAILY FOR DURATION OF CONSTRUCTION TO ASSURE PIPE FLOW IS NOT BLOCKED.
2. EXISTING CULVERT AT MP 44.29 TO BE FILLED-IN WITH FLOWABLE FILL AND RETIRED ONCE THE PROPOSED CULVERT HAS BEEN CONSTRUCTED AND IS IN ACTIVE USE.

Plotted on 13-Mar-2025 2:28 PM
Last Saved by: USDM682745 on: Mar 13, 2025 1:56 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d10060431TO3-MP44.29_PERMIT\CONST-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		9	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 2

N/F
P.J. KEATING COMPANY
BK/PG 59185/254
PB/PL 44/744
83 KINGS HIGHWAY
PID 17-21 A-O

℄ CENTERLINE OF ROAD
APPROXIMATE PROPERTY LINE ℄

5
N: 2752944.917'
E: 850612.485'
EL: 73.114'
MREB

4
N: 2752740.171'
E: 850922.754'
EL: 72.588'
SPK

PROPOSED SHEET PILE WALL

MEET EXISTING SEMASS LEAD TRACK HORIZONTAL AND VERTICAL ALIGNMENT

TRACK ALIGNMENT TIE:
ISTA 49+94.12
IN 2752760.6986
E 850874.9155

TRACK ALIGNMENT TIE:
ISTA 9+04.75
IN 2752733.2783
E 850888.6202

WETLAND NO. 2

WETLAND EDGE

WETLAND EDGE

APPROXIMATE RAILROAD RIGHT-OF-WAY

ROCHESTER SIDING

CROSSOVER

CAPE MAINLINE

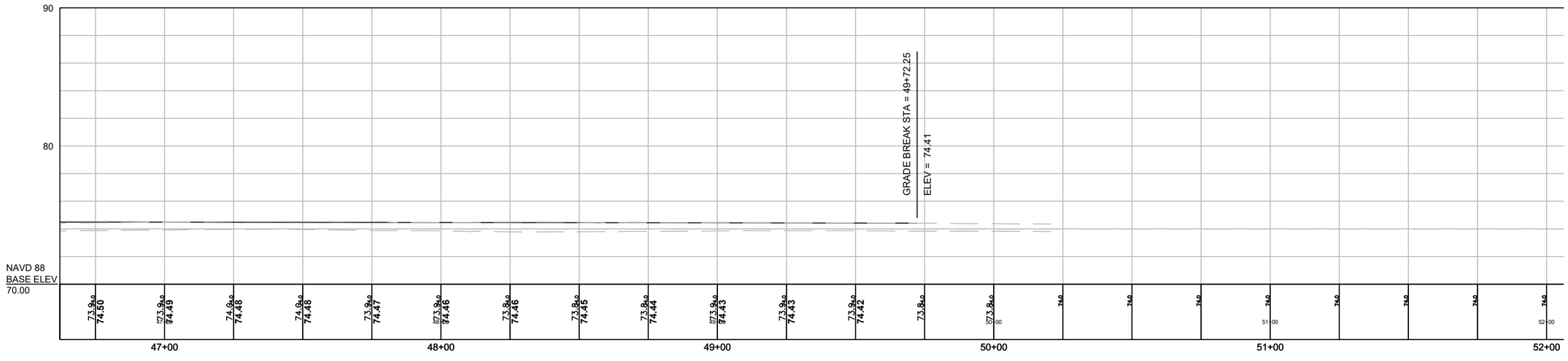
CONTINUED ON SHEET NO. 8

CONTINUED ON SHEET NO. 10

MIDDLEBORO (RR NORTH)

WAREHAM (RR SOUTH)

BENCHMARK: BMK-C
RRSPK IN 9" OAK STUMP
EL=70.08'



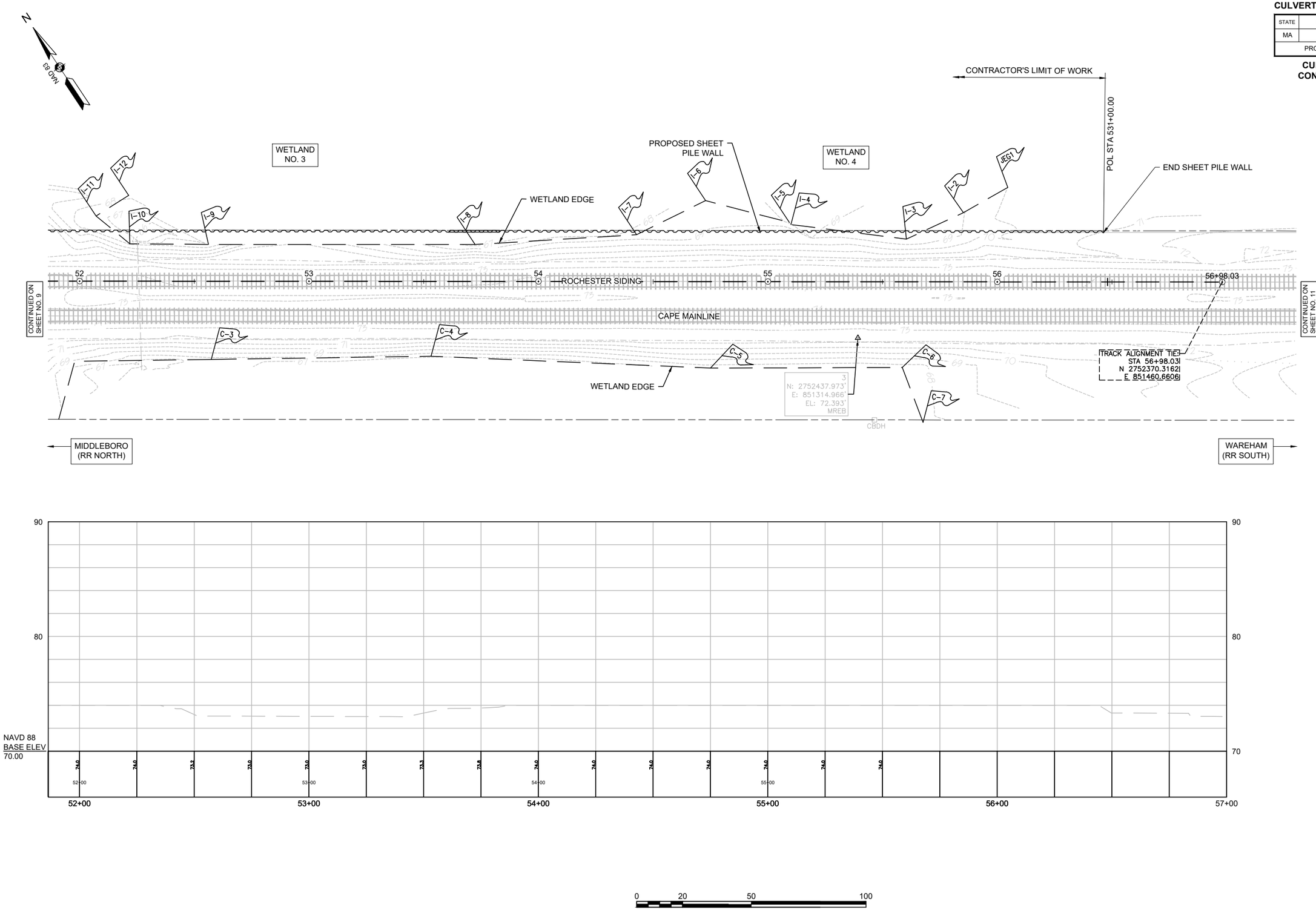
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 1:56 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.29_PERMIT(CONST-PLANS).dwg
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		10	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 3



Plotted on 13-Mar-2025 2:28 PM

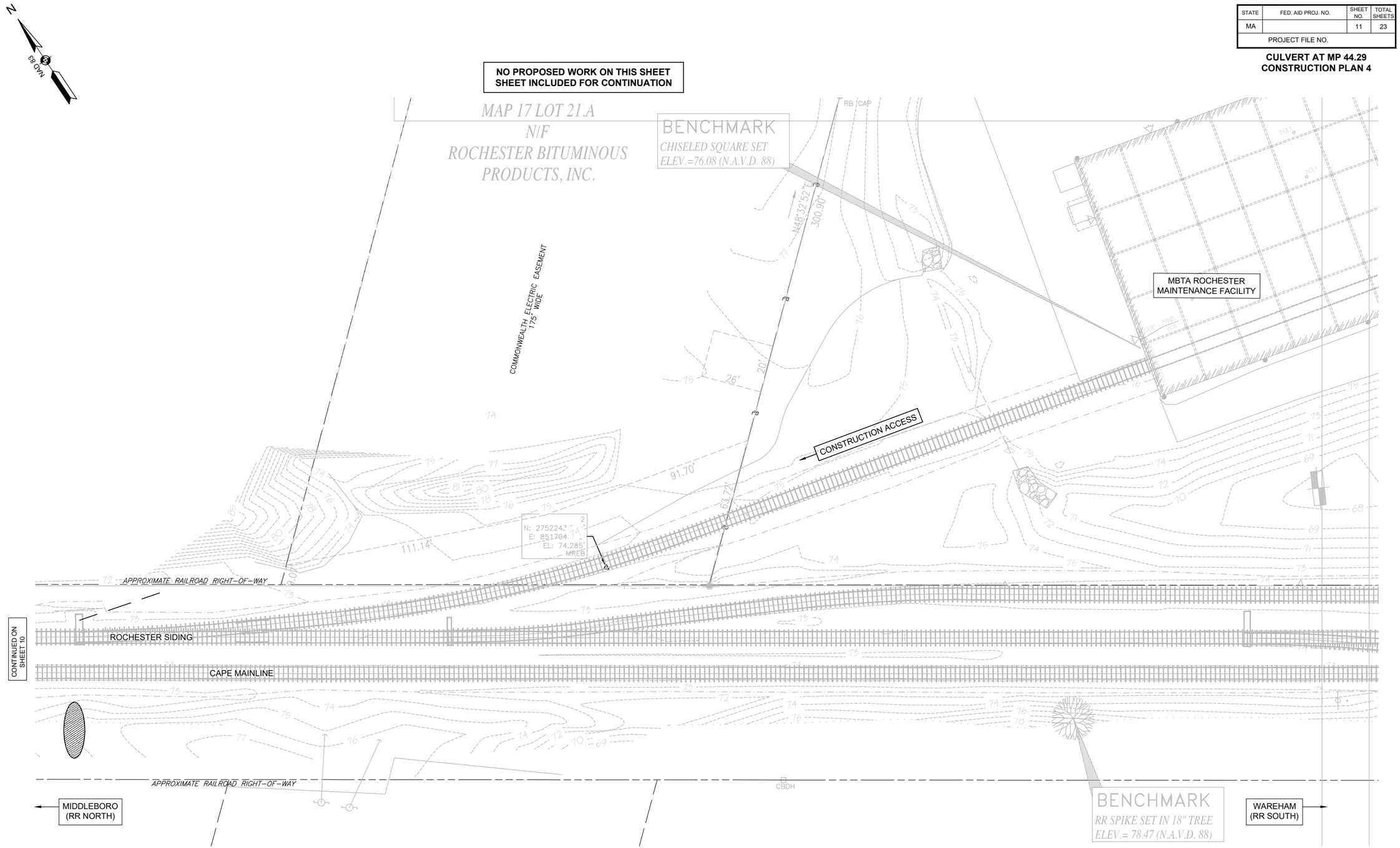
Last Saved by: USDM682745 on: Mar 13, 2025 1:56 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondald1006043\T03-MP44.29_PERMIT(CONST-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		11	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



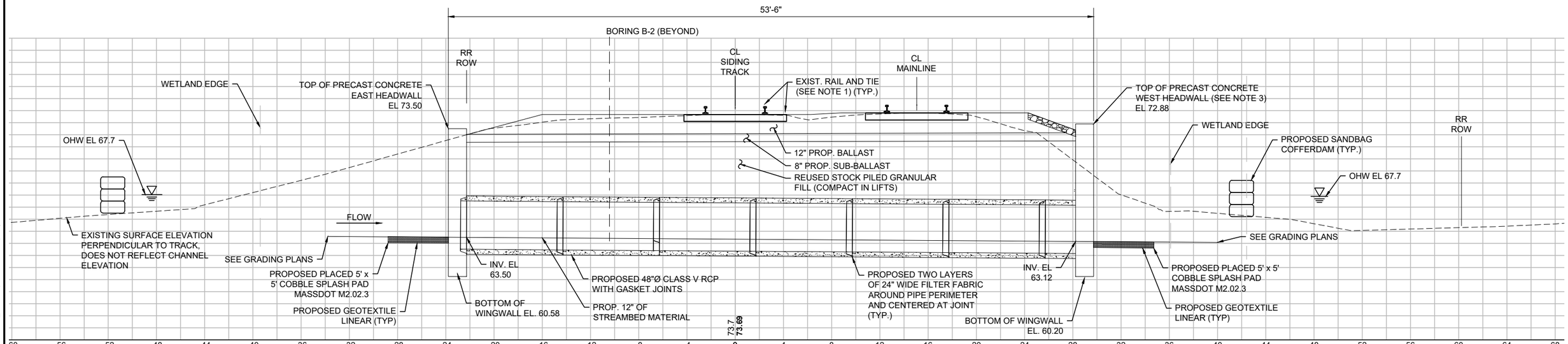
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 1:56 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\10060431T03-MP44.29_PERMIT(CONST-PLANS).dwg
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		12	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
SECTION



45+34.67

NOTES:

1. EXISTING TRACKS (RAILS AND TIES) TO BE REMOVED AND RESET AS NECESSARY FOR CULVERT CONSTRUCTION.
2. EXISTING TRACK SWITCH TO BE REMOVED AND RESET AS NECESSARY FOR CULVERT CONSTRUCTION.
3. PROPOSED WINGWALLS NOT SHOWN FOR CLARITY.

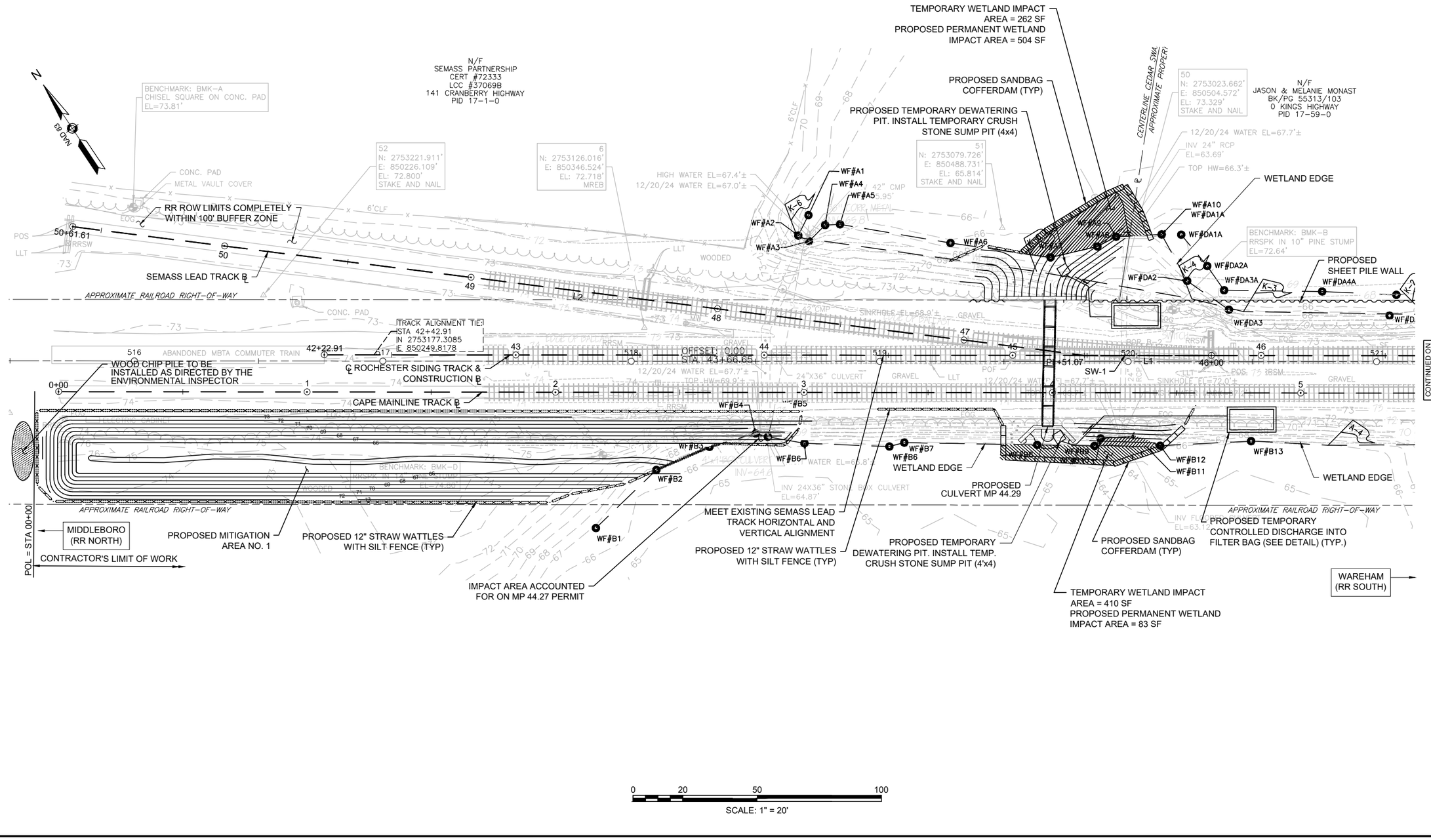
HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

Plotted on 13-Mar-2025 2:28 PM
Last Saved by: USDM682745 on: Mar 13, 2025 2:02 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid100604311O3-MP44.29_PERMIT(CLVRT-SECT1).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		13	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 1



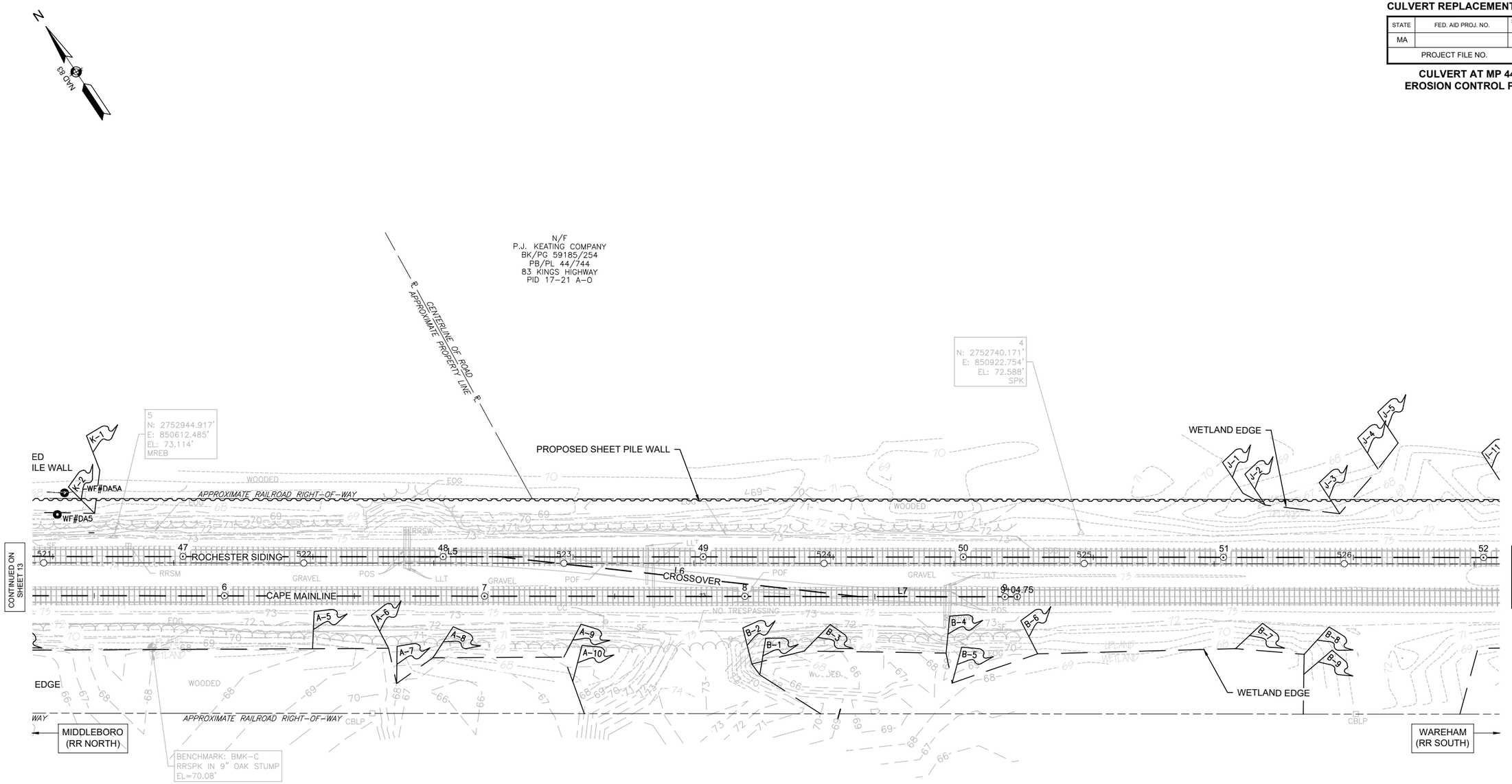
Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid100604\3T03-MP44.29_PERMIT(TEC-PLANS).dwg

Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		14	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 2

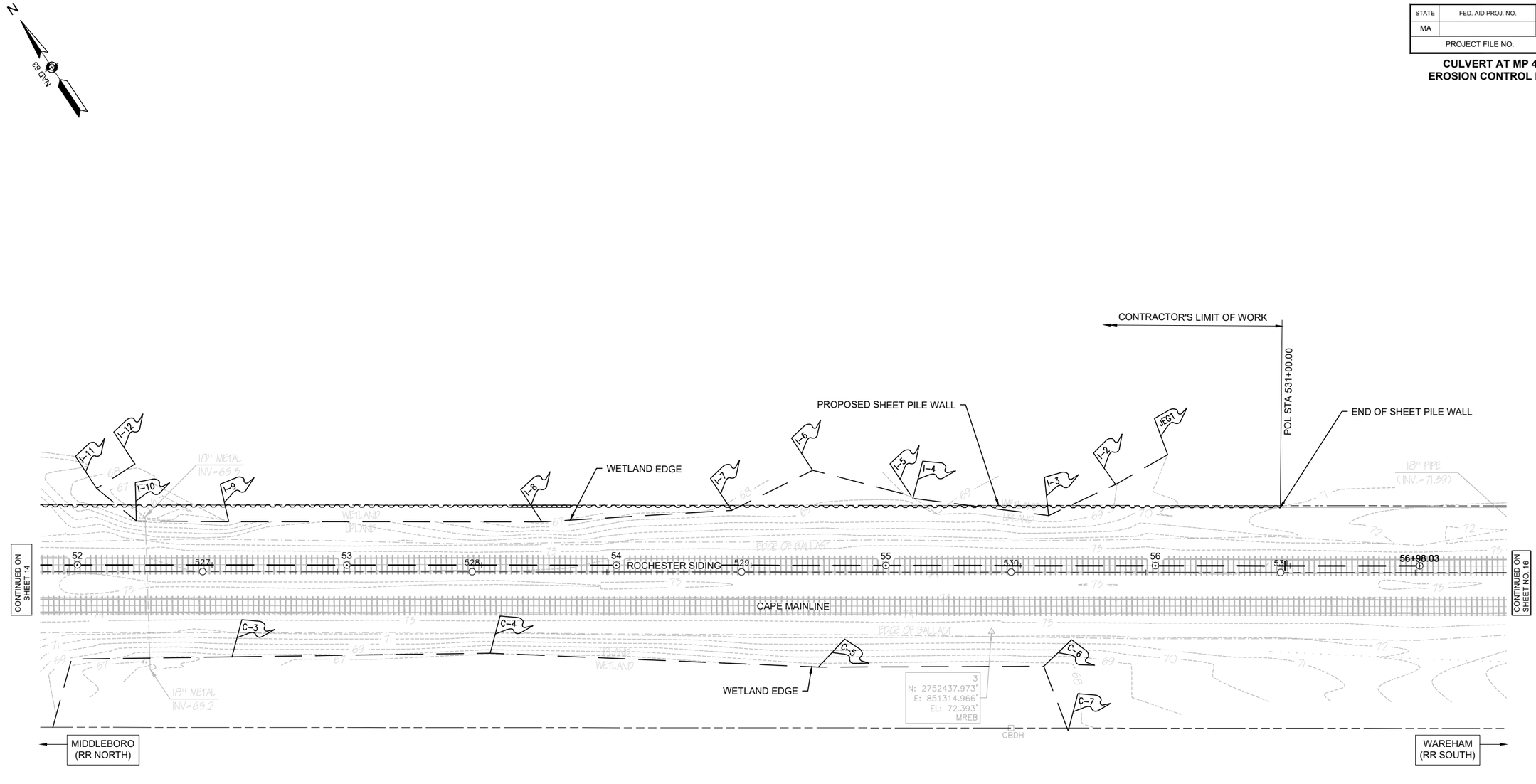


Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondad100060431\TO3-MP44.29_PERMIT\EC-PLANS).dwg
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		15	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 3



0 20 50 100

SCALE: 1" = 20'

Plotted on 13-Mar-2025 2:28 PM

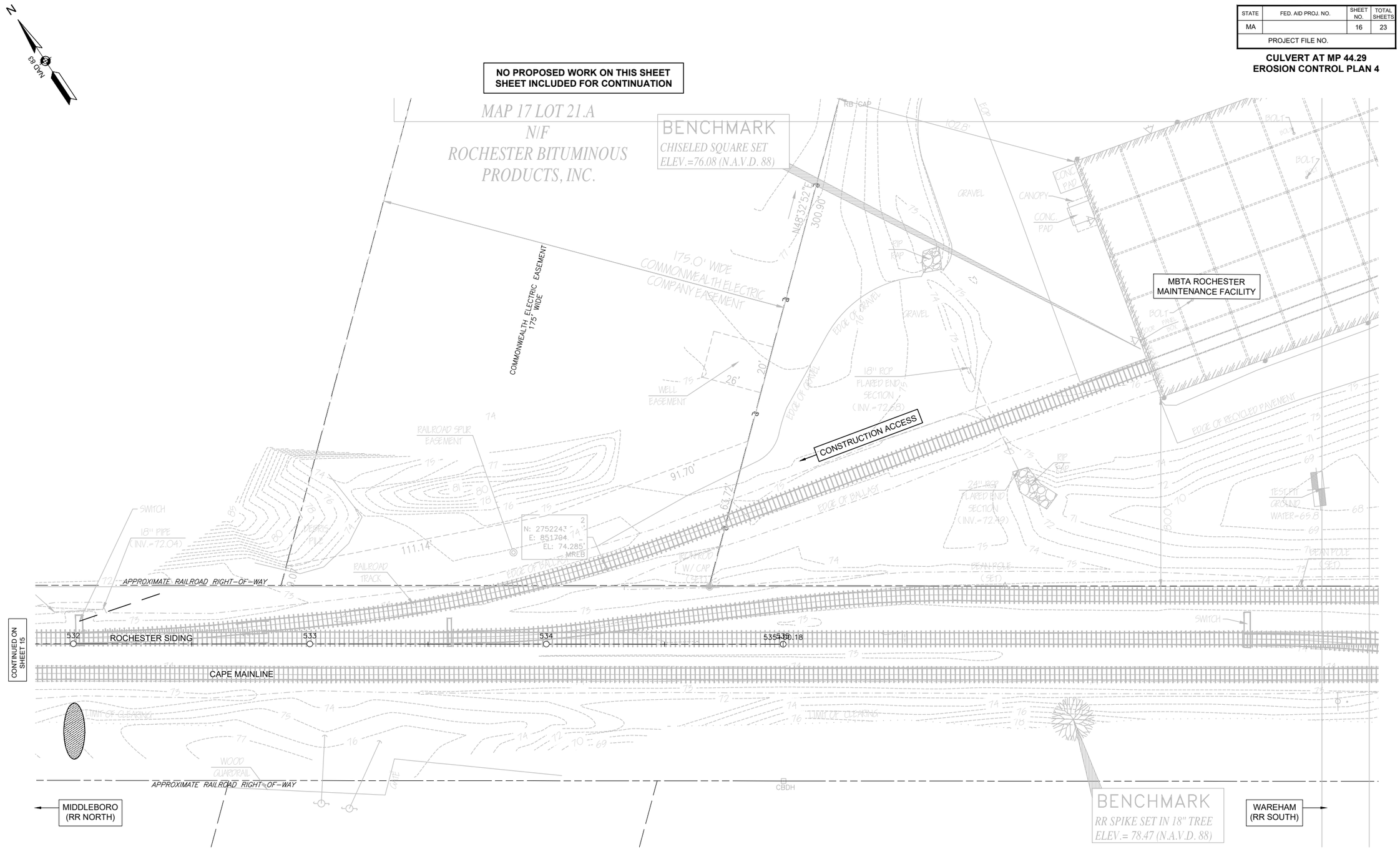
Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-ph-us-pw-02\wsp__david.melchionda\d10060431TO3-MP44.29_PERMIT(EC-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		16	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



0 20 50 100
SCALE: 1" = 20'

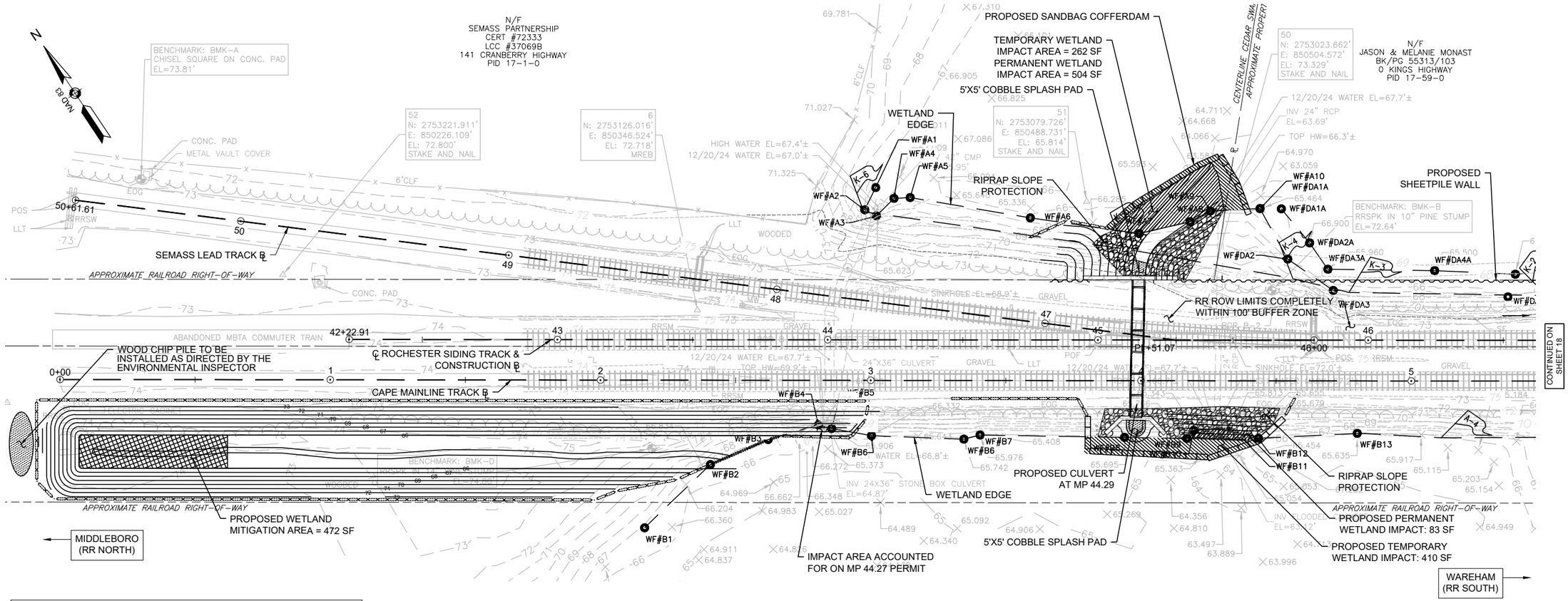
Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid.10060431\T03-MP44.29_PERMIT\EC-PLANS).dwg

Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		17	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 1



WETLAND REPLICATION AREA PLANTING SCHEDULE				
Common Name	Scientific Name	Type	Spacing	Number
Red Maple	Acer rubrum	Bag n Ball	10 ft	15
Silver Maple	Acer saccharum	Bag n Ball	10 ft	15
Pussy Willow	Salix discolor	Tube	10 ft	20
Sweet pepperbush	Clethra alnifolia	1-gallon	8 ft	15
Lowbush blueberry	Vaccinium angustifolium	1-gallon	8 ft	15
Highbush blueberry	Vaccinium corymbosum	1-gallon	8 ft	15
Steeplebush	Spiraea tomentosa	1-gallon	8 ft	20
Tussock sedge	Carex stricta	Plug	12 in	30
New England Wetmix		Seed rate: 2500 sf/lb		

0 20 50 100
SCALE: 1" = 20'

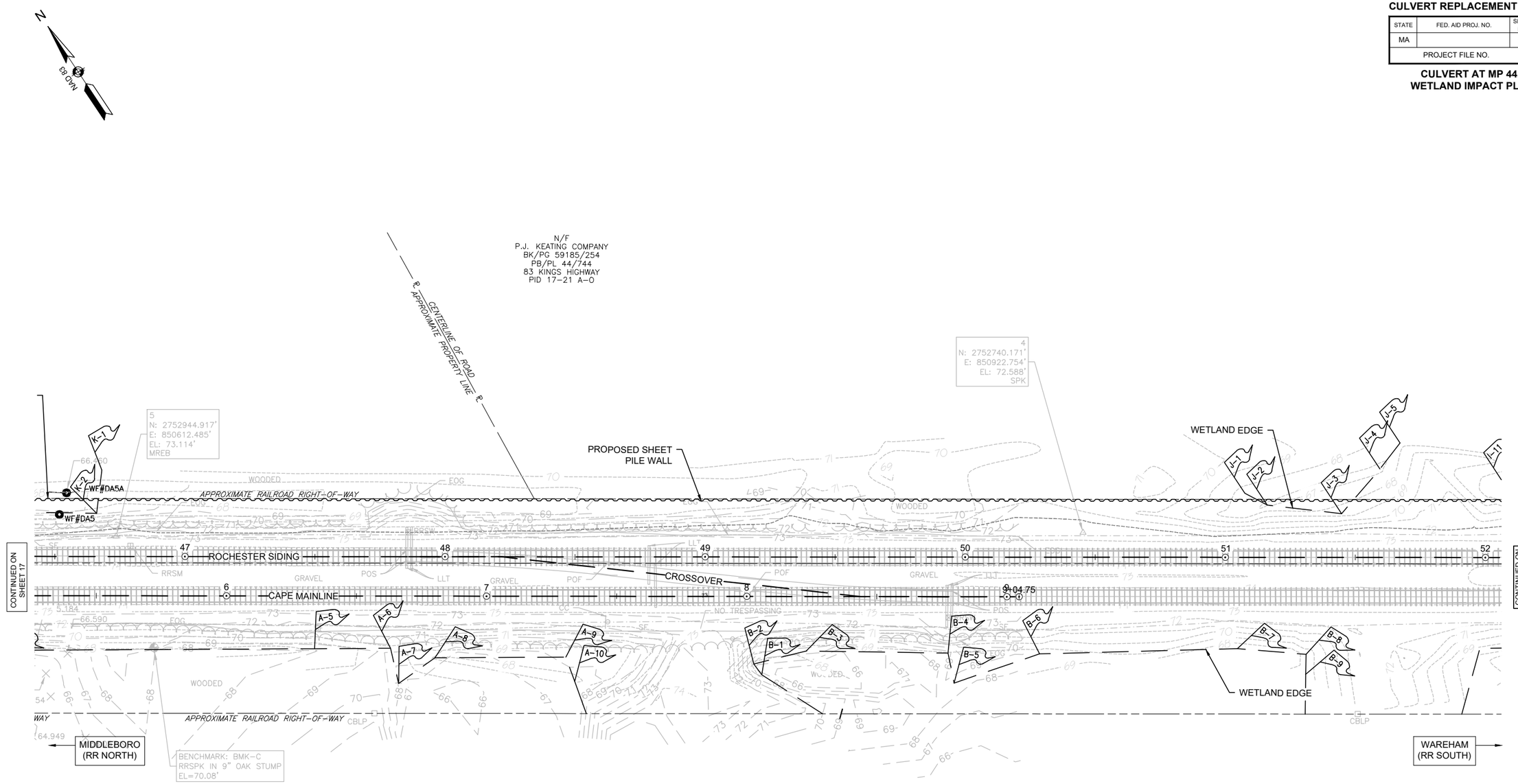
Plotted on 13-Mar-2025 2:28 PM

Last Saved by: USDM682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid100604\31T03-MP44.29_PERMIT\WET-IMPACT-PLN\.dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		18	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 2



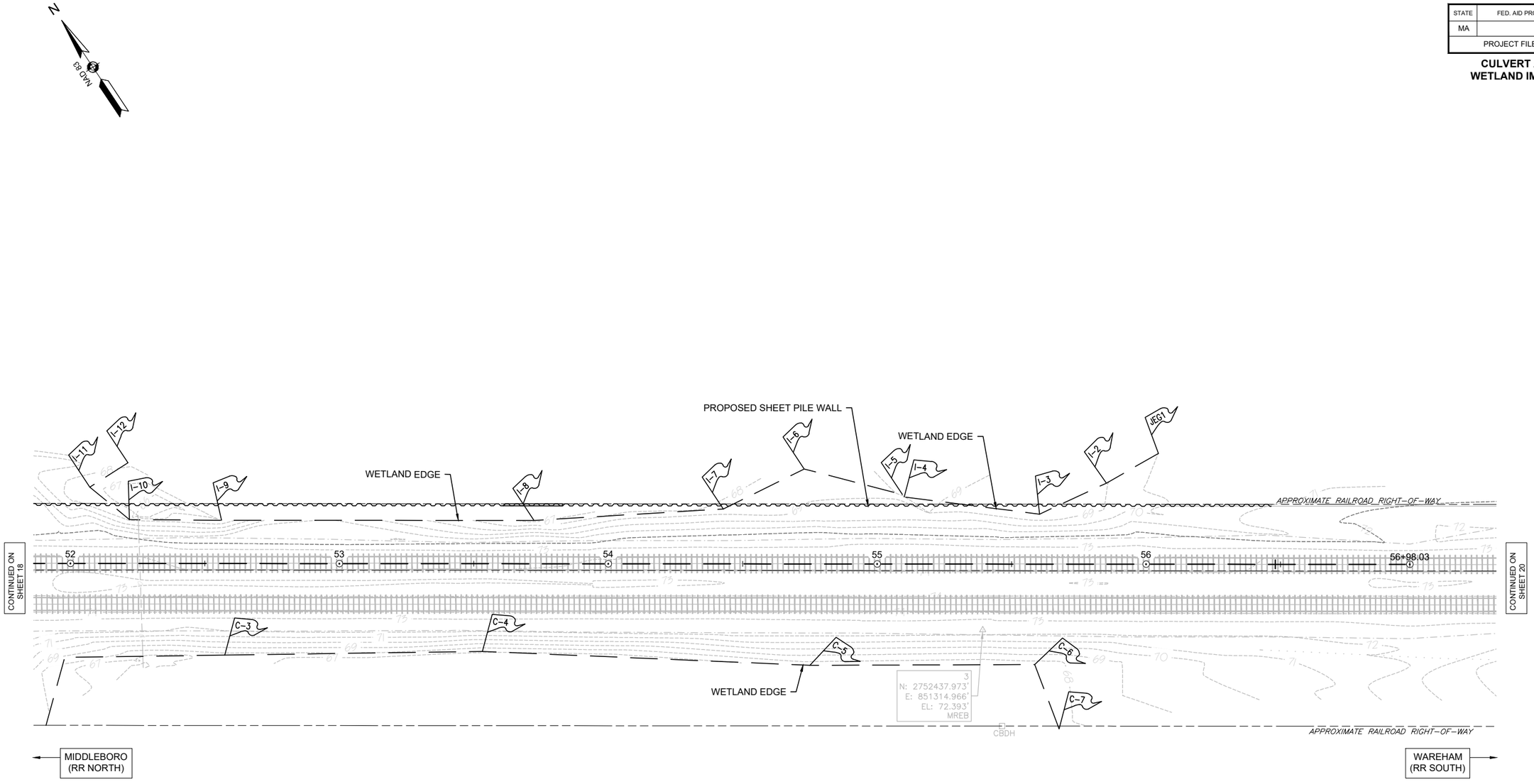
Plotted on 13-Mar-2025 2:28 PM

Last Saved by: USDM682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondad100060431\TO3-MP44.29_PERMIT\WET-IMPACT-PLN\.dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		19	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 3



0 20 50 100

SCALE: 1" = 20'

Plotted on 13-Mar-2025 2:28 PM

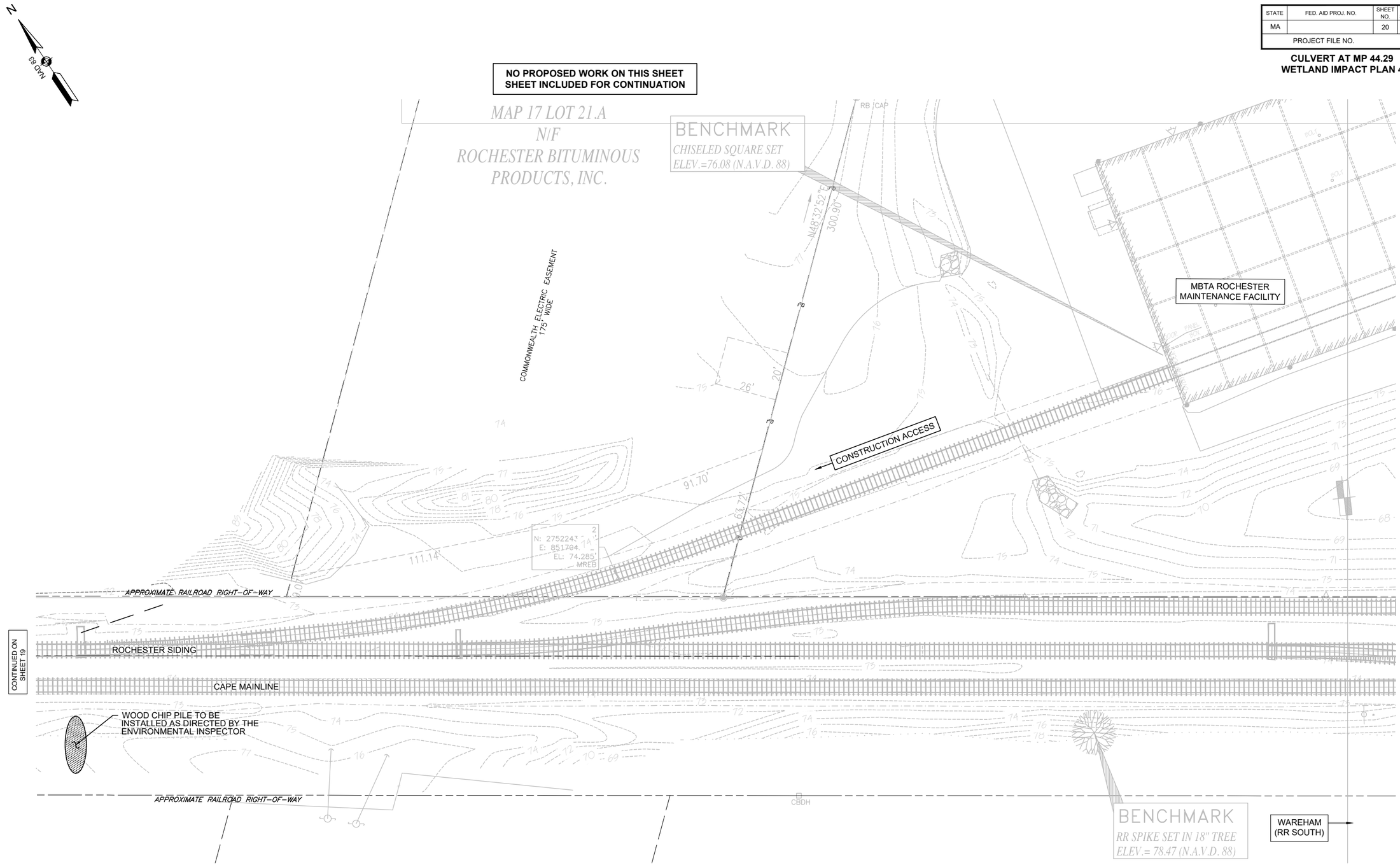
Last Saved by: USDM6682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d10060431TO3-MP44.29_PERMIT(WET-IMPACT-PLN).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		20	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



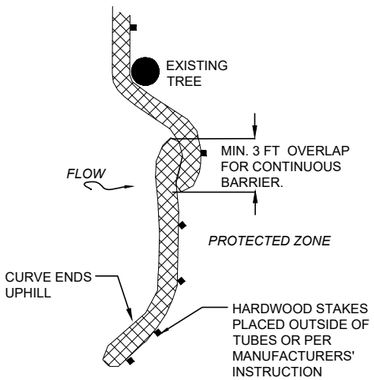
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\10060431T03-MP44.29_PERMIT(WET-IMPACT-PLN).dwg
Plotted on 13-Mar-2025 2:28 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		21	23
PROJECT FILE NO.			

EROSION PROTECTION AND WETLAND MITIGATION DETAILS

Plotted on 13-Mar-2025 2:29 PM



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE.

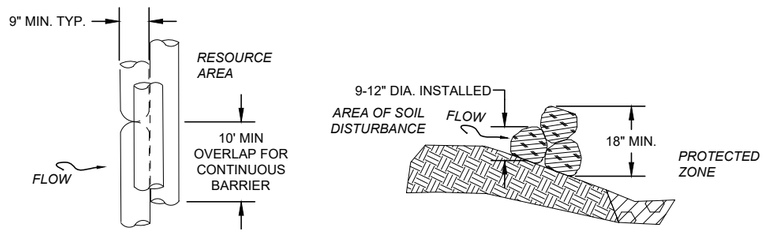
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

SEDIMENT BARRIER INSTALLATION

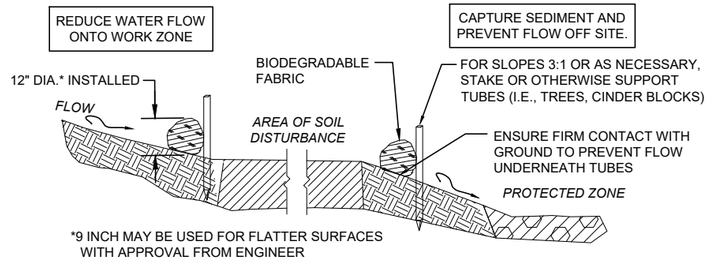
NOT TO SCALE



PLAN VIEW SECTION

SEDIMENTATION CONTROL BARRIER BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE



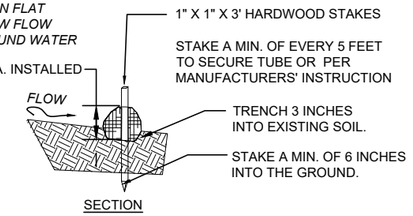
SECTION

SEDIMENT CONTROL BARRIER - STAKED STRAW WATTLE

NOT TO SCALE

12 INCH STRAW WATTLE

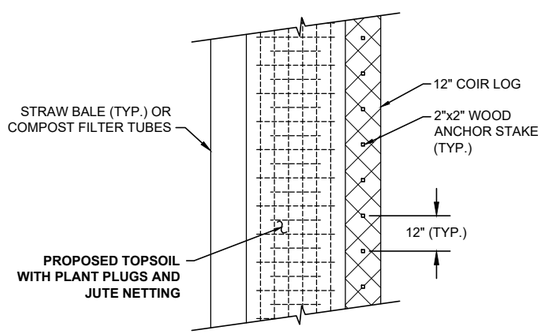
TO BE USED ONLY ON FLAT SURFACES WITH LOW FLOW TO DIVERT OR IMPOUND WATER FLOW



SECTION

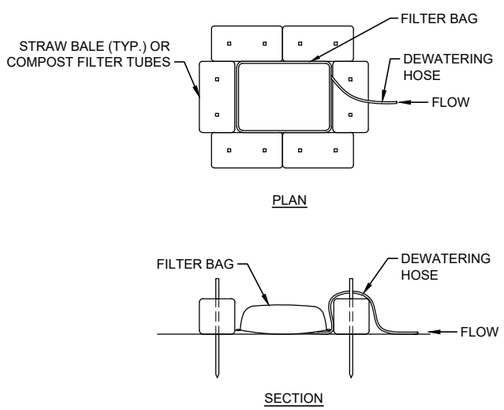
STRAW WATTLE - SEDIMENT BARRIER

NOT TO SCALE



WETLAND MITIGATION DETAIL

NOT TO SCALE



PLAN

SECTION

DEWATERING CONTAINMENT AREA DETAIL

NOT TO SCALE

NOTES:

1. SEE SHEETS 2 AND 3 FOR GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS.
2. SEE SHEET 13 FOR THE EROSION CONTROL PLAN AND SHEET # FOR THE WETLAND IMPACT PLAN.
3. SEE SHEET 22 FOR EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES.
4. ALL EROSION AND SEDIMENT CONTROLS SHALL BE PLACED AND MAINTAINED IN ACCORDANCE WITH MASSDOT STANDARDS.
5. SEDIMENT BARRIERS SHALL BE PLACED AT LOCATIONS SHOWN ON EROSION CONTROL PLANS AND/OR AS DIRECTED BY THE ENGINEER.

Last Saved by: USDM682745 on: Mar 13, 2025 11:46 AM File: c:\bms\wsp-pb-us-pw-02\wsp__data\david.melchionda\d10080043\TO3-MP44.29_PERMIT(EC-DETAILS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		22	23
PROJECT FILE NO.			

EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES

WETLAND REPLICATION AREA NOTES:

1. WETLAND REPLICATION WORK SHALL BE PERFORMED VIA LOW-INTENSITY METHODS INCLUDING THE USE OF HAND TOOLS AND LIMITED PERSONNEL.
2. FINAL GRADES IN THE REPLICATION AREA SHALL CONFORM TO TARGET ELEVATIONS AS SHOWN ON THE PLANS AND AS APPROVED BY THE WETLAND SPECIALIST. THE FINISHED GRADE SHALL BE AT AN ELEVATION THAT WILL PROVIDE A HYDROLOGIC CONNECTION BETWEEN THE REPLACEMENT AREA AND ADJACENT RESOURCE AREAS. THE CONTRACTOR SHALL VERIFY THAT THIS ELEVATION IS NOT AT A LEVEL THAT COULD ALTER THE HYDROLOGY OF AN ADJACENT WETLAND. RESTORATION AREAS SHALL CONFORM TO EXISTING AND/OR ADJACENT GRADES.
3. THE REPLICATION AREA SHALL BE STAKED AND GRADES SET FOR APPROVAL BY THE WETLAND SPECIALIST PRIOR TO EXCAVATION. TO THE EXTENT POSSIBLE, LIMITS SHALL BE A MINIMUM OF 6 FEET FROM TRUNK OF TREES. ACTUAL LIMITS OF THE REPLICATION AREA MAY BE ADJUSTED IN THE FIELD TO PROTECT ROOT SYSTEMS OF EXISTING TREES. HOWEVER, THE TOTAL AREA OF THE REPLICATION AREA REQUIRED BY ALL PERMITS SHALL NOT BE REDUCED.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY EXISTING AREAS OF ESTABLISHED INVASIVE PLANTS AND NOTIFY THE ENGINEER AND WETLAND SCIENTIST OF THE CONDITION. SOIL CONTAINING INVASIVE PLANT MATERIAL SHALL BE EXCAVATED AND DISPOSED OF OFF-SITE AT AN APPROVED FACILITY.
5. ALL CUT TREES, STUMPS, BRUSH, WRACK OR VEGETATION NOT SPECIFIED TO REMAIN SHALL BE REMOVED FROM THE REPLICATION AREA UNLESS DIRECTED OTHERWISE BY THE ENGINEER. MATERIALS SHALL NOT TO BE STOCKPILED IN THE RESOURCE AREAS OR BUFFER ZONE WHILE AWAITING DISPOSAL.
6. SEQUENCE AND EXECUTION OF WORK SHALL ENSURE MINIMAL COMPACTION AND HEAVY EQUIPMENT MOVING OVER PLACED PLANTING SOIL. IF HEAVY EQUIPMENT IS REQUIRED TO TRAVEL OVER EXISTING WETLAND SOILS, WOOD MATS SHALL BE PLACED TO MINIMIZE IMPACTS. UPON ACCEPTANCE OF FINAL GRADES, NO HEAVY EQUIPMENT SHALL TRAVEL ACROSS PLACED SOIL. DO NOT WORK WITH WET OR MOIST SOILS. WORK THAT RESULTS IN COMPACTION OF SOILS SHALL RESULT IN REPLACEMENT OF WETLAND SOILS AT NO ADDITIONAL COST TO THE CONTRACT.

ENVIRONMENTAL NOTES:

1. VEGETATED WETLAND RESOURCE AREAS WITHIN THE PROJECT AREA WERE IDENTIFIED AND FIELD DELINEATED BY WSP IN DECEMBER 2024. THE DELINEATION WAS COMPLETED IN CONFORMANCE WITH THE STANDARDS AND METHODS OUTLINED IN THE U.S. ARMY CORPS OF ENGINEERS (USACE) 1987 WETLANDS DELINEATION MANUAL AND ASSOCIATED NORTHEAST AND NORTHCENTRAL REGIONAL SUPPLEMENT (USACE 2012).
2. ALL PLANS REFERENCE MASSACHUSETTS STATE PLANE, MAINLAND STANDARD COORDINATION SYSTEM.

EROSION CONTROL NOTES:

1. PRIOR TO PROJECT IMPLEMENTATION, THE CONTRACTOR SHALL SUBMIT FOR ACCEPTANCE A GENERAL WORK SCHEDULE, CONSTRUCTION SEQUENCE AND PLAN WHICH INDICATES PLANNING IMPLEMENTATION OF TEMPORARY AND PERMANENT EROSION CONTROL MEASURES. THIS PLAN SHALL INCLUDE PROPOSED METHODS OF SOILS MANAGEMENT AND DISPOSAL OF WASTE MATERIALS.
2. BEFORE CONSTRUCTION BEGINS, AN EROSION CONTROL BARRIER WILL BE ERECTED AROUND THE ENTIRE PROPOSED WETLAND REPLACEMENT SITE, EXCEPT THE UPGRADIENT EDGE TO ALLOW MACHINERY ACCESS TO THE SITE. THE EROSION CONTROL BARRIER PREVENTS EROSION OF DISTURBED SOILS AND SEDIMENTATION INTO THE ADJACENT EXISTING WETLAND AREAS.
3. EROSION CONTROLS SHALL BE FINALIZED BASED ON ACTUAL FIELD CONDITIONS.
4. NO SEDIMENT OR SILT SHALL BE DISCHARGED TO THE WETLAND AT ANY TIME.
5. NO DEWATERING IS PERMITTED UNLESS THE CONTRACTOR PREPARES A DEWATERING PLAN THAT INCLUDES PUMPING WATER TO AN UPLAND SITE WITH ADEQUATE SILTATION CONTROLS, AND THAT PLAN IS APPROVED BY THE DEP. CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING ALL TEMPORARY SEDIMENTATION AND EROSION CONTROLS.
6. FOR EROSION CONTROL INSTALLATION REQUIREMENTS, REFER TO EROSION PROTECTION PLAN. TEMPORARY TREATMENTS SHALL CONSIST OF COMPOST FILTER TUBE, SILT FENCE, FIBER MULCH OR PROTECTIVE COVER SUCH AS FABRIC MATS.
7. THE TOE OF ANY SLOPE IS TO REMAIN AT LEAST ONE FOOT INSIDE OF ALL EROSION CONTROLS. UNDER NO CIRCUMSTANCE SHALL THE CONTRACTOR COVER ANY PORTION OF THE EROSION CONTROLS WITH MATERIAL. ANY MATERIAL THAT IS PLACE ON ANY EROSION CONTROLS BY THE CONTRACTOR, OR ANY AGENT OF THE CONTRACTOR, SHALL BE IMMEDIATELY REMOVED BY THE CONTRACTOR, AND ANY NECESSARY REPAIRS TO THE EROSION CONTROLS ACCOMPLISHED, AT NO COST TO THE OWNER.
8. ADDITIONAL EROSION CONTROLS SHALL BE INSTALLED AS CONDITIONS WARRANT, OR AS DIRECTED BY THE ENGINEER.
9. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EROSION CONTROL MAINTENANCE AND SHALL INSPECT AND/OR REPLACE ALL CONTROLS AS NEEDED. MAINTENANCE WILL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS AND PERMIT CONDITIONS. THE CONTRACTOR IS RESPONSIBLE FOR CARRYING OUT NECESSARY MAINTENANCE DURING ALL PHASES OF PROJECT COMPLETION.
10. SEDIMENTATION CONTROL DEVICES SHALL BE INSPECTED CLOSELY AND MAINTAINED PROMPTLY AS DESCRIBED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES ON A WEEKLY BASIS AND WITHIN 24 HOURS OF EACH STORM EVENT.
11. DISTURBED SLOPES ALONG THE EMBANKMENT WITHIN THE WORK ZONE SHALL BE STABILIZED WITH LOAM AND SEED.
12. UPON PROJECT COMPLETION, IMPACTED WETLANDS SHALL BE RESTORED TO EXISTING CONDITIONS. THE CONTRACTOR MUST REPAIR AND/OR RESEED ANY AREAS THAT DO NOT DEVELOP WITHIN ONE YEAR OF PLANTING.

PLANTING AND SEEDING NOTES:

1. SEEDING WITHIN THE WETLAND REPLICATION AREA AND ADJACENT UPLANDS WILL CONFORM TO THE PLANS OR WILL BE COMPLETED IN ACCORDANCE WITH DIRECTIONS PROVIDED IN THE FIELD. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION WILL BE USED. USE OF CULTIVARS WILL BE PROHIBITED. SPECIES NOT SPECIFIED IN THE FINAL SEEDING PLAN WILL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE WETLAND SCIENTIST AND PERMITTING AGENCY.
2. MANUFACTURED HYDRIC SOIL SHALL BE PLACED WITHIN THE WETLAND REPLICATION AREA. WETLAND SOILS ARE CREATED FROM A MIXTURE OF ORGANIC AND MINERAL MATERIALS, WITH THE FINAL PRODUCT CONTAINING AT LEAST 12 PERCENT ORGANIC MATTER CONTENT BY WEIGHT. THE CONTRACTOR MUST PROVIDE ANALYSIS OF THE PREPARED TOPSOIL TO THE WETLAND SCIENTIST FOR APPROVAL PRIOR TO INSTALLATION. WHERE EMPIRICAL DATA ARE LACKING, COMPOST TO SOIL RATIO SHALL BE 1:1 BY VOLUME. SOIL MUST BE FREE OF SEEDS, ROOTS, STEMS OR OTHER VIABLE PARTS OF INVASIVE PLANT SPECIES. SOIL SHALL NOT CONTAIN KILN-DRIED WOOD OR CONSTRUCTION DEBRIS. SOIL SHALL BE FREE OF SOLID MATERIALS LARGER THAN 4-INCHES IN DIAMETER.
3. COMPOST SHALL BE COMPOST MEETING THE REQUIREMENTS FOR ORGANIC SOIL ADDITIVES, SECTION M 1.06.0 OF THE STANDARD SPECIFICATIONS AND THE FOLLOWING:
4. MOISTURE CONTENT SHALL BE 40-60 PERCENT AS MEASURED BY ASTM D2216 STANDARD TEST METHOD FOR LABORATORY DETERMINATION OF WATER CONTENT OF SOIL AND ROCK AND ASTM D2974 (CITED ABOVE).
5. NO SOIL FROM ANY AREA SUPPORTING INVASIVE SPECIES SHALL BE USED IN THE REPLICATION AREA.
6. CONTRACTOR SHALL SPREAD APPROXIMATELY SIX (6) INCHES OF MANUFACTURED WETLAND SOIL WITHIN THE REPLICATION AREA, RAKE IN SEED AND INSTALL ROLLED EROSION CONTROL PRODUCT TO SLOPES ACCORDING TO THE DETAIL. AN APPROVED, NATIVE CONSERVATION SEED MIX SHALL BE USED IN UPLANDS AND AN APPROVED, NATIVE WETLAND MIX SHALL BE USED IN WETLAND AREAS.
7. THE SUPERVISING WETLAND SCIENTIST WILL INSPECT PLANTING STOCK TO ENSURE THAT THE SPECIMENS ARE HEALTHY, FREE FROM PESTS AND ANY INVASIVE PLANT MATERIAL, AND SUITABLE FOR USE WITHIN THE WETLAND RESTORATION SITE. UNSUITABLE SPECIMENS WILL BE REJECTED AND REPLACED WITH SUITABLE SPECIMENS. THE SUPERVISING WETLAND SCIENTIST MUST APPROVE ANY PLANTING SUBSTITUTIONS. WOODY PLANT STOCK WILL BE EITHER BARE ROOT STOCK OR CONTAINER GROWN.
8. TRANSPLANTS AND PLANT MATERIAL COLLECTED FROM THE WILD IS PROHIBITED UNLESS APPROVED IN WRITING BY THE WETLAND SCIENTIST. ALL PLANT MATERIAL USED SHALL BE NURSERY-GROWN AND HEALTHY, SOUND AND FREE OF DISEASE, INSECT PESTS, EGGS OR LARVAE AND DISCOLORATIONS.
9. CONTAINER-GROWN STOCK SHALL NOT HAVE WILTING OR CURLING LEAVES OR WEEDS. CONTAINTER-GROWN STOCK SHALL HAVE BEEN GROWN IN A CONTAINER LONG ENOUGH FOR THE ROOT SYSTEM TO HAVE DEVELOPED SUFFICIENTLY TO HOLD ITS SOIL AFTER REMOVAL FROM THE CONTAINER. ROOTS SHALL VISIBLY EXTEND TO THE INSIDE FACE OF THE GROWING CONTAINER BUT SHALL NOT BE ROOT-BOUND OR GIRDLING.
10. ALL PLANTS SHALL BE DELIVERED TO THE SITE AS LIVE, ACTIVELY GROWING, OR JUST BREAKING DORMANCY, AND ARRIVE TO THE PROJECT SITE READY FOR PLANTING. THE WETLAND SCIENTIST MAY REJECT PLANTS DAMAGED IN HANDLING OR TRANSPORT. PLANT MATERIAL SHALL BE INSTALLED AS SOON AS POSSIBLE AFTER IT HAS BEEN DELIVERED TO THE SITE. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
11. SOIL AND ROOTMASS SHALL BE WATERED AND MOIST ON DELIVERY TO THE JOB SITE. PLANTS WITH DRY SOIL AND ROOTS SHALL NOT BE ACCEPTABLE. ALL PLANT MATERIALS TEMPORARILY STORED AT THE SITE PRIOR TO PLANTING SHALL BE STORED OUT OF DIRECT EXPOSURE TO SUN AND WIND, SHALL BE MAINTAINED BY CAREFUL WATERING, AND SHALL BE PROTECTED FROM DAMAGE DUE TO CONSTRUCTION ACTIVITIES AND ADVERSE WEATHER.
12. TREE AND SHRUB PLANTING TO OCCUR BETWEEN MAY 1 AND JUNE 15 (SPRING SEASON) OR SEPTEMBER 1 AND NOVEMBER 15 (FALL SEASON).
13. UPON COMPLETION OF PLANTING, THE AREAS AROUND EACH TREE OR SHRUB PLANT WILL BE MULCHED WITH A 3-INCH-THICK LAYER OF LEAF LITTER OR OTHER NATURAL ORGANIC MATERIAL (NOT FRESH WOOD CHIPS). THE LEAF LITTER OR OTHER NATURAL ORGANIC MATERIAL SHALL BE SPREAD TO THE WIDEST EXTENT OF THE PLANT DRIP LINE.
14. CONTRACTOR SHALL SUPPLY A WETLAND SEED MIX INCLUDING A MAJORITY OF THE SPECIES LISTED IN THE WETLAND SEED MIX TABLE. 75% OF THE SEED MIX, BY WEIGHT, SHALL BE INDIGENOUS GRASSES AND SEDGES. SEEDS MUST BE FROM PLANTS GROWN WITHIN 200 MILES OF THE MITIGATION SITE.
15. CONTRACTOR SHALL PROVIDE A WRITTEN ANALYSIS OF THE SEED MIXTURE TO THE WETLAND SCIENTIST. NO SEEDING IS PERMITTED WITHOUT APPROVAL OF THE WETLAND SCIENTIST.
16. CONTRACTOR SHALL SUPPLY AN UPLAND SEED MIX INCLUDING A MAJORITY OF THE SPECIES LISTED IN THE UPLAND SEED MIX TABLE. 75% OF THE SEED MIX, BY WEIGHT, SHALL BE INDIGENOUS GRASSES AND, SEEDS MUST BE FROM PLANTS GROWN WITHIN 200 MILES OF THE MITIGATION SITE, CONTRACTOR SHALL PROVIDE A WRITTEN ANALYSIS OF THE SEED MIXTURE TO THE WETLAND SCIENTIST. NO SEEDING IS PERMITTED WITHOUT APPROVAL OF THE WETLAND SCIENTIST.
17. THE UPLAND SEED MIX SHALL BE APPLIED TO ALL DISTURBED SOILS WITHIN UPLANDS ADJACENT TO THE WETLAND MITIGATION AREA, 5, THE SEED MIXES SHALL BE APPLIED AT A RATE OF 1 LB PER 2,500 SQUARE FEET.
18. WATERING SHALL BE REQUIRED DURING THE GROWING SEASON (MAY 1 - NOV 1) WHEN NATURAL RAINFALL IS BELOW ONE INCH PER WEEK. WATER SHALL BE APPLIED IN SUFFICIENT QUANTITY TO THOROUGHLY SATURATE THE SOIL IN THE ROOT ZONE OF EACH PLANT. FOLLOWING THE FIRST MONTH OF PLANTING, WATERING WILL BE LIMITED TO PERIODS OF DECLARED DROUGHT. WATER SHALL BE PROVIDED BY THE CONTRACTOR AND NOT BE SOURCED FROM WATERWAYS ON SITE.
19. THE EROSION CONTROL BARRIERS WILL BE DISASSEMBLED AND PROPERLY DISPOSED OF BEFORE NOVEMBER 1 OF THE THIRD FULL GROWING SEASON AFTER PLANTING OF THE WETLAND REPLICATION AREA. SEDIMENT COLLECTED BY THE BARRIERS WILL BE REMOVED AND DISPOSED OF IN A MANNER THAT PREVENTS EROSION AND TRANSPORT TO A WETLAND OR WATERWAY. IF MINOR GRADING IS REQUIRED IN THE IMMEDIATE ZONE AROUND THE EROSION CONTROL BARRIER TO PROVIDE SURFACE HYDROLOGIC CONNECTION BETWEEN THE WETLAND ESTABLISHMENT SITE AND THE EXISTING WETLAND AREA, IT WILL BE DONE BY HAND AND STABILIZED BY MULCH.

Plotted on 13-Mar-2025 2:29 PM
Last Saved by: USDM682745 on: Mar 13, 2025 10:20 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondal\1006043\TO3-MP44.29_PERMIT\EC-NOTES).dwg

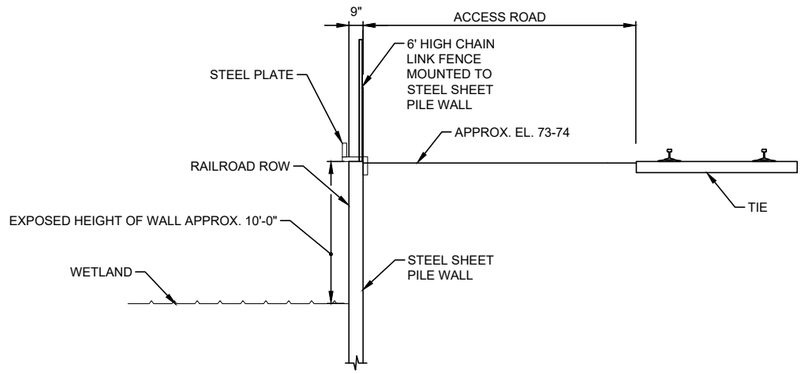
MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		23	23
PROJECT FILE NO.			

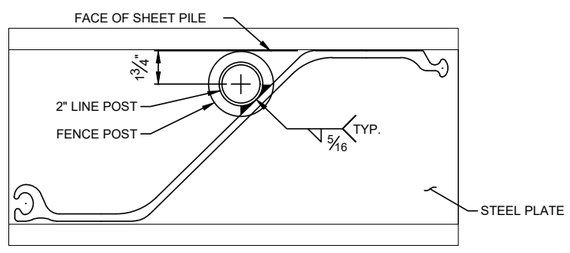
CULVERT AT MP 44.29 SHEET PILE RETAINING WALL DETAILS AND SECTIONS

NOTES:

1. FOR GENERAL CULVERT NOTES, SEE SHEET 3.
2. FOR CHAIN LINK FENCE DETAILS, SEE CIVIL PLANS.



A S-321 SECTION
SCALE: 1/4"=1'-0"



2 - DETAIL
SCALE: 3"=1'-0"

Last Saved by: USDM682745 on: Mar 13, 2025 10:15 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.29_PERMIT\(WALL-DETAILS).dwg

Plotted on 13-Mar-2025 2:29 PM

DOCUMENT A00831

ARMY CORPS OF ENGINEERS

VERIFICATION AND GENERAL PERMIT

THIS PAGE IS INTENTIONALLY LEFT BLANK

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 - Chalita Middle - Last - Belfield	First - Kimberly Middle - Last - Degutis
Company - MassDOT Rail and Transit	Company - WSP
E-mail Address - Chalita.Belfield@dot.state.ma.us	E-mail Address - kimberly.degutis@wsp.com
5. APPLICANT'S ADDRESS:	8. AGENT'S ADDRESS:
Address- 10 Park Plaza, Suite 4260	Address- 100 Summer Street, 13th Floor
City - Bostom State - MA Zip - 02116 Country - US	City - Boston State - MA Zip - 0211 Country - U
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
857.368.8957	781400827

NAME, LOCATION, AND DESCRIPTION OF PROJECT SITE

10. PROJECT NAME OR TITLE
Cape Main MP 44.29 Culvert Replacement

11. FILE NUMBER(S) OF PREVIOUS USACE ACTIONS ON THE SITE (if applicable)	12. NAME OF WATERBODY
	N/A
13. PROJECT COORDINATES (in decimal degrees)	14. PROJECT STREET ADDRESS (if applicable)
Latitude: ◦N Longitude: ◦W	Address Cape Main MP 44.29
41°48'0.50"N 70°47'14.06"W	City - Rochester State - MA Zip - 02770

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
1,259	25	342	10 days

17. PROJECT PLANS (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE ITEMS ARE COMPLETE) (*see instructions*)

- [x] a. Plans shall at least contain the following: Vicinity Map, Plan View, and Typical Cross Section View of the proposed activity.
- [x] b. All direct, indirect and secondary impacts from USACE regulated activities are shown on the project plans.
- [x] c. The size of the impact area for each activity (acre, square feet, linear feet) are shown on the project plans.
- [x] d. For discharges of fill material (§404), the volume of fill material is identified on the project plans.
- [x] e. The duration of each impact, permanent or temporary (X days), is identified on the project plans.
- [x] f. Do activities with permanent impacts result in the loss of waters? If so, this is identified on the project plans.
- [x] 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*)

- [x] a. The project has been designed to avoid and minimize impacts to aquatic resources.
- [x] 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.
- [x] 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).
- [x] 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	Per Appendix A, SHPO was notified and they did not respond with concerns within 30 days.
b. Massachusetts BUAR	Per Appendix A, BUAR was notified and they did not respond with concerns within 30 days.
c. Tribal Historic Preservation Officers	The Tribe(s) were notified and they didn't respond with concerns within 30 days.
d. Endangered Species Act - NOAA	The activity is not located within the ESA-listed Species Range.
e. Endangered Species Act - USFWS	No effect determination reached through the Northeast Species D-Key (PCN Required).
f. Northern Long Eared Bat (ESA)	No effect determination reached with the Rangewide D-Key. See Instructions below.*
g. Essential Fish Habitat	The project footprint does not contain EFH (see EFH definition in the MA GP).
h. Wild & Scenic Rivers	There are no WSR's within 0.25 miles of the project area.
i. 401 Water Quality Certification 401	The activity qualifies under the general 401 WQC for the 2023 MA GPs.
	401 WQC/OOC File Number: OOC issued: 401 issued:
j. Section 408 Permission	Not Required per GC 15a-f, no Federal Projects are within the project vicinity.
k. Coastal Zone	The project is not located within the coastal zone.
l. Construction Mats	Placement of construction mats complies with GC 22.
m.Time of Year Restrictions	N/A, the project is not located in a waterbody that has TOY restrictions.
n. Vernal Pools	Per GC 28, the project is not located in a vernal pool.
o. Sediment & Erosion Controls	Per GC 25, the activity uses BMPs to avoid/minimize sedimentation & erosion.
p. Stream/Wetland Crossings	The activity complies with all applicable terms in GC 31.

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*)

- [x] a. The project plans are enclosed in this SVN submittal (see block 17).
- [x] b. The activity IS NOT funded through the Bipartisan Infrastructure Bill (also known as the Infrastructure Investment and Jobs Act).
- [x] c. All required state, local and federal approvals were acquired prior to starting construction in USACE jurisdiction.
- [x] 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
- [x] 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.

Chalita Belfield	3/26/2025		3/26/2025
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.

Chalita Belfield	3/26/2025		3/26/2025
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.

SECTION 404 SELF-VERIFICATION APPLICATION

CAPE MAIN MP 44.29 CULVERT REPLACEMENT PROJECT

Prepared for:
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION RAIL AND TRANSIT DIVISION

Prepared by:
WSP USA ENERGY & ENVIRONMENT INC.
100 SUMMER STREET, 13TH FLOOR
BOSTON, MASSACHUSETTS 02117
T+ 1 617 426-7330
WSP.COM

US0035009.6582
MARCH 2025

TABLE OF CONTENTS

1 INTRODUCTION....1-1

1.1 Project Purpose....1-2

2 REGULATORY COMPLIANCE SUMMARY 2-1

2.1 MASSACHUSETTS WETLANDS PROTECTION ACT – FOOTPRINT BRIDGE EXEMPTION....2-1

2.2 MASSACHUSETTS WETLANDS PROTECTION ACT – STREAM CROSSING STANDARDS COMPLIANCE....2-2

2.3 Section 401 Clean water act....2-4

2.4 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT....2-4

2.5 ENDANGERED SPECIES ACT OF 1973....2-4

2.6 COASTAL ZONE MANAGEMENT CONSISTENCY DETERMINATION....2-5

2.7 OTHER FEDERAL JURISDICTIONAL REQUIREMENTS....2-5

3 EXISTING CONDITIONS....3-1

3.1 waters of the US....3-1

3.2 Bordering vegetated wetlands....3-1

3.3 LAND UNDER WATERBODIES AND WATERWAYS....3-3

4 ALTERNATIVES ANALYSIS....4-1

4.1 No build....4-1

4.2 REHABILITATION OF EXISTING CULVERT....4-1

4.3 replacement with larger diameter pipe....4-2

4.4 FULL CULVERT REPLACEMENT....4-3

5 CONSTRUCTION SEQUENCE 5-1

6 PROPOSED DISCHARGE OF FILL MATERIAL IN WATERS OF THE US 6-1

7 IMPACT MINIMIZATION AND MITIGATION MEASURES 7-1

7.1 EROSION AND SEDIMENTATION CONTROL 7-1

7.2 STORMWATER MANAGEMENT 7-2

7.3 Dewatering 7-2

7.4 INVASIVE SPECIES CONTROL 7-2

7.5 DIVISION OF MARINE FISHERIES 7-2

8 CONCLUSIONS 8-1

FIGURES

Figure 1: Existing Conditions and Site Locus

Figure 2 FEMA FIRM

APPENDICES

Appendix A: Wetland Delineation Memo

Appendix B: Permit Plans

Appendix C: USFWS IPaC Effect Determination

Appendix D: Section 106 / Historic Coordination

Appendix E: Public Notice to Environmental Monitor

1 INTRODUCTION

On behalf of the Massachusetts Department of Transportation, Rail and Transit Division (MassDOT), WSP is requesting a permit authorization to place fill material within Waters of the United States within the Commonwealth. The Cape Main MP 44.29 Culvert Replacement Project (Project) involves the replacement of the existing 24 X 36-inch stone box with 30-inch reinforced concrete pipe (RCP) extension that has failed at the joint. The Project proposes to replace this culvert with a 48-inch precast Reinforced Concrete Pipe (RCP) and with precast concrete headwall that is slightly offset to the north of the existing box culvert located on the Massachusetts Department of Transportation Rail and Transit Division (MassDOT Rail) owned Cape Main railroad line in the Town of Rochester (see Figure 1 – Existing Conditions and Site Locus). Replacement work will consist of the establishment of a support of excavation, dewatering, removal of the embankment overburden, preparation of the substrate, placement of the proposed 48-inch culvert, installation of precast concrete headwall and re-establishment of the embankment and overburden, and restoration of the track in the Project area. The existing culvert is proposed to remain in place during the construction period to allow for continued bypass of Cedar Swamp Brook, a tributary to the East Branch of the Sippican River. Upon project completion, the existing stone box culvert will be blocked off at the ROW line and the area under the track filled with flowable fill and the embankment area of the sinkhole repaired.

The replacement culvert is proposed to be offset approximately 30 feet to the north of the existing box culvert. This location shift will allow for installation of the replacement pipe predominantly in the dry, thereby, significantly reducing the potential for construction impacts to the adjacent brook and wetlands.

Allowing the culvert replacement project offers tangible public benefit in providing a safe, reliable train crossing across and adjacent to sensitive resource areas. As part of this rehabilitation work, MassDOT will address an existing track settlement issue that currently occurs at the junction seam of the stone box with the RCP extension in the middle of the existing siding track. This settlement issue has created an approximate 2-foot x 2-foot wide and 2-foot-deep sinkhole within the embankment immediately adjacent to the track that has affected the stability of the siding track and made for unsafe walking conditions along the siding track.

The following narrative provides a detailed description of the existing conditions and the proposed Project, as well as a description of the resource areas and the potential discharge of fill material into those resources. Please note that the Project is being completed on land owned by MassDOT and, as an Agency of the Commonwealth, MassDOT is exempt from the abutter notification requirements of the Wetlands Protection Act including filing fees, peer review fees, and local bylaws or ordinances.

The Right of Way and culvert are owned by MassDOT Rail & Transit Division. As a MassDOT-owned culvert, the replacement of said structure qualifies as a bridge-exempt project under the Transportation Bond Bill. Therefore, this project is exempt from the Wetlands Protection Act (WPA), Chapter 91, and the Massachusetts Environmental Policy Act (MEPA).

1.1 PROJECT PURPOSE

The purpose of this Project is to replace the existing, partially failed stone box culvert and concrete pipe extension with a new, larger diameter reinforced concrete pipe (RCP) to pass Cedary Swamp Brook, a tributary to the East Branch of the Sippican River under the tracks.

The existing culvert is currently filled with fallen subgrade and ballast material from the railroad above which prevents the culvert from efficiently passing water thereby reducing the carrying capacity of the culvert. Swift replacement of this culvert is necessary to restore adequate flow of the stream, avoid a threat to the health and safety of the citizens of the Commonwealth, prevent significant damage to railroad, and protect against significant impacts to the environment which would occur in the event of a derailment. In addition, funding for this project is FY25 State capital improvement funds which are only available through June 30, 2025. As a result, it is imperative that the work be completed prior to June 30, 2025.

The culvert was inspected on September 10 and November 19, 2024, and found to be in poor condition due to a localized collapse/failure at the junction seam between the stone box and the RCP extension. A 2-foot-wide sinkhole was observed to have formed, which then filled with railroad ballast and other materials, partially blocking the interior of the RCP. This condition is now affecting the stability of the track and the effectiveness of the culvert to pass the brook. The inspection report recommends replacement of the entire composite structure.

Although passenger services are only seasonally scheduled for the railroad (the MBTA Cape Flyer), the Cape Main Line supports regular daily freight train traffic to the SEMASS Energy Plant, and necessary equipment moves to the Massachusetts Bay Transportation Authority (MBTA) Rochester Maintenance Facility. The failure of the embankment and railroad track due to the sinkhole and nearly failed culvert could result in a catastrophic event, such as a train derailment, potentially resulting in the loss of lives (train operators, neighbors); loss of property; and loss of important commercial services to the communities of Cape Cod and Southeastern Massachusetts. In the event of an accident, adjacent sensitive resource areas may also be negatively impacted by the release of hazardous and non-hazardous materials associated with the train and its cargo.

The Cape Main Line operates both daily freight service and seasonal passenger trains. Freight Service includes the daily movement of municipal waste from the Cape to the SEMASS Plant. This piece of the Cape Main also services the MBTA's Rochester Maintenance Facility. In addition, the MBTA runs the CapeFlyer Service on weekends and holidays from Memorial Day to Labor Day. If not repaired, the current conditions will continue to deteriorate to the point of disrupting Cape Flyer Service and freight access to the SEMASS facility.

2 REGULATORY COMPLIANCE SUMMARY

Except as otherwise provided in 314 CMR 9.06(3), no discharge of dredged or fill material shall be permitted to certain waters and wetlands designated in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) as Outstanding Resource Waters (ORWs), The exceptions are granted without a variance for certain eligible activities as listed in 314 CMR9.06 (3)(a) through (k) if MassDEP determines that the discharge of dredged or fill material may be permitted. The proposed project is an eligible activity as defined in 314 CMR 9.06 (3)(c), as follows:

— (c) *Maintenance, repair, replacement or reconstruction but not substantial enlargement of existing and lawfully located structures or facilities including buildings, roads, railways, utilities, dams, and coastal engineering structures*.

The proposed project is also an eligible activity as defined in 314 CMR 9.06 (3)(k), as follows:

— (k) *Maintenance, repair, replacement, or reconstruction of structures or facilities for water dependent uses. In addition, the enlargement of structures or facilities for water-dependent uses is allowed only in following limited circumstances:*

1. *in an Outstanding Resource Water that is designated for purposes other than a public water supply; or*

The project is designed to facilitate passage of the Brook under an existing railroad embankment and is not affiliated with a public water supply. The project is not located within an Outstanding Resource Water area.

2. *in an Outstanding Resource Water that is located within an Area of Critical Environmental Concern provided that if there is a resource management plan for the ACEC that has been adopted by the municipality and approved by the Secretary, the Department determines that: the enlargement of structures or facilities is consistent with said plan and the fill or structure associated with the enlargement activity is located entirely within an area of previously filled tidelands*.

The culvert replacement project on the Cape Main at MP 44.29 is not located within an Area of Critical Environmental Concern (ACEC).

The project was determined to be subject to federal and state environmental regulations. Below is a list of permits or approvals that MassDOT is in the process of receiving.

2.1 MASSACHUSETTS WETLANDS PROTECTION ACT – FOOTPRINT BRIDGE EXEMPTION

According to c. 79 § 24 of the (Massachusetts) Acts of 2014, the project qualifies for using the Footprint Bridge Exemption. As stated in the cited statute, the ""*bridge" shall include any structure spanning and providing passage over water, railroad right-of-way, public or private way, other vehicular facility or other area*." As the culvert meets the definition of a bridge, the Exemption is applicable

and exempts the project from review under Massachusetts Environmental Policy Act, Wetlands Protection Act, and Waterways Regulations (Chapter 91).

2.2 MASSACHUSETTS WETLANDS PROTECTION ACT – STREAM CROSSING STANDARDS COMPLIANCE

The culvert passes Cedar Swamp Brook, a tributary to the East Branch of the Sippican River under the embankment. The proposed culvert has been designed to the Massachusetts Stream Crossing Standards General Standards, "*General standards provide for fish passage, stream continuity, and some wildlife passage. All new permanent crossings and, where feasible, replacement crossings must meet general standards".* The replacement culvert has been designed to meet, to the extent feasible and allowed by site constraints, engineering standards, railroad design/operations, logistics, cost and project purpose, the six general standards in the following manner:

1) Type of Crossing: The project is proposing the installation of a reinforced concrete pipe culvert with a partially embedded floor incorporating natural substrate material. In accordance with the Federal Railroad Administration, the railroad must comply with engineering standards for structures as set forth in the American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering. The AREMA Manual requires the use of specific materials and structures for the passage of rail traffic over waterways. The proposed Class V Reinforced Concrete Pipe conforms to the required AREMA standards. The geometry of the wetland crossing and the skew crossing angle precludes the use of a three-sided bridge structure, which would require additional disturbance to resource areas for the installation of support foundations and other structural elements necessary to meet AREMA standards. The rounded pipe culvert is the least environmentally impacting design option that meets the AREMA standards needed to efficiently provide and preserve hydrologic conditions at this location. In addition, Railroad Operational Out of Service Restrictions do not allow enough time for construction of a three-sided bridge structure.
2) Embedment: The project is proposing to install the pipe to conform to AREMA standards for culvert crossings. This requires the installation of this pipe on a sound layer of supportive clean, pre-washed crushed stone bedding which when placed for the length of the new pipe installation footprint will result in providing a stabilizing embedment depth relative to the surrounding soil areas. Thereby the culvert will be fixed in position counteracting any probable dislodging or shifting due to the vibratory live and dead loadings of the passing trains and the rail-track structure set atop of the embankment over this pipe. The embedment assures a static, stable condition of the pipe and long-term integrity of the reconstructed culvert crossing at this location. The proposed replacement culvert will be embedded on a crushed stone base to a depth to allow for 12inches of natural streambed material and match existing inverts.
3) Crossing Span: The hydraulic opening size of the replacement culvert has been calculated to pass the design 100-year flood event for this area. Installation of a larger span crossing is not appropriate at this location as the required depth of overburden to support both live and dead loads of passing trains is insufficient to meet AREMA standards. Meeting the required

depth of overburden would necessitate raising the approach track profile for a significant distance in either direction. This is turn would necessitate adjustments to the siding tracks at both the MBTA's Rochester Maintenance Shops and the SEMASS facility. If a bridge structure was to be constructed at this crossing; in conformance with AREMA standards, it would require the installation of large support footings, wide-end concrete abutments, and other buried structural features installed at deeper excavated levels that would require further disturbance to resource areas and, potentially, the brook itself. In addition, the installation of a bridge structure would require a longer-duration outage of the track and a greater potential for long-term maintenance and repair issues to occur thereby impacting the commercial interests of local and national transportation concerns and affecting the ability of the railroad to conduct interstate commerce tasks. For these noted reasons, the railroad's AREMA standards prefer replacements of existing crossings with the installation of precast round pipe wherever applicable with respect to the given time constraints, site constraints and conditions.

4) Openness: The openness ratio of the proposed culvert crossing is calculated to be 0.19. The existing openness ration is calculated at 0.04, due to partial collapse of the existing culvert and blockage with material. The proposed new pipe would provide a functional lift for wildlife passage as well as improved flow conveyance. As noted earlier, it is not feasible to install a replacement crossing structure that would provide additional width and height of opening relative to crossing length and still conform to the required AREMA engineering standards. The proposed round pipe culvert manages the flow volume as is intended to process the accumulating flow volume from the contributing watershed. In addition, the height of overburden on the replacement culvert to achieve the openness ratio in the Standards would require elevating the track sections and increasing the amount of fill within adjacent wetlands to accommodate the widened toe of slope for embankment stability.
5) Substrate: During installation, the contractor will be directed by the Project Engineer to infill the lower 12 inches of the new 48" diameter pipe with natural streambed material. The pipe is proposed to be installed to maintain the existing invert elevations at the inlet and outlet ends to prevent the creation of a perched condition in the flow line profile. The natural infill material layer will be placed by the contractor to the inspected acceptance of the wetland scientist on site to resist potential displacement from occurring during higher storm flow events.
6) Water Depth and Velocity: The proposed culvert is a 53'-6" long, 48-inch diameter Precast Reinforced Concrete Pipe with Precast Concrete Headwall and Wingwalls at inlet and outlet ends and is sized to accommodate anticipated future flood events. The inlet and outlet ends include a proposed 5-foot x 5-foot inlet and 6-foot x 7-foot outlet cobble pads to limit outflow velocity. Currently the culvert passes Cedar Swamp Brook. The proposed culvert as designed will maintain the elevation and grade characteristics of the existing flow structure through the profile slope and function to convey the flow volume effectively.

For the reasons stated above and given the site constraints and logistics, it is our professional opinion that the Project has met the Stream Crossing Standards to the maximum extent feasible.

2.3 SECTION 401 CLEAN WATER ACT

A request for certification under Section 401 - Water Quality Certificate is being applied for by MassDOT for the proposed project. Authorization by the Massachusetts Department of Environmental Protection is anticipated in April 2025.

2.4 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

In accordance with a concurrent request for Section 404 authorization, MassDOT is coordinating with the State Historic Preservation Officer (SHPO), the Board of Underwater Archeological Resources (BUAR), and appropriate Tribal Historic Preservation Officers (THPO). Copies of coordination letters are included under Appendix D.

2.5 ENDANGERED SPECIES ACT OF 1973

The proposed culvert replacement and sheet pile wall project is not located within mapped Natural Heritage & Endangered Species Program (NHESP) Estimated or Priority Habitat. There are no mapped Potential or Certified Vernal Pools located within 1000-feet of the Project area. A search conducted of the U.S. Fish and Wildlife (USFWS) Information for Planning and Conservation (IPaC) database on December 16, 2024, for milepost 44.27[1] listed two bats, one amphibian, and one insect as potentially present within the Project limits. A copy of the IPaC report is included under Appendix C. The listed species identified in the IPaC report are summarized below in Table 1.

Table 1 – Federally Listed Species Potentially within the Project Limits

SCIENTIFIC NAME	COMMON NAME	STATUS
Myotis septentrionalis	Northern Long-Eared Bat	Federally Endangered
Perimyotis subflavus	Tricolored Bat	Proposed Endangered
Pseudemys rubriventris bangsi	Plymouth Redbelly Cooter	Federally Endangered
Danaus plexippus	Monarch Butterfly	Proposed Threatened

Northern long-eared bat (NLEB) is a federally listed species (threatened) that is known to occur within the project limits. While Designated Critical Habitat for the NLEB has been defined, specific habitat that may be used by the bats are protected under the 4(d) rule of the Endangered Species Act if tree removal is required. Specifically:

[1] The IPaC Federal Highways Programmatic Consultation for Transportation Projects affecting NLEB was offline and unavailable for informal consultation at the time of this permit preparation.

> "Incidental take resulting from tree removal is prohibited if: 1) Occurs within 0.25-mile radius of known northern long-eared bat hibernacula or 2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot radius from the known maternity tree during the pup season (June 1 through July 31)."

For the NLEB, potential habitat includes known hibernacula (e.g., caves or mines) and maternity or roost trees that include hardwood specimens greater than 3-inch diameter breast height (DBH) with crevices or shaggy bark capable of providing shelter for the bats. Large dead snags are also considered resting habitat.

A review of the Massachusetts Division of Fisheries and Wildlife's NLEB page with interactive habitat map indicated no mapped hibernacula are located within 0.25 miles of the project location and no mapped maternity roost trees are mapped within 1000-feet of the project location. In addition, a limited habitat assessment was conducted within the project limits. No trees >3" DBH were identified within the project limits that may be permanently impacted by project construction.

Given the limited nature of required, selective tree and shrub clearing to access the project work zone, project activities are not anticipated to affect either the NLEB nor any migratory birds protected under the Migratory Bird Treaty Act or identified on the USFWS Birds of Conservation Concern (BCC) list (see Appendix C – USFWS Official Species List).

Necessary clearing, grubbing, and/or selective removal of trees will be conducted by hand at the direction of the Engineer. Removal of vegetation will be limited to areas of construction access and areas required for safe excavation of embankment soils to access the existing culvert and work area.

2.6 COASTAL ZONE MANAGEMENT CONSISTENCY DETERMINATION

The Project is not located within areas under the jurisdiction of the Federal Coastal Zone Management Act. The Project will not require a federal consistency review.

2.7 OTHER FEDERAL JURISDICTIONAL REQUIREMENTS

The Project will not impact federal lands or wetlands and waterbodies associated with or designated as a National Wild and Scenic River.

3 EXISTING CONDITIONS

The Project Area includes a 1-acre portion within the railroad right-of-way, between mile marker 44.29 and the MBTA's Rochester Shops facility on the Cape Main line in Rochester, Massachusetts. The Project is located approximately 650-feet southeast of the SEMASS facility.

The Project Area includes two railroad tracks on an elevated, soil-based embankment; one track is the Cape Main mainline; the second track is an active siding to the SEMASS and Rochester facilities. The project area also includes two railroad switches and ancillary supporting utilities.

Inspection of the railroad embankment by MassCoastal occurred in the summer of 2024 and identified a sinkhole near the edge of track at MP 44.29. Based upon a follow-up field inspection of the culvert area conducted by WSP on September 10, 2024, engineers found the culvert to be in poor condition due to a localized collapse/failure of the joined segments between the stone box portion and the reinforced concrete pipe (RCP) extension under the embankment. A 2-foot-wide sinkhole has formed in between the rails on the siding track at the culvert seam between the stone box and the RCP; subgrade material and railroad ballast from above has partially blocked the interior of the culvert the culvert itself was noted as being in poor condition. The inspection report recommended replacement of the entire structure. The sinkhole has compromised the structural condition of the embankment and track and thereby presents a hazard to the safe operation of the railroad.

On November 19, 2024, a WSP USA (WSP) wetland scientist conducted a reconnaissance of the Project Area. The focus of this work included assessing and delineating 200 linear feet to the northwest and southeast of the culvert opening. The culvert passes Cedar Swamp Brook, a tributary to the East Branch of the Sippican River. The Project Area is bordered to the north and east by freshwater emergent wetlands, to the south by freshwater emergent wetlands that feed into active cranberry bogs, to the east by undeveloped uplands and MBTA's Rochester Rail Maintenance facility and to the northwest by the SEMASS property. Several natural communities exist on-site, including upland forest, and freshwater scrub-shrub and emergent wetland systems. The Wetland Delineation Memo has been included under Appendix A.

3.1 WATERS OF THE US

Wetlands Protection Act Resource Areas identified within the project limits include:

— Bordering Vegetated Wetlands / Palustrine Emergent Wetlands

— Land under Waterbodies and Waterways

3.2 BORDERING VEGETATED WETLANDS

Wetlands Protection Act Regulations (310 CMR 10.55) define bordering vegetated wetlands as, "*freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The boundary of Bordering Vegetated Wetlands is the line within which 50% or more of the vegetational community consists of wetland indicators plants and saturated or inundated conditions exist*".

Bordering Vegetated Wetland (BVW) was identified on both the north and south sides of the railroad embankment within the project limits. The BVW for generally consists of emergent habitat to the north and emergent habitat to the south and along the toe of slope of the railroad embankment. All wetlands within the project area are assumed jurisdictional under the definition of the Waters of the United States and therefore subject to USACE review[2].

As stated in 310 CMR 10.55 (4), the proposed project will address the following performance standards.

Performance Standard	Proposed Project
(b)(1) *the surface of the replacement area to be created ("the replacement area") shall be equal to that of the area that will be lost ("the lost area")*	Wetland replication of 587 square feet is proposed for the project. Wetland mitigation is proposed as part of an aggregate site to include mitigation commitments as part of the MM 44.27 culvert replacement project. Mitigation is located on the northwest side of the project area. See attached permit plans.
(b)(2) *the ground water and surface elevation of the replacement area shall be approximately equal to that of the lost area*	The replication area has been designed to meet the existing surface elevation of adjacent wetlands; due to the size and shape of the proposed replication area, a channel has been proposed to convey surface waters from the adjacent wetland into the proposed area. Subsurface elevations will be approved by the supervising Wetland Scientist upon confirmation of wetland hydrology indicators
(b)(3) *The overall horizontal configuration and location of the replacement area with respect to the bank shall be similar to that of the lost area*	The replication area has been located within the MassDOT owned right-of-way. The replication area is located immediately adjacent to the existing wetland along the northwest side of the project area. See attached permit plans.
(b)(4) *the replacement area shall have an unrestricted hydraulic connection to the same water body or waterway associated with the lost area*	The replication area has been designed to incorporate a shallow, sinuous channel to convey surface water from the immediately adjacent wetland system through the proposed, created area. See attached permit plans.
(b)(5) *the replacement area shall be located within the same general area of the water body or reach of the waterway as the lost area*	The replication area has been designed immediately adjacent, and hydrologically connected to, the palustrine emergent wetlands along the northwest side of the railroad embankment. See attached permit plans.
(b)(6) *at least 75% of the surface of the replacement area shall be reestablished with indigenous wetland plant species within two growing seasons, and prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard U.S. Soil Conservation Service method*	The replication area has been designed to use native vegetation and will be monitored by MassDOT or its appointed entity for two growing seasons to document success
(b)(7) *the replacement area shall be provided in a manner which is consistent with all other General*	The replication area has been designed to comply with the WPA General Performance Standards.

[2] WOUS – Water of the United States, jurisdictional definition as of December 17, 2024

Performance Standards for each resource area in Part III of 310 CMR 10.00.	Please see the attached permit plans for additional details
(c) *Notwithstanding the provisions of 310 CMR 10.56(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59*	The replication area is not located within specified or mapped habitat sites of rare vertebrate or invertebrate species
(c)(1) and (2) "*said portion has a surface area less than 500 square feet*", and "*said portion extends in a distinct linear configuration ("finger-like") into adjacent uplands*"	Proposed project activities are anticipated to permanently impact 587 square feet of bordering vegetated wetland through grading and placement of culvert appurtenance; however, the project activities are not proposing to impact finger-like projects of wetlands.
(d) *…no project may be permitted which will have any adverse effect on specified habitat sites of rare* vertebrate or invertebrate species	The project is not located within mapped NHESP Estimated Rare or Priority Habitat areas
(e) *…Any proposed work shall not destroy or otherwise impair any portion of a Bordering Vegetated Wetland that is within an Area of Critical Environmental Concern…*	The project is not located within an Area of Critical Environmental Concern

3.3 LAND UNDER WATERBODIES AND WATERWAYS

Wetlands Protection Act Regulations (310 CMR 10.56) Land Under Water Bodies and Waterways (LUW) as "*the land beneath any creek, river, stream, pond or lake*". The boundary of LUW is the mean annual low water level. Cedar Swamp Brook, a tributary to the East Branch of the Sippican River, constitutes the LUW observed within the project area. Boundary of LUW was delineated using the procedures outlined in the US Army Corps of Engineers *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams*[3]. The data sheet has been included within the wetland delineation report.

As stated in 310 CMR 10.56 (4), the proposed project will address the following performance standards as stated in the Regulations, "*Where the presumption set forth in 310 CMR 10.56(3) is not overcome, any proposed work within Land under Water Bodies and Waterways shall not impair the following*:"

Performance Standard	Proposed Project
(a)(1) *The water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks*	The proposed project is proposing limited regrading within the upstream channel into the existing culvert inlet to redirect flow towards the relocated replacement culvert location. No additional impacts to LUW are proposed. The water carrying capacity within Cedar Swamp Brook is not anticipated to be affected by the regrading of the stream bed

[3] U.S. Army Corps of Engineers, 2022. *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams, Interim Version.* ed. Gabrielle C. L. David, Ken M. Fritz, Tracie-Lynn Nadeau, Brian J. Topping, Aaron O. Allen, Patrick H. Trier, Steven L. Kichefski, L. Allan James, Ellen Wohl, and Daniel Hamill. ERDC/CRREL TR-22-26. Vicksburg, Mississippi; Wetlands Regulatory Assistance Program

(a)(2) *Ground and surface water quality*	No direct impacts to Cedar Swamp Brook are proposed; indirect impacts may include temporary disturbance due to minor regrading of the stream bed to relocate the centerline of the channel. Erosion and sediment controls will be installed to limit impacts. Ground and surface water quality within the Brook are not anticipated.
(a)(3) *The capacity of said land to provide breeding habitat, escape cover and food for fisheries*	No direct impacts to Cedar Swamp Brook are proposed; indirect impacts due to temporary construction activities are not anticipated to affect the capacity of the resource area to provide breeding habitat, escape cover and food for Fisheries is not anticipated to be affected.
(a)(4) *The capacity of said land to provide important wildlife habitat functions.*	No direct impacts to Cedar Swamp Brook are proposed; indirect impacts to wildlife habitat functions may occur due to construction activities. Permanent impacts to wildlife habitat functions are not anticipated to be affected.
(a)(5) *Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.56(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards by consisting of a span or embedded culvert in which, at a minimum, the bottom of a span structure or the upper surface of an embedded culvert is above the elevation of the top of the bank, and the structure spans the channel width by a minimum of 1.2 times the bankfull width. This presumption is rebuttable and may be overcome by the submittal of credible evidence from a competent source*	Compliance with the Massachusetts Stream Crossing Standards is discussed under Section 2.2.
(b) Notwithstanding the provisions of 310 CMR 10.56(4)(a), the issuing authority may issue an Order in accordance with M.G.L. c. 131, § 40 to maintain or improve boat channels within Land under Water Bodies and Waterways when said work is designed and carried out using the best practical measures so as to minimize adverse effects such as the suspension or transport of pollutants, increases in turbidity, the smothering of bottom organisms, the accumulation of pollutants by organisms or the destruction of fisheries habitat or nutrient source areas	The project will utilize best management practices to limit adverse effects due to construction of the proposed culvert, including installation of erosion and sediment controls, field inspection of erosion controls by qualified personnel and pre-construction meetings to inform project personnel about work adjacent to regulated resource areas. Additional detail is provided under Section 5.
(c) *Notwithstanding the provisions of 310 CMR 10.56(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.*	The proposed culvert replacement project is not located within mapped Natural Heritage & Endangered Species Program (NHESP) Estimated or Priority Habitat.

4 ALTERNATIVES ANALYSIS

Several alternatives were assessed during the planning and design of the proposed culvert replacement project, including the No Build, Rehabilitation of the Existing Culvert, and Full Culvert Replacement. However, it was determined that there are no safe practicable alternatives that do not involve an additional discharge of fill material to jurisdictional wetlands. Culvert type and size alternatives are limited to AREMA-compliant type and size to safely carry trains over the area.

All alternatives considered involve the installation of temporary dewatering/water diversion structures and appropriate erosion and sedimentation controls. The selected alternative includes appropriate and practicable steps to minimize potential adverse impacts to resources delineated in the field as Waters of the United States

4.1 NO BUILD

The No Build Alternative assumes no repair or replacement of the existing culvert will occur and the existing condition will remain. Structural deficiencies of the stone and corrugated metal pipe culverts will not be addressed. Therefore, the No Build Alternative is not practicable because if no action is taken, the culvert will deteriorate, the sinkhole may continue to enlarge and eventually undermine the embankment soils, leading to potentially catastrophic failure of the track. The resulting condition will lead to downstream impacts to wetlands and waterbodies including potential addition of sediment and ballast to sensitive resource areas that will ultimately cause unacceptable adverse environmental impacts. The inspection report has recommended replacement of the existing system. This option was rejected due to the engineer's recommendation for replacement.

4.2 REHABILITATION OF EXISTING CULVERT

The Rehabilitation Alternative assumes repair of the existing culvert will occur through removal of stone ballast within the culvert junction area, removal of track and ties over the area of deformation, placement of a steel plate over the sinkhole on the embankment surface, replacement of the track and ties and regrading of the area. The existing culvert will remain in place; however, the defect and disconnect at the culvert connection point will not be accomplished. This alternative is considered a temporary option as it does not address the root cause of the nearly failed culvert condition. The embankment soils may also be temporarily stabilized, however, the creation of additional sinkholes due to weakened embankment soils in the area of the original point of failure may continue to occur, potentially exacerbating and / or accelerating the existing condition. This option was rejected due to the engineer's recommendation for replacement and potential for future required maintenance to address the ongoing condition.

4.3 REPLACEMENT WITH LARGER DIAMETER PIPE

The Replacement Option with a Larger Diameter Pipe was evaluated for both environmental and engineering feasibility. The existing stone box is a 24 X 36-inch stone box (with an approximate 30-inch RCP extension to the north); the proposed replacement under this alternative would include a 60-inch precast RCP with headwalls and wingwalls. The footprint of disturbance would be larger than the Preferred Alternative, necessitating additional impact to existing wetlands and Land Under Waterbodies and Waterways due to increased size post-construction.

In addition, setting the bottom invert elevations of the existing culvert would require matching the bottom elevation of the proposed larger pipe, which would raise the elevation of the top of the pipe due to its larger diameter. Due to the decreased distance between the top of the new, larger pipe and the track and ties, this would reduce the total amount of overburden between the pipe and the track bed. AREMA standards require a minimum depth of material over culvert crossings to spread the weight of live and dead loads and safely pass equipment. Installation of a larger pipe would reduce the total amount of overburden and not meet the minimum depth standard.

Engineers evaluated raising the profile of both track beds to accommodate the minimum depth of overburden. This option would necessitate manipulation of approximately 300-linear feet of approach track in both directions and increase the height of the embankment. This would also increase chances for erosion of the embankment over adjacent resource areas over time and require additional wetland impacts to accommodate the required widened embankment base to spread and stabilize the load.

Engineers have also been advised by pre-cast suppliers that 60-inch pipe is not a standard size, and each piece would require special order. The schedule for fabrication of a larger, special-order pipe would add weeks to the project schedule. Funding for this project is contingent upon completion by MassDOT's fiscal year end: June 30th. Approval of permits, the Commonwealth's bid process (which requires approved permits prior to advertisement) and the increased pre-cast production schedule will likely not meet the June 30th deadline.

A hydraulic analysis conducted by WSP indicated that installation of a 60-inch culvert may result in too significant a change in both upstream and downstream hydrologic conditions. Currently, the box culvert and embankment serve as a dike and create a "detention pond" on the upstream (east) side of the Site. This ponded area works as flood storage during storm events, allowing water to be released slowly into the downstream (west) side of the embankment where there are numerous active cranberry bogs. In addition, significantly increasing the hydraulic capacity of the culvert could act to not only remove benefit but potentially act to dewater existing wetlands on the upstream side and negatively impact resource areas that have been in existence for approximately 150 years.

This option was rejected due to the engineer's recommendation for replacement and the numerous construction, schedule, financial and engineering constraints.

4.4 FULL CULVERT REPLACEMENT

The Full Culvert Replacement option includes the replacement of the existing 24 by 36-inch stone box and 30-inch RCP culvert extension with a 48-inch RCP, headwalls and wingwalls at MP 44.29 in Rochester, Massachusetts.

The proposed replacement structure includes a 53''-6" foot long, 48-inch diameter reinforced concrete pipe with precast concrete headwalls and wingwalls along an offset alignment approximately 30-feet north of the existing box culvert. This project element would impact approximately 587 square feet of wetland. The proposed structure, once installed, will be fully located within MassDOT-accessible property. Relocation of the culvert will also require limited grading to an associated adjacent property. The existing structure was installed to convey the center of the Brook under the embankment, with an extension on the upstream side that exceeds the edge of the MassDOT right-of-way and encroaches onto privately held property. It is unknown when the extension was installed or by whom the extension was constructed. Property deeds indicate that a portion of the existing structure is located on land not owned nor is accessible by MassDOT. Moving the structure will allow current proposed replacement as well as for future unrestricted access to facilitate maintenance on MassDOT controlled property.

In addition, relocating the replacement culvert provide the following additional benefits:

- The Project can maintain flow to the existing culvert throughout construction.
- A majority of construction of the replacement culvert will be completed within the dry.
- Erosion and sediment control would only be needed at each terminal end.
- The support of excavation would require a reduced footprint, and thus fewer temporary impacts.

A hydraulic analysis for the culvert replacement using a 48-inch pipe concluded that during the 100-year, 50-year and 25-year storm events, water surface elevations would change less than one-foot. Impacts to upstream wetlands would be negligible as dewatering is not predicted to occur. Downstream impacts from upsizing the culvert would also be negligible and unlikely to negatively impact the active cranberry bogs and other resource areas.

Given the age of the rail line, embankment and culverts, the culverts' size and elevation, and the current configuration in which the upstream wetland acts as a detention pond, the proposed replacement culvert has been designed to maintain, to the extent practicable, the flow regime that has existed at the site for the past 150± years.

The existing culvert will be abandoned in place, filled with flowable fill after the Cedar Swamp Brook is diverted to the replacement culvert.

The entire project is proposed to permanently impact approximately 587 square feet of Bordering Vegetated Wetland. MassDOT is proposing to construct an aggregate wetland replication area of 3,005 square feet along the northwest side of the existing embankment within

the MassDOT Rail ROW; this area would include replication commitments from the MP 44.27 Culvert Replacement Project of 2,325 square feet of BVW.

Temporary impacts of approximately 672 square feet are anticipated as a result of construction of the project. These impacts are related to installation and removal of temporary support of excavation and erosion controls, including anticipated pedestrian impacts within adjacent resource areas, to secure and inspect the support of excavation throughout the life of the Project. In addition, temporary impacts may also occur due to manual adjustment of armor stone, ballast and the rip-rap dissipation pads at the inlet and outlet terminus. Temporary impacts due to regrading of the streambed and sideslope areas to adjust the centerline of the stream channel are also anticipated. Additional discussion of impacts is provided under Section 6.

5 CONSTRUCTION SEQUENCE

Construction will include the establishment and installation of erosion control BMPs around the work zone prior to ground disturbance. Construction equipment will access the Project site from the MBTA Rochester Shops and by utilizing the newly created access along the wall. Entry will not cross through adjacent resource areas. Proposed temporary and permanent impacts will be located within limited sections of adjacent LUWW and BVW resource areas immediately adjacent to the railroad embankment. No additional impervious surface is proposed as a result of the culvert replacement. As is typically the case with railroad culvert replacement the track will be taken out of service and the work completed over the 3–5-day outage with work potentially occurring on a 24-hour schedule. The proposed work consists of the following activities:

— Establishment of soil erosion and sediment control BMPs around areas of proposed ground disturbance

— Limited vegetation clearing and grubbing to allow for safe access within the work zone

— Removal and stockpiling of existing track, tie and embankment soil materials for reuse upon embankment reconstruction

— Establishment of temporary dewatering areas, as necessary for the installation of the new culvert (by-pass flow of the brook to be handled through existing culvert during construction of new culvert)

- Construction of a limited area of benching within the project work zone for safe access by equipment

- Installation of support of excavation around proposed culvert inlet/outlet areas using sand bags

— Removal of overburden, removal of existing stone box culvert and extension elements

— Preparation of excavation area subbase and support materials; installation of proposed 48-inch fabric wrapped Precast RCP Culvert and precast concrete headwalls; installation of slope armoring and/or riprap to protect the inlet/outlet, and associated finish grading.

— Installation of 8 inches of natural substrate inside the newly installed pipe

— Reconstruction of the track structure with ballast, ties and rail using stockpiled materials to the extent practicable followed by finish ballast, tamping and surfacing to finish top of rail

— Install flowable fill material within old culvert to stabilize and seal the inside;

— Construction of the wetland replication area

— Removal of soil erosion and sediment controls.

The existing ballast and soil within the work limits will be excavated and utilized during construction then disposed of within designated uplands along the railroad right-of-way after the work is completed. Existing culvert elements and adjacent areas (e.g., side-slope stone armor) found to be in good condition may be reused, if feasible. The remaining material will be transported down the railroad right-of-way to a pre-identified upland disposal location within MassDOT-owned railroad property.

The proposed culvert excavation prism is shown on the attached plans (refer to Appendix B – Permit Plans). The bottom subgrade elevation of the culvert excavation will be approximately 1-2 foot lower than the existing bottom culvert invert elevation.

In addition, and as discussed under Section 6 below, a wetland replication area will be constructed along the northwest side of the project area to offset and mitigate for wetland impacts associated with implementation of this project and the replacement of the culvert at MP 44.27. It is anticipated that the wetland replication area will be constructed during and/or immediately after the installation of the culvert.

Upon project completion, disturbed upland areas within the right-of-way will be stabilized and restored. Soil erosion and sediment control BMP measures will remain in place until exposed soils are permanently stabilized. Disturbed areas will be stabilized with a fast-germinating erosion control native seed mix, covered with a biodegradable erosion control blanket and properly staked.

Proposed conditions plans and standard specifications for installation of soil erosion and sediment controls are located under Appendix B – Permit Plans.

6 PROPOSED DISCHARGE OF FILL MATERIAL IN WATERS OF THE US

The proposed project will discharge a limited volume of fill material into jurisdictional wetlands. Impacts to resource areas, both permanent and temporary, are quantified in Table 2. The nature and extent of fill material to these resources is limited to the area immediately adjacent to the outlet ends of the culvert. Temporary fill in resource areas will occur due to installation of the support of excavation, construction access, grading, installation, maintenance of erosion and sedimentation controls, and installation and maintenance of dewatering/diversion structures. Permanent fill in resources will result from the installation of new precast concrete headwalls and clean fill for final grading.

For the installation of the sheet pile wall, the Project has provided for an additional one-foot lateral distance to the north of the wall for temporary impact due to construction and access. This allowance is conservative and allows for any field anomalies that may result in impacts outside of the wall installation.

Table 2 – Summary of Estimated Impacts to Resource Areas

	Temporary Impacts (ft^2)	Permanent Impacts (ft^2)	Total Estimated Impacts (ft^2)
North Side	262	504	766
South Side	410	83	493
Total	672	587	1,259

Avoidance of impacts to wetlands is not feasible given the project location, existing and proposed facilities. Impacts to regulated resource areas will be limited to the extent practicable by reducing the total area of required grading for the support of excavation, limiting vegetation removal required for access, and siting of headwalls. Areas of temporary impact will be restored with a native seed mix where appropriate, or approved equal, and stabilized with a coconut blanket or other similar biodegradable option upon project completion. Additional detail on impact minimization and mitigation is provided in the following section.

Table 3 – Summary of Estimated Dredge/Fill Impacts

	Fill Impacts (ft^3)	Dredge Impacts (ft^3)
North Side	0	880
South Side	342	9
Total	342	889

Table 3 details permanent dredge and fill impacts due to project implementation. Approximately 880 cubic feet / 32 cubic yards of dredge on the north / upstream side is proposed to realign the stream channel into the proposed new culvert location. Approximately 9 cubic feet / 0.3 cubic yards of dredge are proposed on the south / downstream side is proposed to match existing grade, and approximately 342 cubic feet / 12.6 cubic yards of fill, in the form of armor stone and ballast in the area of the existing culvert outlet, is proposed to stabilize the embankment upon installation of the proposed new culvert.

7 IMPACT MINIMIZATION AND MITIGATION MEASURES

Measures to limit impacts to the resource areas noted above include the following: temporary barriers, fencing and signage will be placed at the work site during construction; the contractor will have a spill kit/absorbent pads on each piece of equipment; each vehicle shall be inspected daily for leaks and leaking equipment shall be removed from the Project Site immediately and shall not return to service until repaired; the work area will be left in a condition such that precipitation and/or adverse weather will not cause damage to the work area or adjacent areas, site preparation work will include limited vegetation clearing and/or removal of select trees by hand, if necessary; sedimentation and erosion control measures will be installed prior to the start of work and will remain in place during construction activities; proposed work shall comply with Federal, State, and Local Codes and Regulations.

Access for the project will be established from uplands adjacent to the proposed work zone. Access through adjacent resource areas will be limited to pedestrian traffic only to allow for safe passage of personnel and manual equipment. Hi-rail vehicles will enter the right-of-way through the MBTA Rochester Shops facility; this facility will also act as a staging and stockpile location for project related materials.

Mitigation for impacts to vegetated wetlands will be provided within a single, aggregate wetland replication area on the northwest side of the railroad embankment. This replication area will account for impacts to the adjacent MM 44.27 culvert replacement project and this project. Total replication is proposed to be 3,005 square feet. Grading of the wetland replication area will be maintained at an elevation similar to the adjacent wetland and will have a minimum of 6 inches of wetland topsoil. The wetland mitigation area will be stabilized with coir logs and containerized willows and / or sweet pepperbush, as indicated on the Proposed Conditions Plans under Appendix B – Permit Plans. The soil within the limits of the coir logs will be seeded with a native wetland seed mix, or approved equal, and stabilized with jute netting. Table 3 summarizes wetland mitigation provided within the project area:

Table 3 – Total Wetland Mitigation by Project Area

	Replication Commitment by size (ft^2)
North Side	504
South Side	83
Total	2,912

7.1 EROSION AND SEDIMENTATION CONTROL

During removal and construction activities, erosion control best management practices will be utilized.s such as compost filter tubes or similar, will be utilized. Sedimentation and erosion control measures will be removed following completion of the work and stabilization of the site.

The Contractor will be required to inspect the project site and remove demolition debris or other construction related materials upon completion.

Work will be conducted within the railroad embankment. A temporary cofferdam structure will be required. No bypass of Cedar Swamp Brook is proposed as the existing culvert will remain in place and continue to function throughout the construction effort.

7.2 STORMWATER MANAGEMENT

The existing conditions within the project location incorporate country flow style drainage from the top of the railroad embankment and into the existing ballast. The project does not propose the addition of new impervious surfaces, new point source outfalls, or additional drainage facilities. The project is proposing to increase the hydraulic capacity of the existing culvert to provide better flow conditions during extreme storm events. The railroad ballast base serves as a stormwater Best Management Practice by providing additional flood storage within the void spaces which will reduce the runoff rate and remove sediment prior to discharge to wetlands and waterways.

7.3 DEWATERING

Work associated with the culvert replacement will require establishing support of excavation and dewatering within the excavation area. Dewatering within the support of excavation may use a sump area and pump system to redirect sediment-laden water into a dirt bag to be located within adjacent uplands. Contract documents will require the submission of a specific dewatering and turbidity control plan for review and approval by the drainage engineer and by MassDEP if required.

7.4 INVASIVE SPECIES CONTROL

Control of invasive plants will be conducted in accordance with MassDOT standard specifications for this practice and will be in compliance with Local, State, and Federal requirements for such practices.

7.5 DIVISION OF MARINE FISHERIES

Coordination with the Massachusetts Division of Marine Fisheries has confirmed that there is no diadromous fish present in this location and that a time-of-year restriction will not be required[4].

[4] MA DMF. 2015. Recommended Time of Year Restrictions (TOY) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts: TR-47 Time of Year Tables.

8 CONCLUSIONS

MassDOT is requesting the timely acknowledgement and expedited approval by the USACE for this Self-Verification Notification for the proposed culvert replacement and sheet pile wall project. The existing condition poses a threat to the public health and safety to the citizens of the Commonwealth of Massachusetts. Work is expected to commence as soon as possible. Anticipated discharges of fill material to wetland resources, presumed to be under the jurisdiction of the USACE, will be avoided and limited through the implementation of environmental controls meant to meet the performance standards outlined in Federal and State resource protection regulations. Work will be observed by a MassDOT qualified Wetland Scientist, Environmental Monitor, and Site Engineer to adhere to applicable environmental protection laws.

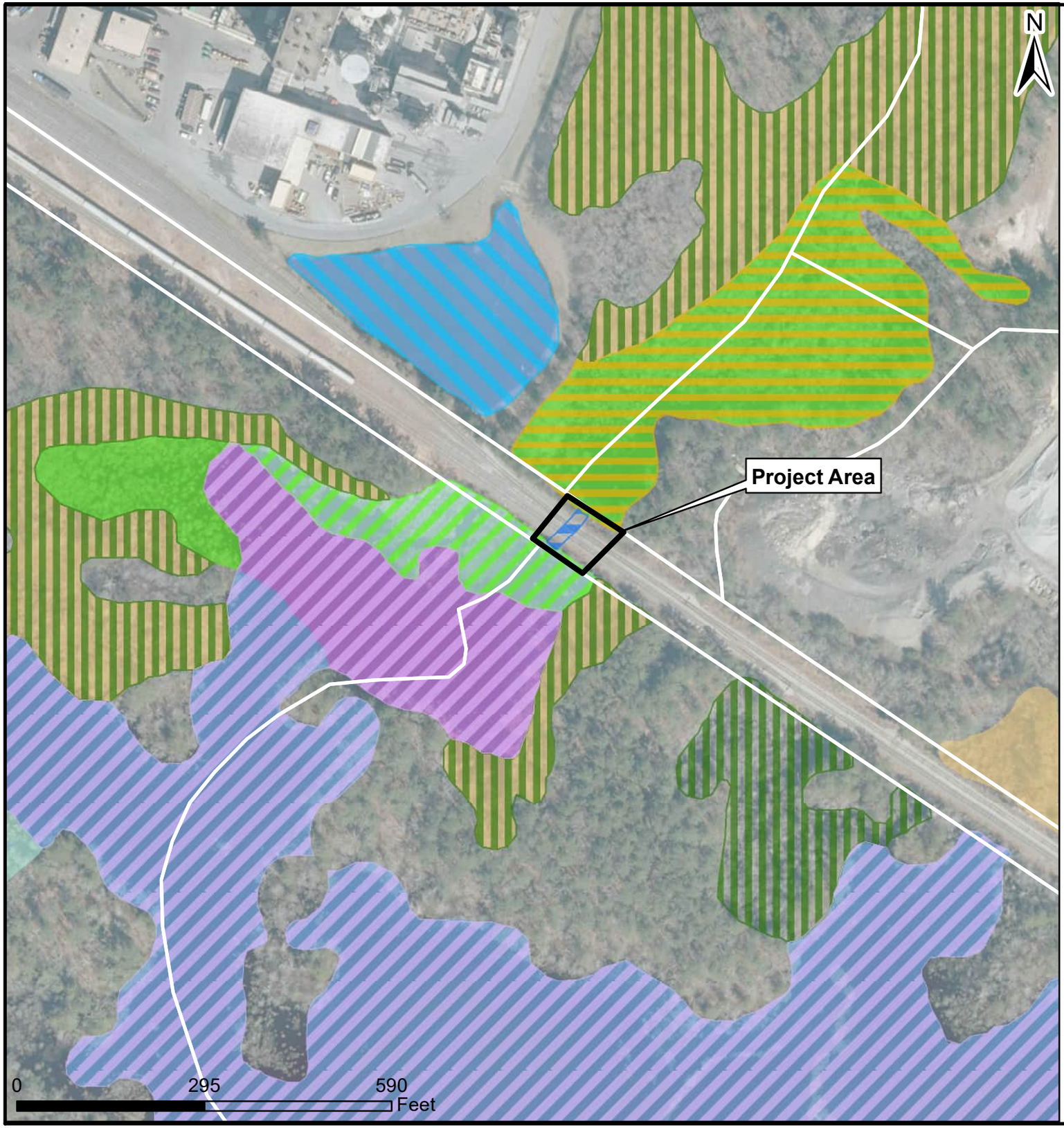
As designed, total impacts are limited to the extent practicable. The design approach taken was to avoid wetland impacts where feasible, and where unavoidable, and limit impacts to the extent practical through an extensive and thoughtful review and design process.

FIGURES

EXISTING CONDITIONS

MassDOT Rail and Transit

Cape Main MP 44.29
Rochester, Massachusetts



Legend

NWI Mapped Wetlands

- Lacustrine Permanently Flooded
- Palustrine Emergent
- Palustrine Forested
- Palustrine Scrub Shrub
- Palustrine Excavated Pond
- Intermittent Stream

MassDEP Wetlands

- DEEP MARSH
- OPEN WATER
- SHALLOW MARSH MEADOW OR FEN
- SHRUB SWAMP
- WOODED SWAMP DECIDUOUS
- Parcel Boundary

WSP

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Service Layer Credits: MassGIS
Copyright:© 2013 National Geographic Society, i-cubed

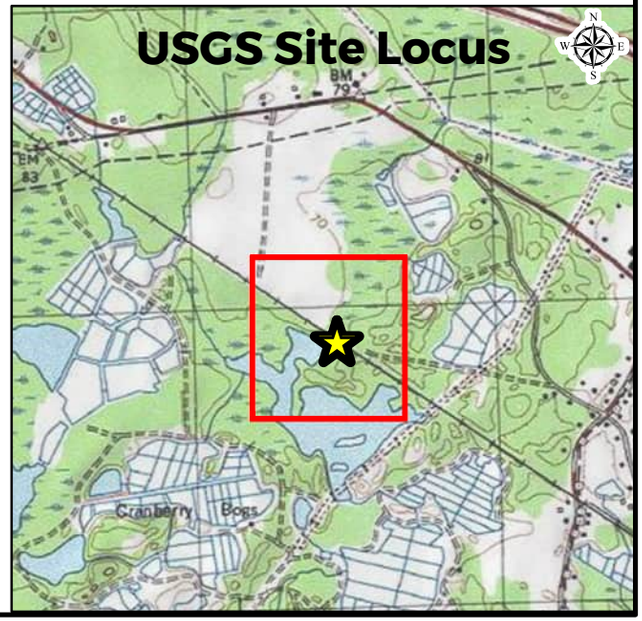


FIGURE 2 - FEMA FIRM

National Flood Hazard Layer FIRMette

FEMA

70°47'27"W 41°48'11"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

70°46'50"W 41°47'44"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/28/2025 at 2:44 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDICES

APPENDIX A

WETLAND DELINEATION MEMO

WSP USA, Inc.
100 Summer Street, 13th Floor
Boston, MA 02110
USA
T: 617.426.7330

Memo

To: Ms. Chalita Belfield
MassDOT Rail and Transit

From: Kimberly Degutis, PWS, WSP

Date: December 16, 2024

Re: Wetland Delineation: Cape Main MP 44.29, Rochester, MA

On November 19, 2024, a WSP USA (WSP) wetland scientist conducted a reconnaissance of an existing culvert and associated project site located at Cape Main MP 44.29 in Rochester, Massachusetts. The focus of this work included the area encompassing the culvert opening and 250-linear to the southeast and northwest of its location (Study Area). The purpose of this work was to delineate wetlands in the Study Area and to assess the potential regulatory jurisdiction of observed features.

SITE LOCATION AND DESCRIPTION

The Study Area includes a 1.5-acre portion of an active railroad and surrounding undeveloped land in the Town of Rochester. The Study Area includes two railroad tracks on an elevated, soil-based embankment; one track is the Cape Main mainline; the second track is an active siding for the Cape Main mainline. The current land use of the Study Area is primarily developed rail transportation on the embankment.

Wetlands in the Study Area appear to be hydrologically connected via culvert under the railroad embankment. The culvert passes an unnamed tributary to the Cedar Swamp Brook / East Branch of the Sippican River to the south. The culvert is comprised of a 24-inch wide x 36-inch tall stone box culvert of an unspecified length with a round 30-inch reinforced concrete pipe (RCP) extension on the north / inlet side.

The culvert was inspected on September 10, 2024, and found to be in poor condition due to a localized collapse/failure of the CMP. A 2-foot-wide x 2-foot-deep sinkhole has formed in between the north side tracks in line with the culvert due to a void in the roof of the culvert. In addition, the inspection report noted that the culvert appeared to be undersized to carry flows under the embankment. The inspection report recommended replacement of the entire structure.

The Study Area is bordered to the north, east and west by freshwater emergent wetlands, to the south by freshwater emergent wetlands that feed into active cranberry bogs, to the east by the MBTA's Rochester Rail Maintenance facility and to the west by the SEMASS property. A remnant wetland ditch, to the south and east of the existing culvert headwall, was observed and delineated. The USFWS National Wetlands Inventory mapper indicates that the wetlands to the immediate south of the railroad are mapped as being diked/impounded, likely due to the agricultural operations. Several natural communities exist on-site, including upland forest, and freshwater scrub-shrub and emergent wetland systems.

SUMMARY OF FINDINGS

Within the Study Area, WSP observed three (3) regulated resource areas. Wetlands A and B appear to be connected under the railroad embankment by a 2-foot x 3-foot stone box and concrete RCP. Stream A is the hydrologic connection between Wetlands A and B. Resource areas are summarized in Table 1, below, and described fully under Resource Area Descriptions.

Table 1 - Resource Area Summary

Resource Area Name	MassDEP Wetland Type	Anticipated Federal (USACE) Jurisdiction	Anticipated State (WPA) Jurisdiction	Notes
STRM A	Perennial Stream	Likely – perennial contains a surficial, relatively permanent connection to a WOUS al stream,	Stream is likely jurisdictional	Mapped as Cedar Swamp Brook / unnamed tributary to East Branch Sippican River
A	PEM	Likely – contains a surficial, relatively permanent connection to a WOUS[1]	BVW is likely jurisdictional	Assumed hydrologic connection via culvert under the embankment
B	PEM	Likely – contains a surficial, relatively permanent connection to a WOUS	BVW is likely jurisdictional	Assumed hydrologic connection via culvert under the embankment

RESOURCE AREA BOUNDARY DELINEATION AND METHODOLOGY

The wetland delineation was conducted between late October and early November 2024 in accordance with the 1987 Corps of Engineers *Wetlands Delineation Manual*[2] (1987 Manual), using the Routine Determination Method; in conjunction with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual*[3] (Regional Supplement). Stream boundaries were delineated using procedures outlined in the US Army Corps of Engineers *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams*[4]. Observed wetlands were classified in accordance with the *Classification of Wetlands and Deepwater Habitats of the United States – Second Edition*[5].

[1] WOUS – Water of the United States, jurisdictional definition as of November 17, 2024.

[2] U.S. Army Corps of Engineers, Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi

[3] U.S. Army Corps of Engineers, 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0), ed. J.S. Wakeley, R.W. Lichvar, C.V. Noble and J.F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, Mississippi; U.S. Army Engineer Research and Development Center

[4] U.S. Army Corps of Engineers, 2022. *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams, Interim Version.* ed. Gabrielle C. L. David, Ken M. Fritz, Tracie-Lynn Nadeau, Brian J. Topping, Aaron O. Allen, Patrick H. Trier, Steven L. Kichefski, L. Allan James, Ellen Wohl, and Daniel Hamill. ERDC/CRREL TR-22-26. Vicksburg, Mississippi; Wetlands Regulatory Assistance Program

[5] Federal Geographic Data Committee. 2013. *Classification of Wetlands and Deepwater Habitats of the United States.* FGDT-STD-004-2013, 2nd edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC

Publicly available environmental data including the USDA Natural Resources Conservation Service Web Soil Survey for Plymouth County (MA)[6]; Massachusetts MassMapper; and FEMA Flood Insurance Rate Maps were used to prepare the Wetland Determination Data Forms and this wetland delineation report. Descriptions of resource areas delineated within the Study Area are provided in the following sections, and representative photographs are attached.

Resource boundaries were witnessed in the field with pink or blue flagging tied on vegetation. Flagging points were collected using traditional survey methods. The resource boundary flags were established by examining the vegetation, soils, and evidence of hydrology at several locations within the Study Area. Sample plots were conducted, and data were collected to characterize the wetland and upland conditions. Dominant vegetation, soils, and indicators of hydrology were recorded on standard Wetland Determination Data Forms sourced from the *Regional Supplement*; these forms are attached.

DESKTOP ANALYSIS

A desktop analysis using the MassGIS *MassMapper*[7] online database preceded the field investigation to identify critical areas on or within 200 feet of the Study Area.

There are two MassDEP mapped wetlands represented in the Study Area: a shrub swamp to the immediate north of the embankment and a shallow marsh meadow to the immediate south. The wetland ditch, to the south and east of the existing culvert headwall, is not represented on desktop mapping. A stream is captured on desktop mapping (MassGIS, StreamStats) passing through the culvert.

The Study Area is mapped as underlain by one soil unit: Freetown muck, ponded, 0 to 1 percent slopes, *a hydric soil*. The railroad embankment is also mapped as Freetown muck.

A review U.S. Fish and Wildlife Service, National Wetland Inventory[8] information for the Study Area identified Freshwater Forested/Shrub Wetland on the north side of the embankment and Freshwater Emergent Wetland on the south side of the embankment. The south side wetland is also mapped as being permanently flooded and diked/impounded, likely due to the active cranberry fields approximately 1,600 feet to the south of the Study Area.

There is one mapped FEMA Flood Hazard Area (Special Flood Hazard Zone A with no Base Flood Elevation) adjacent to the south side of the embankment; there are no FEMA mapped flood zones on the north side of the Study Area. There are no Massachusetts Natural Heritage & Endangered Species Program (NHESP) Estimated Habitats of Rare Wildlife or NHESP Priority Habitats of Rare Species mapped within the Study Area. There are no NHESP Certified Vernal Pools mapped within the Study Area.

A review of the Northeast Regional Climate Center's 3-month Percent of Normal[9] map for New England starting in October indicates that the Study Area is at 25-50% of the total precipitation total, well below average. Additionally, the Massachusetts Executive Office of Energy and Environmental Affairs, Drought Management Task Force[10] has declared the Southeast Region within Critical Drought during the time of the wetland delineation.

---

[6] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at the following link: https://websoilsurvey.sc.egov.usda.gov/. Accessed 11/15/2024

[7] MassGIS (Bureau of Geographic Information), Commonwealth of Massachusetts EOTSS. MassMapper Interactive Mapping Application. Accessed online at: https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html. Accessed 11/15/2024.

[8] Available online at: https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/ Accessed 11/15/2024

[9] Available online at: https://www.nrcc.cornell.edu/regional/monthly/monthly.html Accessed 11/15/2024

[10] Available online at: https://www.mass.gov/news/major-drought-declared-across-massachusetts Accessed 11/15/2024

RESOURCE AREA DESCRIPTIONS

WETLAND A – FRESHWATER EMERGENT

Wetland A is a freshwater emergent wetland (PEM) habitat encompassing Stream A and appears to include braided channels. Wetland A was not flooded within the Project Site during the time of the delineation, likely due to the ongoing Significant Drought conditions. The boundary of the wetland was delineated along a defined topographic (toe of the railroad embankment) along the south edge. A wetland ditch was observed immediately south of the existing culvert headwall; the ditch dissipated approximately 25-feet from the entrance area coincident with the south edge of the culvert headwall. Dominant vegetation observed included sweet pepperbush (*Clethra alnifolia*, FAC), tussock sedge (*Carex stricta*, OBL), speckled alder (*Alnus incana*, FACW) and pussy willow (*Salix discolor*, FACW). Representative soil samples satisfied the S1 indicator (Sandy Mucky Mineral). Secondary hydrologic indicators include geomorphic position and sparsely vegetated concave surface within the depressional area.

WETLAND B – FRESHWATER EMERGENT

Wetland B is a freshwater emergent wetland (PEM) system located along the south side of the railroad embankment. It is hydrologically connected to Wetland A via a pipe culvert under the embankment and additionally hydrologically connected to an emergent wetland complex to the east, which flows into the East Branch of the Sippican River. Wetland B was dry during the site investigation, likely due to a significant and prolonged drought in the region. Wetland B is dominated by tussock sedge, broad leaf cattail (*Typha latifolia*, OBL) and beggars ticks (*Bidens frondosa*, FACW). Representative soil samples satisfied the S1 indicator (Sandy Mucky Mineral) for hydric soil. Saturation was observed at 9-inches below ground surface. Secondary indicators of hydrology included geomorphic position (localized depressional area), saturation visible on aerial imagery and microtopographic relief.

STREAM A – PERENNIAL / LAND UNDER WATERBODIES AND WATERWAYS

A perennial stream, Cedar Swamp Brook, a tributary to the East Branch of the Sippican River, passes through the culvert. The stream traverses the project area from northeast to southwest. Mean annual high water was estimated at 5-feet in the field due to safety concerns regarding access to the visible break in slope and change in vegetative character between the stream and adjacent emergent wetland area. A data sheet to document the stream, using the USACE *Rapid Ordinary High Water Mark Field Identification*, has been attached.

JURISDICTIONAL WETLAND RESOURCE AREAS – FEDERAL CLEAN WATER ACT (SECTION 404)

According to 33 CFR §328.3(c)(4), vegetated wetlands are defined as "*those areas that are inundated or saturated by surface or groundwater 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.*" The wetland boundaries previously described in this report were delineated in accordance with this definition.

It is our opinion that Stream A, Wetlands A and B are jurisdictional features being connected to the Cedar Swamp Brook / East Branch of the Sippican River via a surficial, relatively permanent hydrologic connection.

PALUSTRINE EMERGENT WETLAND

Two wetland boundaries were observed within the Project Site. Wetlands A and B are assumed to be bordering WOTUS through a relatively permanent surface hydrologic connection via the culvert and direct adjacency to Cedar Swamp Brook / East Branch of the Sippican River. The wetland ditch feature was flagged as part of Wetland A. The ditch area terminates approximately 20-feet from the connection to Wetland A at the culvert headwall.

LAND UNDER WATERBODIES AND WATERWAYS / ORDINARY HIGH-WATER MARK

One perennial stream was observed within the Project Site. Stream A was assessed as perennial through a review of StreamStats information, USGS topographic map information, historic aerial photo review and observed characteristics during the field delineation.

JURISDICTIONAL WETLAND RESOURCE AREAS –
MASSACHUSETTS CLEAN WATERS ACT (SECTION 401)

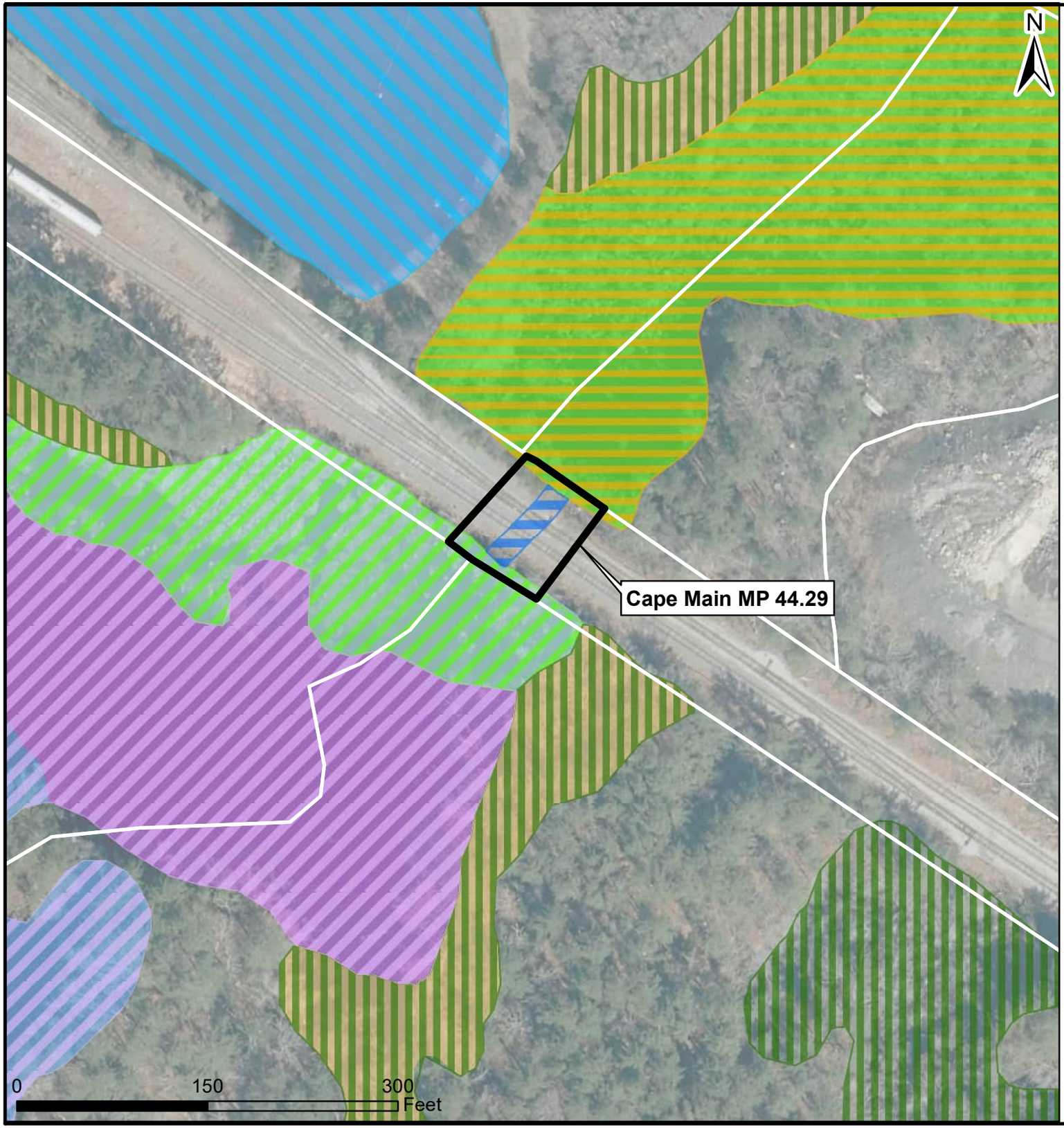
The limit of jurisdiction under Massachusetts Clean Waters Act (Section 401), as specified in 314 CMR 9.00, is the limit of Section 404 jurisdiction under the federal Clean Water Act. Exceedances of the jurisdictional threshold under 314 CMR 9.00 require filing for a Water Quality Certification under Section 401.

WETLAND DELINEATION FIGURE

EXISTING CONDITIONS

MassDOT Rail and Transit

Cape Main MP 44.29
Rochester, Massachusetts



Legend

NWI Mapped Wetlands

- Lacustrine Permanently Flooded
- Palustrine Emergent
- Palustrine Forested
- Palustrine Scrub Shrub
- Palustrine Excavated Pond
- Intermittent Stream

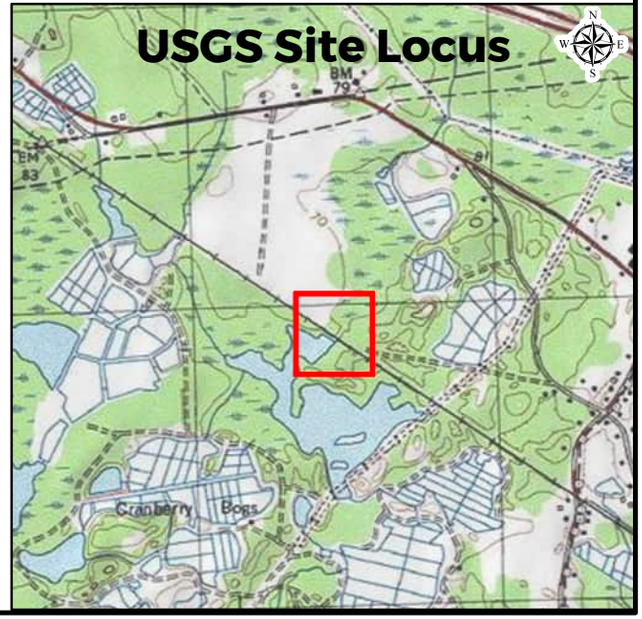
MassDEP Wetlands

- DEEP MARSH
- OPEN WATER
- SHALLOW MARSH MEADOW OR FEN
- SHRUB SWAMP
- WOODED SWAMP DECIDUOUS
- Parcel Boundary

wsp

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Service Layer Credits: MassGIS
Copyright:© 2013 National Geographic Society, i-cubed



WETLAND DATA SHEETS

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 9/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Cape Main MM 44.29 City/County: Rochester / Plymouth Sampling Date: 11/19/24

Applicant/Owner: MassDOT Rail and Transit State: MA Sampling Point: 1

Investigator(s): K Degutis, PWS Section, Township, Range: N/A

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope %: 1

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 41°48'0.68"N Long: 70°47'13.97"W Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: A
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
Area is experiencing significant drought at time of investigation. Sample plot associated with flag A9 near culvert opening.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- X Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 1
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Aerial photo review; NRCC 3-month climate percent of normal mapping (November 2024)

Remarks:
Area is under Critical Drought status as declared by MA EEOA (Nov 2024).

VEGETATION – Use scientific names of plants. Sampling Point: 1

Tree Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 10)			
1. *Salix discolor*	25	Yes	FACW
2. *Clethra alnifolia*	10	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	35 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Carex stricta*	30	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	30 =Total Cover		
Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	25	x 2 =	50
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	65 (A)		110 (B)

Prevalence Index = B/A = 1.69

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Plot size modified to include only vegetation within habitat type surveyed; wetland boundary closely defined along toe-of-slope.

SOIL Sampling Point 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/1	100					Mucky Sand	
5-9	10YR 6/3	100					Sandy	
9-18	10YR 4/4	90	10YR 6/3	10	C	M	Sandy	Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Iron Monosulfide (A18)
- X Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: N/A

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 9/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Cape Main MM 44.29 City/County: Rochester / Plymouth Sampling Date: 11/19/24

Applicant/Owner: MassDOT Rail and Transit State: MA Sampling Point: 2

Investigator(s): K Degutis, PWS Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Slope Local relief (concave, convex, none): none Slope %: 5

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 41°48'0.66"N Long: 70°47'14.04"W Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes ____	No X	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
Area is experiencing significant drought at time of investigation. Sample plot associated with flag A9 on railroad embankment slope.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Aerial photo review; NRCC 3-month climate percent of normal mapping (November 2024)

Remarks:
Area is under Critical Drought status as declared by MA EEOA (Nov 2024).

VEGETATION – Use scientific names of plants. Sampling Point: 2

Tree Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus strobus*	35	Yes	FACU
2. *Quercus coccinea*	35	Yes	UPL
3. *Acer rubrum*	15	No	FAC
4.			
5.			
6.			
7.			
	85	=Total Cover	
Sapling/Shrub Stratum (Plot size: 10)			
1. *Clethra alnifolia*	20	Yes	FAC
2. *Pinus strobus*	20	Yes	FACU
3. *Quercus coccinea*	15	Yes	UPL
4. *Rosa multiflora*	10	No	FACU
5.			
6.			
7.			
	65	=Total Cover	
Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		=Total Cover	
Woody Vine Stratum (Plot size: 5)			
1. *Smilax glauca*	5	Yes	FACU
2.			
3.			
4.			
	5	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 16.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	35	x 3 =	105
FACU species	70	x 4 =	280
UPL species	50	x 5 =	250
Column Totals:	155 (A)		635 (B)

Prevalence Index = B/A = 4.10

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Plot size modified to include only vegetation within habitat type surveyed; wetland boundary closely defined along toe-of-slope.

SOIL

Sampling Point 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/3	100					Loamy/Clayey	
2-8	10YR 6/3	90	10YR 3/4	10	C	M	Sandy	Distinct redox concentrations
8-18	10YR 4/4	80	10YR 6/3	20	C	M	Sandy	Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Iron Monosulfide (A18)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: N/A

Depth (inches): ___

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

Railroad ballast encountered in top 10" of profile.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 9/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Cape Main MM 44.29 City/County: Rochester / Plymouth Sampling Date: 11/19/24

Applicant/Owner: MassDOT Rail and Transit State: MA Sampling Point: 3

Investigator(s): K Degutis, PWS Section, Township, Range: N/A

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope %: 1

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 41°48'0.21"N Long: 70°47'14.33"W Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: B
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
Area is experiencing significant drought at time of investigation. Sample plot associated with flag B9.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 0.5
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Aerial photo review; NRCC 3-month climate percent of normal mapping (November 2024)

Remarks:
Area is under Critical Drought status as declared by MA EEOA (Nov 2024). Microtopographic relief +9" due to Carex mounds.

VEGETATION – Use scientific names of plants. Sampling Point: 3

Tree Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 10)			
1. *Clethra alnifolia*	15	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	15 =Total Cover		
Herb Stratum (Plot size: 5)			
1. *Carex stricta*	50	Yes	OBL
2. *Typha latifolia*	25	Yes	OBL
3. *Bidens frondosa*	15	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90 =Total Cover		
Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	75	x 1 =	75
FACW species	15	x 2 =	30
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	105 (A)		150 (B)

Prevalence Index = B/A = 1.43

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Plot size modified to include only vegetation within habitat type surveyed; wetland boundary closely defined along toe-of-slope.

SOIL Sampling Point 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					Mucky Sand	
3-10	10YR 2/1	100					Mucky Sand	
10-18	10YR 3/1	100					Mucky Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Iron Monosulfide (A18)
- X Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: N/A

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 9/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Cape Main MM 44.29 City/County: Rochester / Plymouth Sampling Date: 11/19/24

Applicant/Owner: MassDOT Rail and Transit State: MA Sampling Point: 4

Investigator(s): K Degutis, PWS Section, Township, Range: N/A

Landform (hillside, terrace, etc.): slope Local relief (concave, convex, none): convex Slope %: 8

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 41°48'0.31"N Long: 70°47'14.26"W Datum: NAD83

Soil Map Unit Name: Freetown muck, ponded, 0 to 1 percent slopes NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes ____	No X	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
Area is experiencing significant drought at time of investigation. Sample plot associated with flag B9 on railroad embankment.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Aerial photo review; NRCC 3-month climate percent of normal mapping (November 2024)

Remarks:
Area is under Critical Drought status as declared by MA EEOA (Nov 2024).

VEGETATION – Use scientific names of plants. Sampling Point: 4

Tree Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus coccinea*	30	Yes	UPL
2. *Juniperus virginiana*	25	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	55	=Total Cover	
Sapling/Shrub Stratum (Plot size: 10)			
1. *Clethra alnifolia*	10	Yes	FAC
2. *Pinus strobus*	5	Yes	FACU
3. *Juniperus virginiana*	5	Yes	FACU
4.			
5.			
6.			
7.			
	20	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Rosa multiflora*	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15	=Total Cover	
Woody Vine Stratum (Plot size: 5)			
1. *Celastrus orbiculatus*	8	Yes	FACU
2.			
3.			
4.			
	8	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	58	x 4 =	232
UPL species	30	x 5 =	150
Column Totals:	98 (A)		412 (B)

Prevalence Index = B/A = 4.20

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)
Plot size modified to include only vegetation within habitat type surveyed; wetland boundary closely defined along toe-of-slope.

SOIL

Sampling Point 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/3	100					Loamy/Clayey	
3-9	10YR 6/3	80	10YR 3/3	10	C	M	Sandy	Distinct redox concentrations
			7.5YR 4/4	10	C	M		Distinct redox concentrations
9-18	10YR 4/4	90	10YR 3/3	5	C	M	Sandy	Faint redox concentrations
			10YR 6/3	5	C	M		Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Iron Monosulfide (A18)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ? Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: N/A

Depth (inches): ___

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

U.S. Army Corps of Engineers (USACE)

RAPID ORDINARY HIGH WATER MARK (OHWM) FIELD IDENTIFICATION DATA SHEET

The proponent agency is Headquarters USACE CECW-CO-R.

OMB Control No. 0710-XXXX

Approval Expires:

Project ID #:	Site Name: Cape Main MM 44.29	Date and Time: 11/19/24; 14:30
Location (lat/long): 41°42'55.25"N / 71°28'11.37"W	Investigator(s): K Degutis	

Step 1 Site overview from remote and online resources

Check boxes for online resources used to evaluate site:

- [ ] gage data
- [x] LiDAR
- [ ] geologic maps
- [x] climatic data
- [x] satellite imagery
- [ ] land use maps
- [x] aerial photos
- [x] topographic maps
- [x] Other: MassMapper GIS

Describe land use and flow conditions from online resources.

Were there any recent extreme events (floods or drought)?

Region currently within Abnormally Dry condition (US Drought Monitor for MA).

Step 2 Site conditions during field assessment

First look for changes in channel shape, depositional and erosional features, and changes in vegetation and sediment type, size, density, and distribution. Make note of natural or man-made disturbances that would affect flow and channel form, such as bridges, riprap, landslides, rockfalls etc.

Cedar Swamp Brook under existing railroad track/embankment; significant drought and dewatered condition observed. OHW assessd based upon secondary visual characteristics

Step 3 Check the boxes next to the indicators used to identify the location of the OHWM.

OHWM is at a transition point, therefore some indicators that are used to determine location may be just below and above the OHWM. From the drop-down menu next to each indicator, select the appropriate location of the indicator by selecting either just below `b', at `x', or just above `a' the OHWM.

OHWM. Go to page 2 to describe overall rationale for location of OHWM, write any additional observations, and to attach a photo log.

Geomorphic indicators

- [x] **Break in slope:**
  - [x] *on the bank:* x
  - [ ] *undercut bank:*
  - [ ] *valley bottom:*
  - [ ] Other: _____
- [ ] **Shelving:**
  - [ ] *shelf at top of bank:* x
  - [ ] *natural levee:*
  - [ ] *man-made berms or levees:*
  - [ ] *other berms:* _____
- [x] **Channel bar:**
  - [ ] *shelving (berms) on bar:*
  - [ ] *unvegetated:*
  - [x] *vegetation transition (go to veg. indicators)*
  - [ ] *sediment transition (go to sed. indicators)*
  - [ ] *upper limit of deposition on bar:*
- [ ] **Instream bedforms and other bedload transport evidence:**
  - [ ] *deposition bedload indicators (e.g., imbricated clasts, gravel sheets, etc.)*
  - [ ] *bedforms (e.g., poofs, riffles, steps, etc.):*
  - [ ] *erosional bedload indicators (e.g., obstacle marks, scour, smoothing, etc.)* b
- [x] **Secondary channels:**

Sediment indicators

- [ ] **Soil development:**
- [x] **Changes in character of soil:** b
- [ ] **Mudcracks:**
- [ ] **Changes in particle-sized distribution:**
  - [ ] *transition from* _____ to _____
  - [ ] *upper limit of sand-sized particles*
  - [ ] *silt deposits:*

Vegetation Indicators

- [x] **Change in vegetation type and/or density:** x

  Check the appropriate boxes and select the general vegetation change *(e.g., graminoids to woody shrubs).* ***Describe the vegetation transition looking from the middle of the channel, up the banks, and into the floodplain.***

  - [ ] *vegetation absent to:*
  - [ ] *moss to:*
  - [x] *forbs to:* woody shrubs
  - [x] *graminoids to:* woody shrubs
  - [ ] *woody shrubs to:*
  - [ ] *deciduous trees to:*
  - [ ] *coniferous trees to:*
- [x] **Vegetation matted down and/or bent:** x
- [x] **Exposed roots below intact soil layer:** b

Ancillary indicators

- [x] **Wracking/presence of organic litter:** b
- [ ] **Presence of large wood:**
- [x] **Leaf litter disturbed or washed away:** b
- [x] **Water staining:** x
- [ ] **Weathered clasts or bedrock:**

Other observed indicators?

Describe:

Slight incisement of bank observed. Matte vegetation observed adjacent to stream channel; scour marks observed;

Step 4 Is additional information needed to support this determination?

- [ ] Yes
- [x] No

If yes, describe and attach information to datasheet:

Project ID #: _____

Step 5 Describe rationale for location of OHWM

Channel bed/bank clearly defined for break in slope and change in veg due to incisement of channel.

Additional observations or notes

Attach a photo log of the site. Use the table below, or attach separately.

Photo log attached? ☐ Yes ☒ No If no, explain why not: See attached wetland delineation report

List photographs and include descriptions in the table below.

Number photographs in the order that they are taken. Attach photographs and include annotations of features.

Photo Number	Photograph description

PHOTO LOG

Photographic Log

Client Name: MassDOT Rail and Transit	Site Location: Cape Main MM 44.29 Rochester, Massachusetts	Project No. US0035009.6582

Photo No. 1	Date: 11/19/24
Direction Photo Taken: South	
Description: View facing existing reinforced concrete pipe and stone headwall	

Photo No. 2	Date: 11/19/24
Direction Photo Taken: South	
Description: View facing existing reinforced pipe culvert and stone headwall on railroad embankment	

Photographic Log

Client Name: MassDOT Rail and Transit	Site Location: Cape Main MM 44.29 Rochester, Massachusetts	Project No. US0035009.6582

Photo No. 3	Date: 11/19/24
Direction Photo Taken: North	
Description: Wetland A / Stream A view from top of existing stone box culvert	

Photo No. 4	Date: 11/19/24
Direction Photo Taken: East	
Description: View within ditch area between Wetland A and railroad embankment	

Photographic Log

Client Name: MassDOT Rail and Transit	Site Location: Cape Main MM 44.29 Rochester, Massachusetts	Project No. US0035009.6582

Photo No. 5	Date: 11/19/24
Direction Photo Taken: Southeast	
Description: View facing into Wetland B across outlet area of Stream A.	



Photo No. 6	Date: 11/19/24
Direction Photo Taken: North	
Description: View facing stone box culvert and Stream A outlet	



APPENDIX B

PERMIT PLANS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
RAIL & TRANSIT DIVISION

PLAN AND PROFILE AND DETAILS OF

CULVERT REPLACEMENT AT CAPE MAIN MP 44.29

IN THE TOWN OF

ROCHESTER

PLYMOUTH COUNTY

PRELIMINARY - ENVIRONMENTAL PERMITS

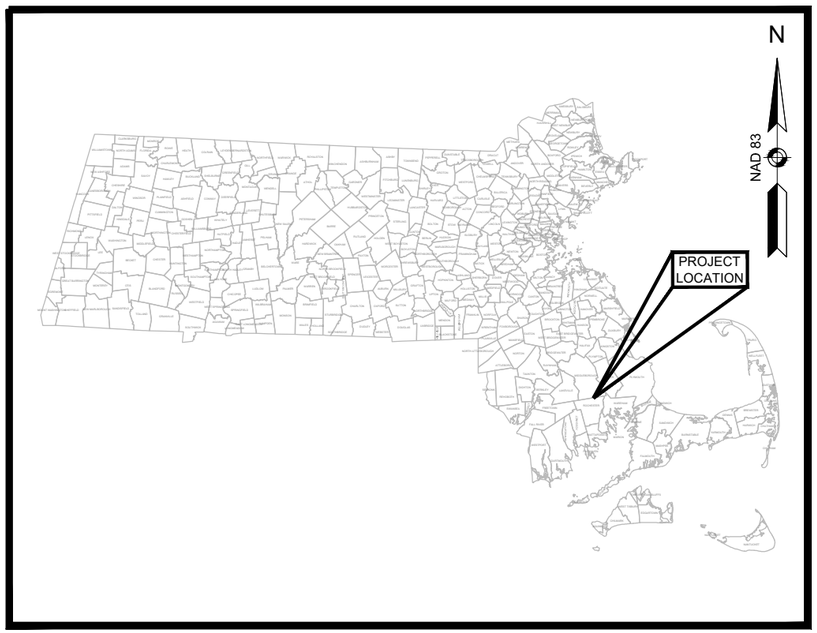
MARCH 10, 2025

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		1	23
PROJECT FILE NO.			

TITLE SHEET & INDEX

INDEX	
SHEET NO.	**DESCRIPTION**
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	GENERAL NOTES
4	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 1
5	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 2
6	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 3
7	CULVERT AT MP 44.29 EXISTING CONDITIONS PLAN 4
8	CULVERT AT MP 44.29 CONSTRUCTION PLAN 1
9	CULVERT AT MP 44.29 CONSTRUCTION PLAN 2
10	CULVERT AT MP 44.29 CONSTRUCTION PLAN 3
11	CULVERT AT MP 44.29 CONSTRUCTION PLAN 4
12	CULVERT AT MP 44.29 SECTION
13	CULVERT AT MP 44.29 EROSION CONTROL PLAN 1
14	CULVERT AT MP 44.29 EROSION CONTROL PLAN 2
15	CULVERT AT MP 44.29 EROSION CONTROL PLAN 3
16	CULVERT AT MP 44.29 EROSION CONTROL PLAN 4
17	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 1
18	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 2
19	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 3
20	CULVERT AT MP 44.29 WETLAND IMPACT PLAN 4
21	EROSION PROTECTION AND WETLAND MITIGATION DETAILS
22	EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES
23	CULVERT AT MP 44.29 SHEET PILE RETAINING WALL



0 10,000 20,000 30,000 40,000

SCALE: 1" = 10,000 FEET

PERMIT PLANS NOT FOR CONSTRUCTION

2/28/2025	PRELIM. PERMITS	
DATE	DESCRIPTION	REV #

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

WSP USA Inc.
100 SUMMER STREET
BOSTON, MA 02110

CHIEF ENGINEER **DATE**

Plotted on 13-Mar-2025 2:27 PM
Last Saved by: USDM6682745 on: Mar 13, 2025 11:56 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\d1006043\TO3-MP44.29_PERMIT(TITLE-SHEET).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		2	23
PROJECT FILE NO.			

LEGEND & ABBREVIATIONS

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB		JERSEY BARRIER
CB		CATCH BASIN
		CATCH BASIN CURB INLET
FP		FLAG POLE
GP		GAS PUMP
MB		MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL		WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG		GAS GATE
BHL #		BORING HOLE
MW #		MONITORING WELL
TP #		TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
C		CABLE MANHOLE
D		DRAINAGE MANHOLE
E		ELECTRIC MANHOLE
G		GAS MANHOLE
M		MISC MANHOLE
S		SEWER MANHOLE
T		TELEPHONE MANHOLE
W		WATER MANHOLE
MHB		MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY		TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB		UTILITY POLE W/ FIREBOX
UPDL		UTILITY POLE WITH DOUBLE LIGHT
ULT		UTILITY POLE W / 1 LIGHT
UPL		UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		SWAMP / MARSH
WG		WATER GATE
PM		PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
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)
E E E		UNDERGROUND ELECTRICAL
C C C		UNDERGROUND COMMUNICATIONS
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
x		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION CONTROLS (COIR LOGS)
		TREE LINE
		SAWCUT LINE
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
BLSF BLSF		BORDERING LAND SUBJECT TO FLOODING (BLSF) FEMA 100 YEAR FLOOD (TEXT UNDERLINE INDICATES SIDE OF LINE WHERE BLSF EXISTS)
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
646		RECORD BASELINE
		EASEMENT
	FO	BURIED INNERDUCT & FIBER (PLOW OR TRENCH)
		INNERDUCT & FIBER INSTALLED IN EXISTING CONDUIT
		INNERDUCT & FIBER INSTALLED IN NEW CONDUIT/CASING PIPE OVER UTILITIES OR STRUCTURES BELOW GRADE
	I-F	INNERDUCT & FIBER INSTALLED IN NEW SURFACE MOUNTED CONDUIT
	UC	FIBER INSTALLED IN NEW UNDERGROUND CONDUIT
		EXISTING CONDUIT WITH PROPOSED FIBER

Plotted on 13-Mar-2025 2:27 PM
Last Saved by: USDM682745 on: Mar 13, 2025 8:46 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.29_PERMIT(LEGEND).dwg

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		3	23
PROJECT FILE NO.			

GENERAL NOTES

Plotted on 13-Mar-2025 2:27 PM

DESIGN CRITERIA:

DESIGN STANDARDS AND CODES OF PRACTICE
• AREMA MANUAL FOR RAILWAY ENGINEERING, 2024 EDITION
• DESIGN LOAD: AREMA COOPER E-80

GENERAL NOTES:

1. ALL WORK SHALL BE PERFORMED DURING SCHEDULED RAILROAD SHUTDOWN PERIODS NOT TO EXCEED 4 DAYS (MAXIMUM) UNLESS A LONGER SHUTDOWN IS AUTHORIZED BY MCRR. ALL WORK SHALL BE COORDINATED AT LEAST 30 DAYS IN ADVANCE WITH MCRR.
2. THE CONTRACTOR SHALL CONDUCT A PRECONSTRUCTION SURVEY AND VERIFY ALL EXISTING DIMENSIONS AND MATERIAL TYPES IN THE FIELD BEFORE COMMENCING WORK AND IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES. WHERE THE CLEAR INTENT OF THE PROPOSED WORK IS TO MATCH EXISTING CONDITIONS, THE FIELD DATA SHALL GOVERN.
3. THE RAILROAD CENTERLINE SHALL BE ESTABLISHED AS THE CONSTRUCTION BASELINE.
4. ALL ITEMS NOT REFERENCED FOR MODIFICATION WILL BE "EXISTING TO REMAIN" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. ALL WORK PERFORMED, AND MATERIALS INSTALLED IN THE EXECUTION OF THE WORK SHALL BE UNDERTAKEN IN STRICT ADHERENCE TO ALL MCRR AND MASSDOT RAIL DIVISION APPLICABLE CODES, STANDARDS, REGULATIONS, AND ORDINANCES OF GOVERNMENTAL AGENCIES HAVING JURISDICTION AT THE WORK SITE.
6. AT THE END OF EACH WORK DAY, THE CONTRACTOR WILL MAKE REASONABLE EFFORTS TO KEEP THE WORK AREA CLEAN AND FREE OF CONSTRUCTION DEBRIS, RUBBISH, SPOILS, TRASH, AND OTHER FOREIGN MATERIALS. ALL SUCH RUBBISH, DEBRIS AND LIKE MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL ORDINANCES, RULES AND REGULATIONS OF THE JURISDICTIONAL AUTHORITY, INCLUDING ENVIRONMENTAL REGULATIONS.
7. THE CONTRACTOR SHALL SUPERVISE AND EXECUTE THE WORK USING THE HIGHEST QUALITY CONSTRUCTION SKILLS AND ATTENTION TO DETAIL. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR, AND HAVE CONTROL OVER THE CONSTRUCTION MEANS, METHODS, TECHNOLOGIES, SEQUENCES, AND PROCEDURES.
8. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO MASSDOT STANDARDS AND AREMA SPECIFICATIONS FOR CONSTRUCTION, WHICHEVER IS MORE STRINGENT.
9. THE STRUCTURAL DRAWINGS REPRESENT THE FINAL COMPLETED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR DESIGNING AND PROVIDING ALL SHORING, BRACING, OR OTHER TEMPORARY SUPPORTS REQUIRED TO PERFORM THE WORK.
10. EXTREME CARE SHALL BE EXERCISED TO PREVENT ANY DEMOLITION AND CONSTRUCTION DEBRIS FROM FALLING INTO WETLAND RESOURCES. IF ANY MATERIAL/EQUIPMENT FALLS IN WETLAND RESOURCES, IT SHALL BE IMMEDIATELY REMOVED.

SURVEY DATUM:

VERTICAL ELEVATIONS: NAVD 88
COORDINATES: MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83

CULVERT NOTES:

1. ALL CONCRETE SHALL BE PRECAST FOR THE CULVERT SEGMENTS. ALL REINFORCEMENT AND CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR. ALL DESIGN CALCULATIONS, DETAILS, PLANS AND PRODUCT LITERATURE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. THE PRECAST CONCRETE SEGMENTS ARE SHOWN FOR REFERENCE ONLY. THE ACTUAL DIMENSIONS WILL BE DEPENDENT ON THE FABRICATOR. ALL UNITS SHALL BE THE SAME LENGTH AND SHAPE. THE INSIDE DIMENSIONS SHALL BE AS PER PLANS.
3. TWO LAYERS OF A TWO (2) FOOT WIDE STRIP OF FILTER FABRIC SHALL BE APPLIED AT EACH JOINT (TOP & SIDES). FABRIC SHALL BE CENTERED ON THE JOINT.
4. CONCRETE FOR PROPOSED PRECAST HEADWALLS SHALL BE 4,000 PSI.
5. WELDED WIRE FABRIC REINFORCEMENT SHALL BE GRADE 60 KSI, UNCOATED.
6. COVER FOR PRECAST CONCRETE HEADWALLS REINFORCEMENT SHALL BE $1\frac{1}{2}$".
7. LIFTING ANCHORS FOR PRECAST CONCRETE HEADWALLS SHALL BE DESIGNED BY THE CONTRACTOR. ALL LIFTING HOLES AND CONNECTION POCKETS SHALL BE FILLED WITH 5,000 PSI GROUT AFTER BEING SET IN THEIR FINAL POSITION.
8. PROPOSED RCP SHALL BE CLASS V WITH JOINTS TREATED WITH GASKET JOINTS.
9. ALL CORNERS OF PRECAST CONCRETE HEADWALL SHALL RECEIVE A $\frac{3}{4}$" CHAMFER.

SUGGESTED CONSTRUCTION SEQUENCE:

1. INSTALL DEWATERING EQUIPMENT, COFFERDAMS AND EROSION CONTROL MEASURES AS REQUIRED FOR CONSTRUCTION.
2. UPON REMOVAL OF EXISTING TRACK WORK, REMOVE AND STOCKPILE EXISTING OVERBURDEN AS REQUIRED FOR CONSTRUCTION.
3. REMOVE AND DISPOSE OF EXISTING CULVERTS AND HEADWALLS.
4. PREPARE PIPE BEDDING AND RIPRAP APRON.
5. INSTALL PROPOSED HEADWALL, CULVERT PIPE AND INLET STRUCTURE.
6. INSTALL (PLACE AND COMPACT) BACKFILL IN LIFTS, FINE GRADE, AND INSTALL REMAINING RIPRAP.
7. ALL EMBANKMENTS SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING TWELVE (12) INCHES (AFTER COMPACTION) AND SHALL BE COMPACTED AS SPECIFIED BEFORE THE NEXT LAYER IS PLACED.
8. PREPARE TRACK BEDDING FOR REINSTALLATION OF STOCKPILED TIES AND TRACK.
9. REMOVE DEWATERING EQUIPMENT AND COFFERDAMS.
10. INSTALL AND COMPACT EIGHT (8) INCHES OF SUBBALLAST.
11. INSTALL TRACK, TIES AND REMAINING BALLAST.
12. TAMP, LIFT AND SURFACE TO FINAL ELEVATION AND ALIGNMENT.
13. REMOVE DEWATERING EQUIPMENT AND COFFERDAMS.
14. CONTRACTOR TO STOCKPILE EXISTING STREAM BED SUBSTRATE FOR PLACEMENT INSIDE OF 60" DIA PIPE TO ELEVATIONS INDICATED ON THE CONTRACT PLANS.

CULVERT NOTES:

1. ALL LIFTING HOLES AND CONNECTIONS POCKETS SHALL BE FILLED WITH 5000 PSI GROUT AFTER BEING SET IN THEIR FINAL POSITION.
2. THE CONTRACT PLANS REPRESENT THE FINAL COMPLETED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR DESIGNING AND PROVIDING ALL SHORING, BRACING, AND ALL OTHER TEMPORARY SUPPORTS NECESSARY TO PERFORM THE WORK.
3. ALL WORKING POINTS ARE SHOWN AT THE CENTERLINE OF THE CULVERT.

TRACK NOTES:

1. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL SUBMIT A PHASING PLAN FOR TRACK CONSTRUCTION TO MCRR/MASSDOT FOR APPROVAL.
2. FLAGGING, AS REQUIRED BY MASS COASTAL RAILROAD (MCRR), LLC SHALL BE ARRANGED BY THE CONTRACTOR, AND AT THE EXPENSE OF THE MCRR AND MASSDOT. THESE SERVICES WILL BE PROVIDED AS SPECIFIED HEREIN AND AS APPROVED BY THE MCRR AND MASSDOT TO ALLOW THE CONTRACTOR TO CARRY OUT THEIR REGULAR WORK ACTIVITIES SAFELY AND WITHOUT UNACCEPTABLE IMPACTS TO RAILROAD OPERATIONS.

ENVIRONMENTAL NOTES:

1. IF ANY UNKNOWN HAZARDOUS MATERIALS ARE ENCOUNTERED IN THE SOILS DURING EXCAVATION OPERATIONS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SUSPEND EXCAVATION OPERATIONS UNTIL THE SITUATION CAN BE PROPERLY EVALUATED.
2. IN ORDER TO PROTECT FISH LIFE WITHIN THE STREAM, WORK ACTIVITIES WITHIN THE STREAM MAY BE LIMITED BY A TIME OF YEAR RESTRICTION AS SPECIFIED IN THE PROJECT PERMITS.

CULVERT DESIGN DATA:

1. DESIGN SPECIFICATIONS: AREMA MANUAL OF RAILWAY ENGINEERING, DATED 2015.
2. DESIGN LIVE LOADS: AREMA COOPER E-80 LOCOMOTIVE WITH FULL IMPACT. STRESSES INDUCED BY TRANSPORTATION AND HANDLING.
3. SEISMIC DESIGN DATA: SEISMIC ANALYSIS AND DESIGN SHALL BE IN ACCORDANCE WITH THE AREMA MANUAL OF RAILWAY ENGINEERING.
4. GEOTECHNICAL DATA:
   - MINIMUM LATERAL EARTH PRESSURE COEFFICIENT = 0.33.
   - MAXIMUM LATERAL EARTH PRESSURE COEFFICIENT = 1.00.
   - MOIST UNIT WEIGHT OF SOIL = 120 PCF
   - ALLOWABLE BEARING CAPACITY:
   - AREMA LOAD GROUP I: 8.6 KSF (F.S. = 3)
   - AREMA LOAD GROUP II:12.9 KSF (F.S. = 2)

CULVERT MATERIALS:

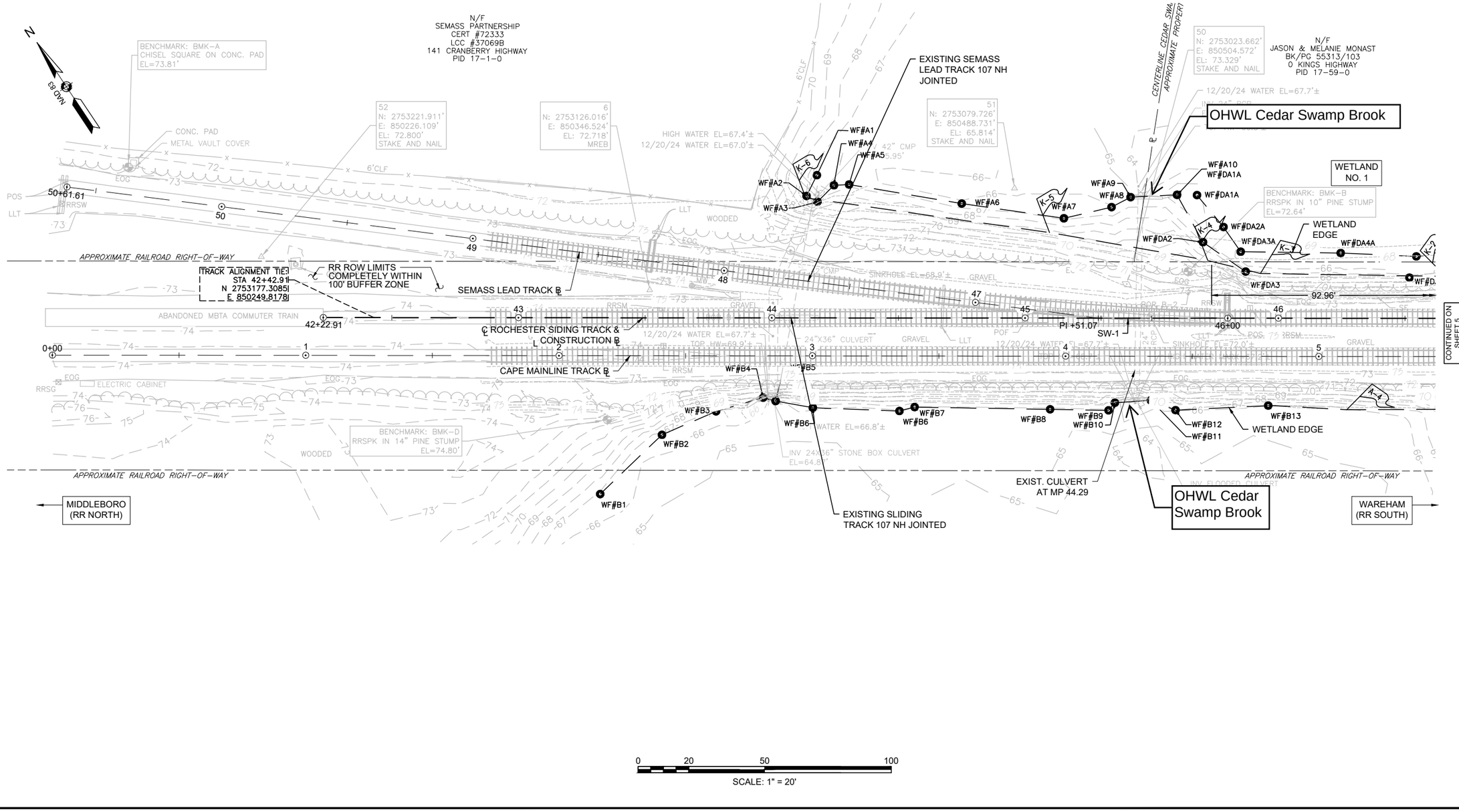
1. PRECAST CONCRETE PIPE - CLASS V:
2. PIPE BEDDING:
3. FOR ADDITIONAL MATERIAL REQUIREMENTS, SEE THE CONTRACT SPECIFICATIONS.

Last Saved by: USDM682745 on: Mar 13, 2025 8:47 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\10060431TO3-MP44.29_PERMIT\NOTES).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		4	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 1



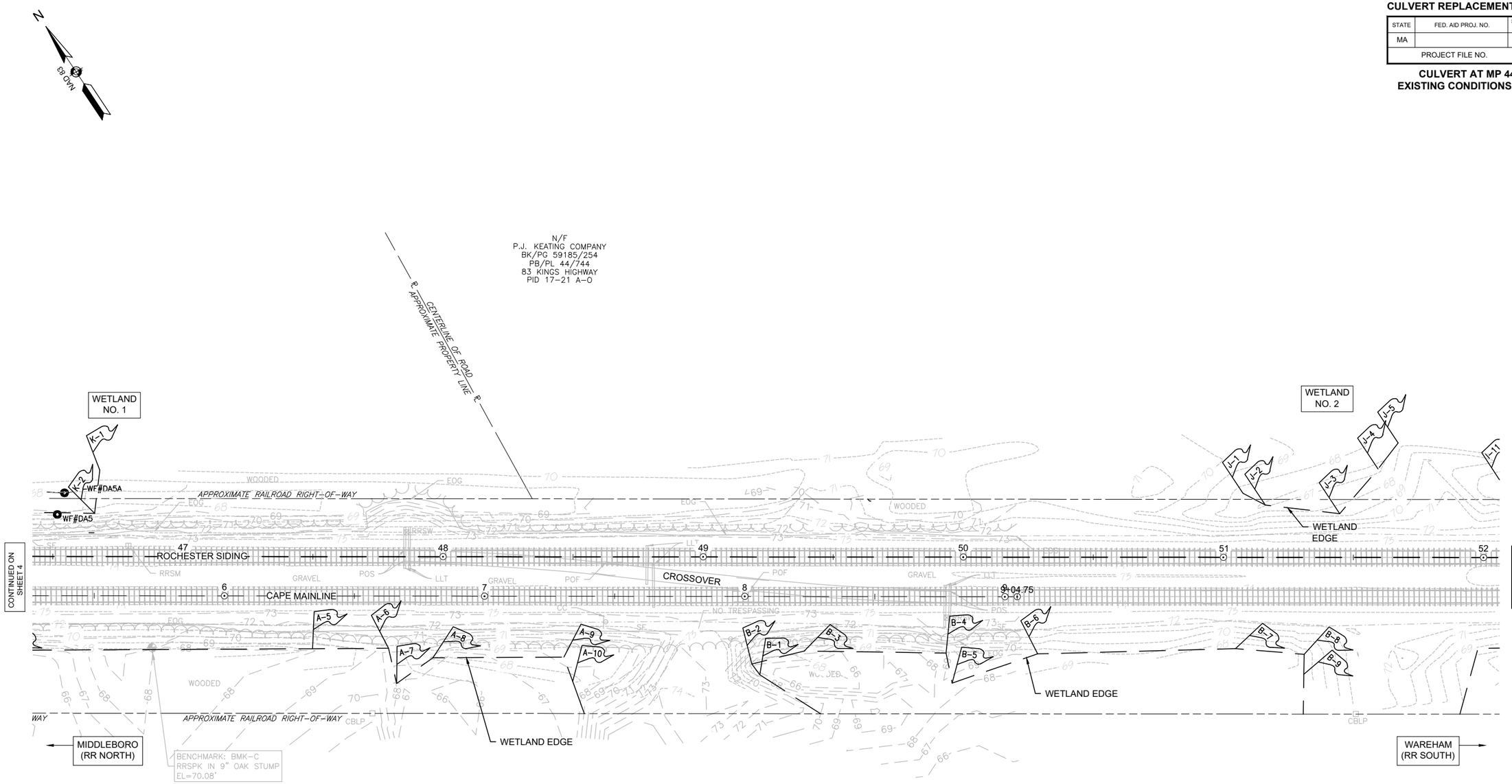
Last Saved by: USDM682745 on: Mar 13, 2025 10:40 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TOS-MP44.29_PERMIT(EXCOND-PLANS).dwg

Plotted on 13-Mar-2025 2:27 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		5	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 2



0 20 50 100

SCALE: 1" = 20'

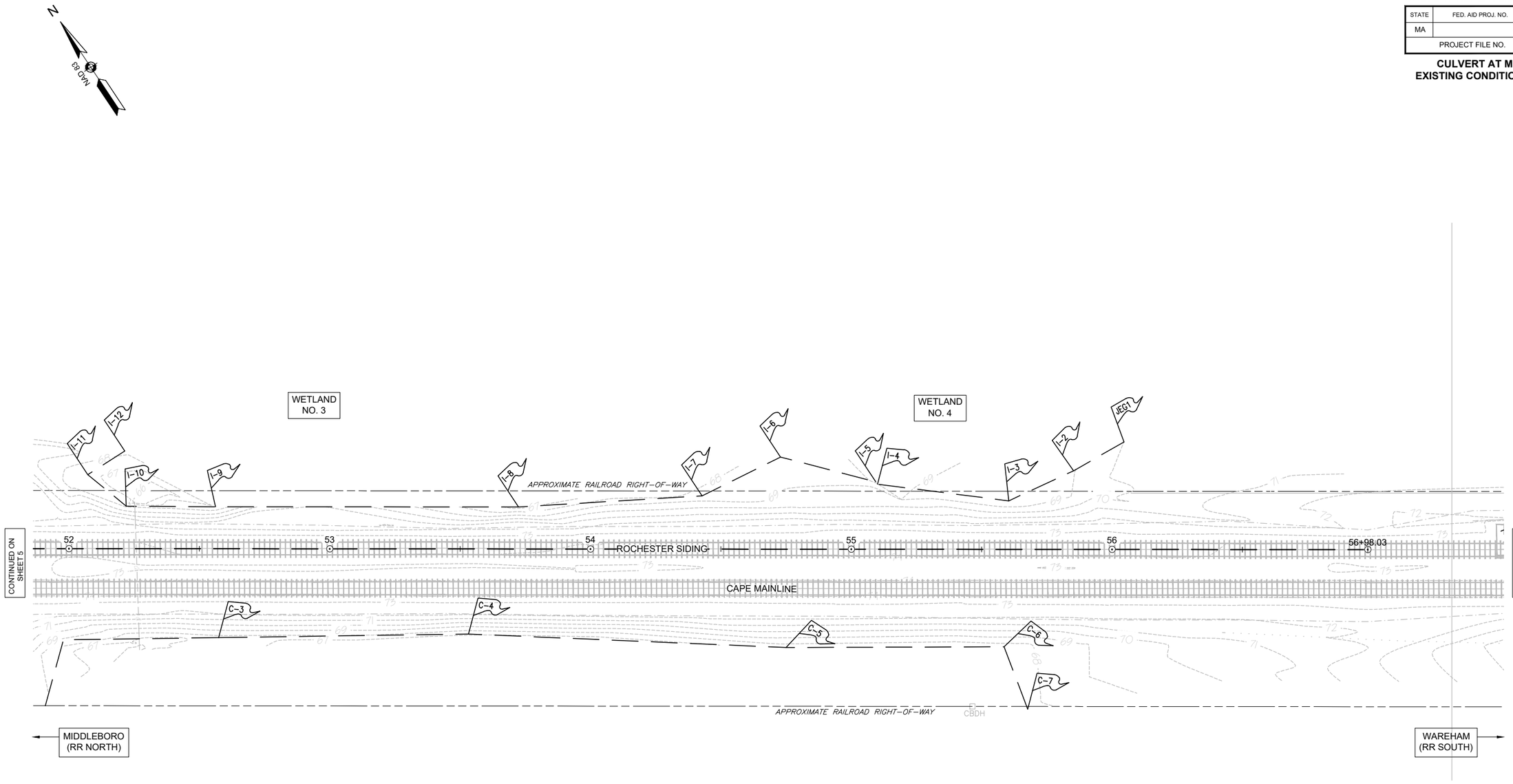
Last Saved by: USDM6827745 on: Mar 13, 2025 10:40 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.29_PERMIT(EXCOND-PLANS).dwg

Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		6	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 3



0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 10:40 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondald1006043\TO3-MP44.29_PERMIT\EXCOND-PLANS).dwg

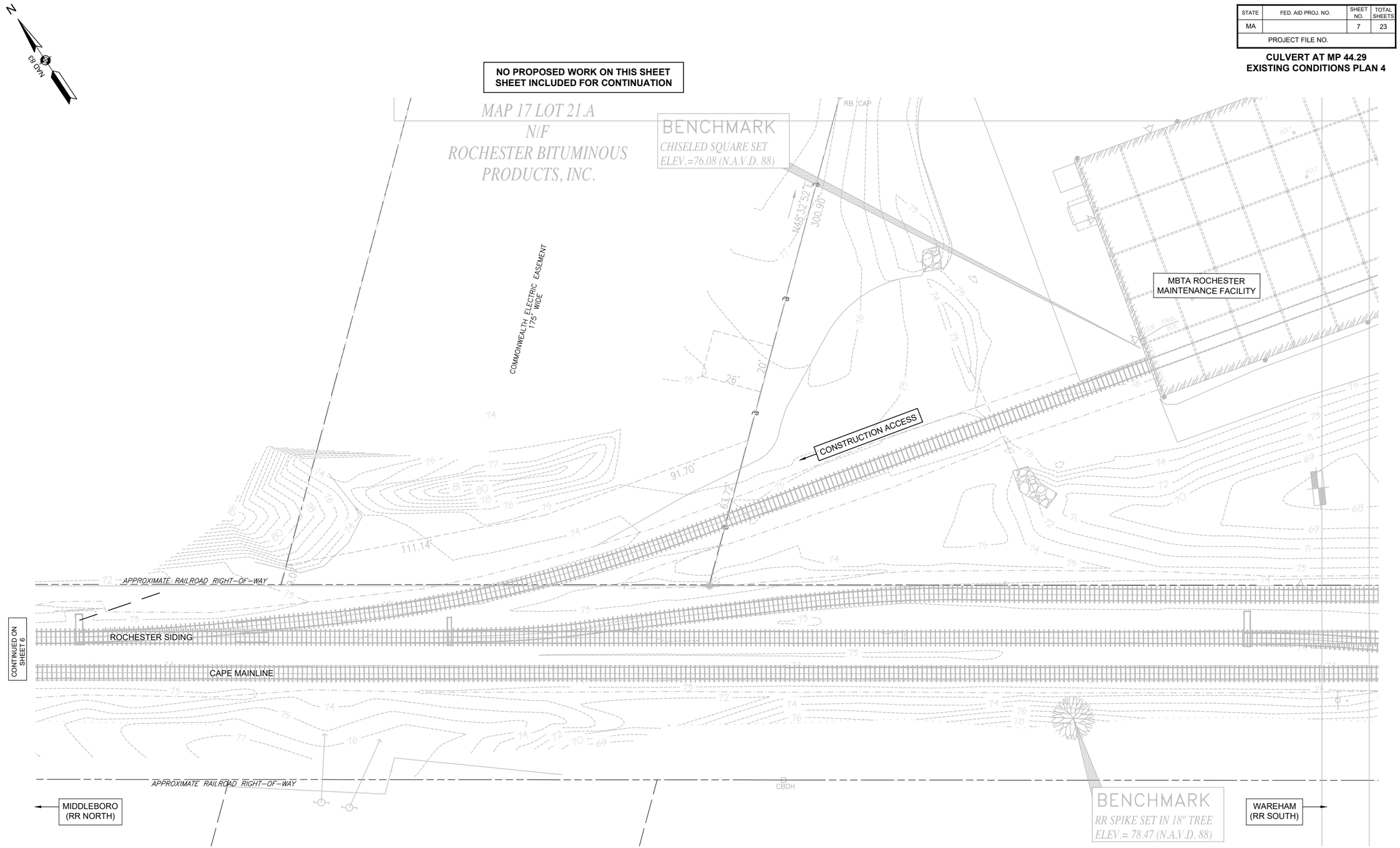
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		7	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EXISTING CONDITIONS PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



0 20 50 100
SCALE: 1" = 20'

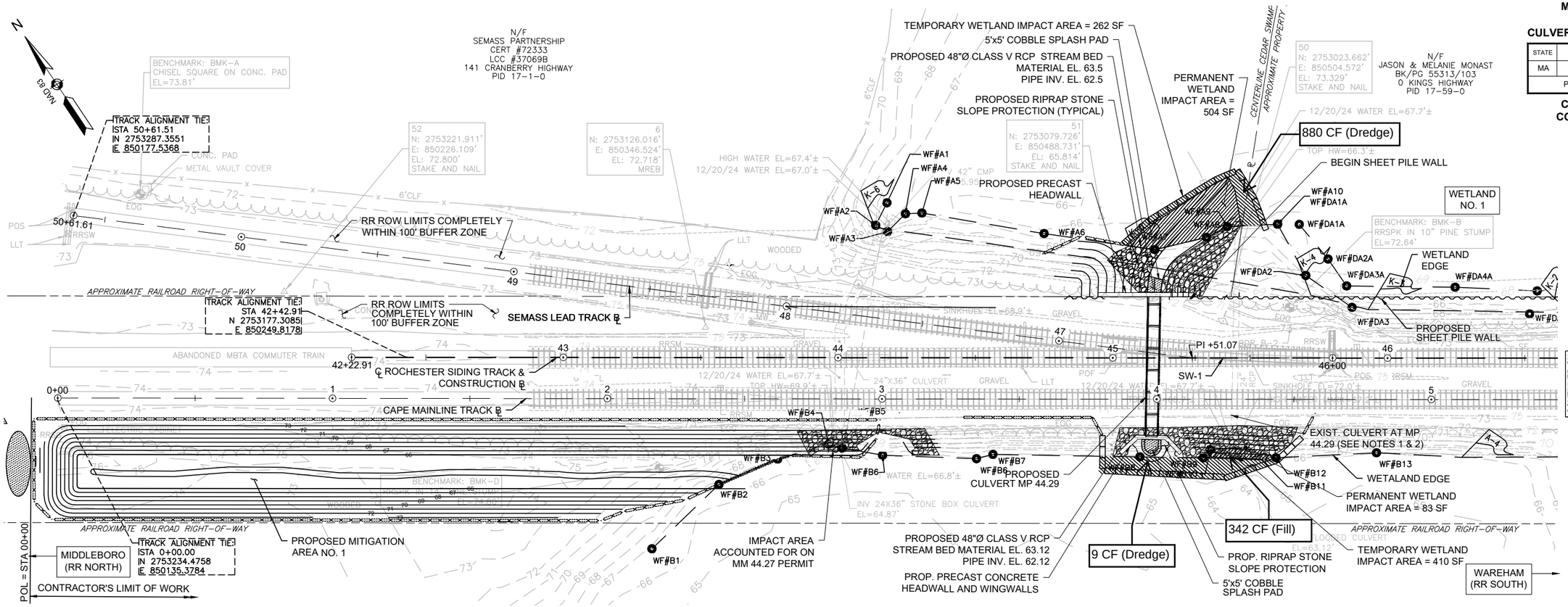
Plotted on 13-Mar-2025 2:28 PM

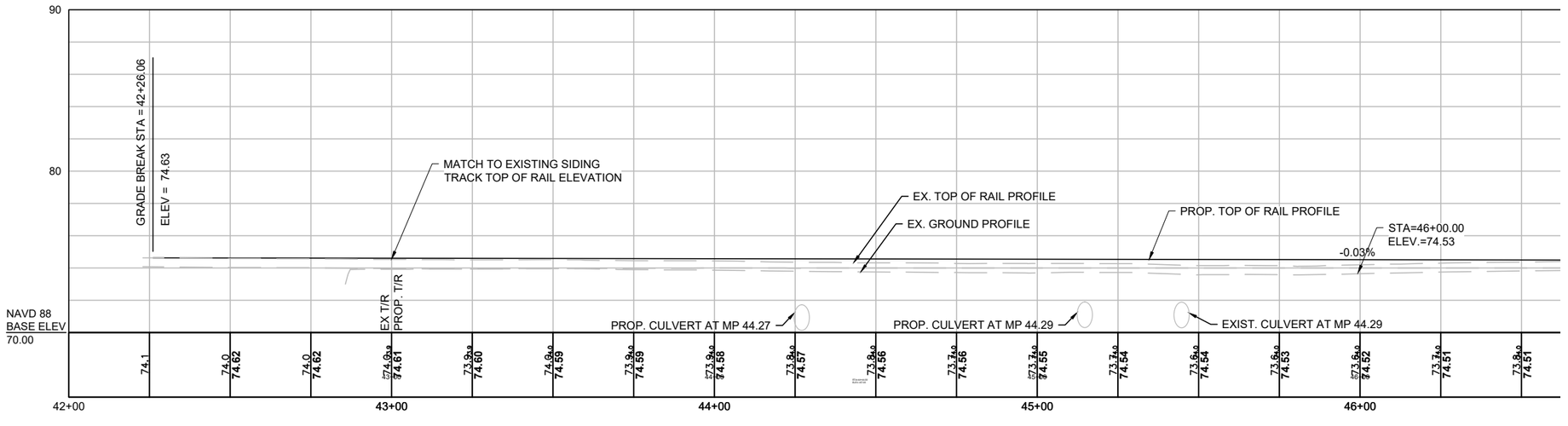
Last Saved by: USDM682745 on: Mar 13, 2025 10:40 AM File: c:\bms\wsp-pb-us-pw-02\wsp__data\david.melchionda\d1006043\TO3-MP44.29_PERMIT(EXCOND-PLANS).dwg

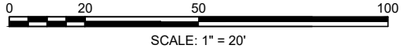
MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		8	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 1







NOTES:

1. CONTRACTOR SHALL INSPECT PIPE OPENINGS DAILY FOR DURATION OF CONSTRUCTION TO ASSURE PIPE FLOW IS NOT BLOCKED.
2. EXISTING CULVERT AT MP 44.29 TO BE FILLED-IN WITH FLOWABLE FILL AND RETIRED ONCE THE PROPOSED CULVERT HAS BEEN CONSTRUCTED AND IS IN ACTIVE USE.

Plotted on 13-Mar-2025 2:28 PM
Last Saved by: USDM682745 on: Mar 13, 2025 1:56 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d10060431TO3-MP44.29_PERMIT\CONST-PLANS\.dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		9	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 2

N/F
P.J. KEATING COMPANY
BK/PG 59185/254
PB/PL 44/744
83 KINGS HIGHWAY
PID 17-21 A-O

℄ APPROXIMATE PROPERTY LINE ℄

℄ CENTERLINE OF ROAD

N
MAG 63
DWN

5
N: 2752944.917'
E: 850612.485'
EL: 73.114'
MREB

4
N: 2752740.171'
E: 850922.754'
EL: 72.588'
SPK

PROPOSED SHEET PILE WALL

MEET EXISTING SEMASS LEAD TRACK HORIZONTAL AND VERTICAL ALIGNMENT

TRACK ALIGNMENT TIE:
ISTA 49+94.12
IN 2752760.6986
E 850874.9155

TRACK ALIGNMENT TIE:
ISTA 9+04.75
IN 2752733.2783
E 850888.6202

WETLAND NO. 2

WETLAND EDGE

WETLAND EDGE

K-1
K-2
WF#DA5A
WF#DA5

J-1
J-2
J-3
J-4
J-5
J-11

APPROXIMATE RAILROAD RIGHT-OF-WAY

ROCHESTER SIDING

CROSSOVER

CAPE MAINLINE

A-5
A-6
A-7
A-8
A-9
A-10

B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9

WOODED
FOG
RRSW
RRSM
GRAVEL
POS
LLT
POF
SE
NO. TRESPASSING
CBLP

47
48
49
50
51
52
6
7
8
9+04.75

CONTINUED ON SHEET NO. 8

CONTINUED ON SHEET NO. 10

MIDDLEBORO (RR NORTH)

WAREHAM (RR SOUTH)

BENCHMARK: BMK-C
RRSPK IN 9" OAK STUMP
EL=70.08'

GRADE BREAK STA = 49+72.25
ELEV = 74.41

NAVD 88
BASE ELEV
70.00

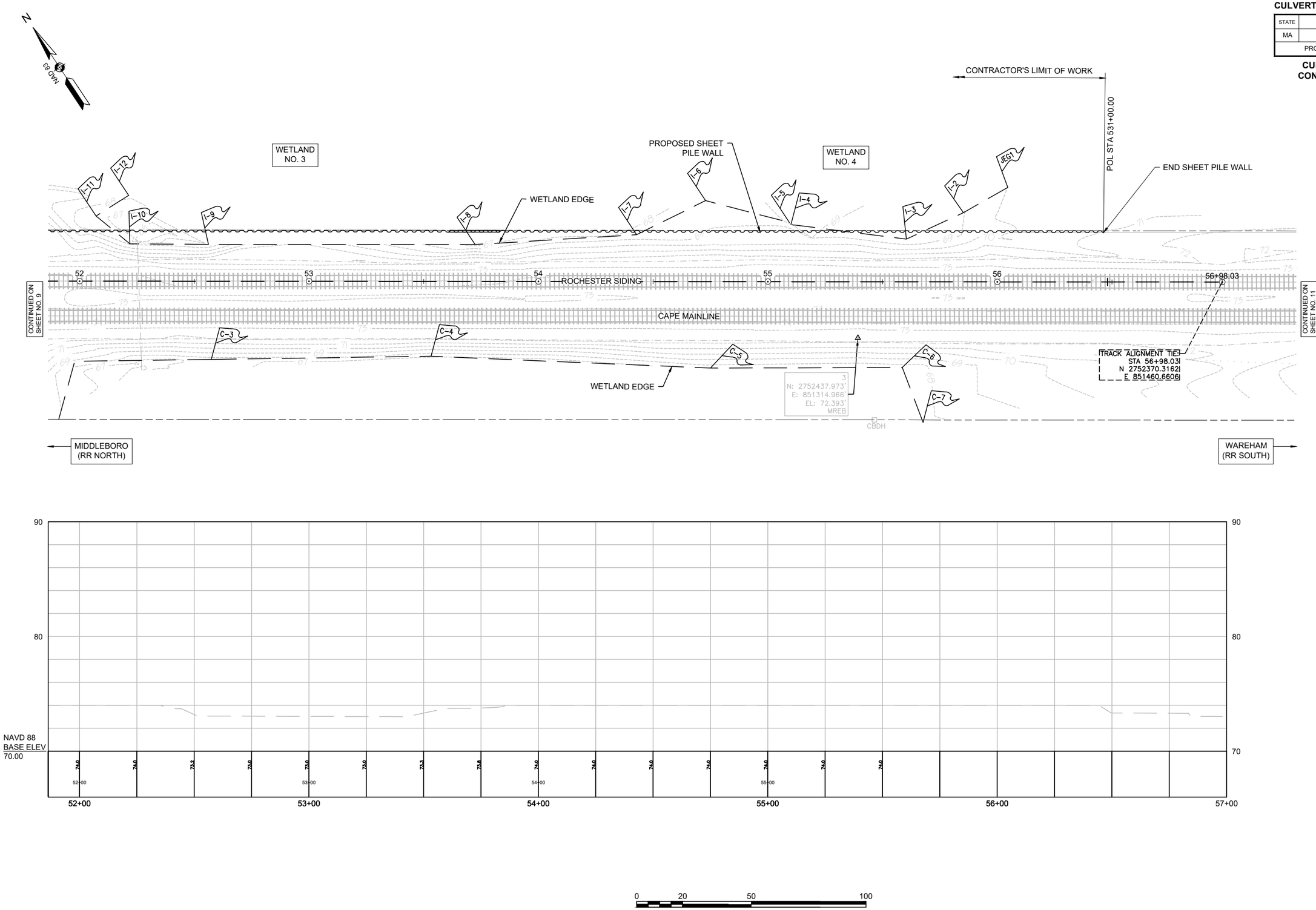
90
80

47+00	48+00	49+00	50+00	51+00	52+00
73.9 / 74.50	73.9 / 74.49	74.0 / 74.48	74.0 / 74.48	73.9 / 74.47	73.9 / 74.46
73.8 / 74.46	73.8 / 74.45	73.8 / 74.44	73.9 / 74.43	73.9 / 74.43	73.9 / 74.42
73.8 / 74.40	73.8 / 74.40	74.0 / 74.40	74.0 / 74.40	74.0 / 74.40	74.0 / 74.40
74.0 / 74.40	74.0

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		10	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 3



Last Saved by: USDM682745 on: Mar 13, 2025 1:56 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondald1006043\T03-MP44.29_PERMIT(CONST-PLANS).dwg

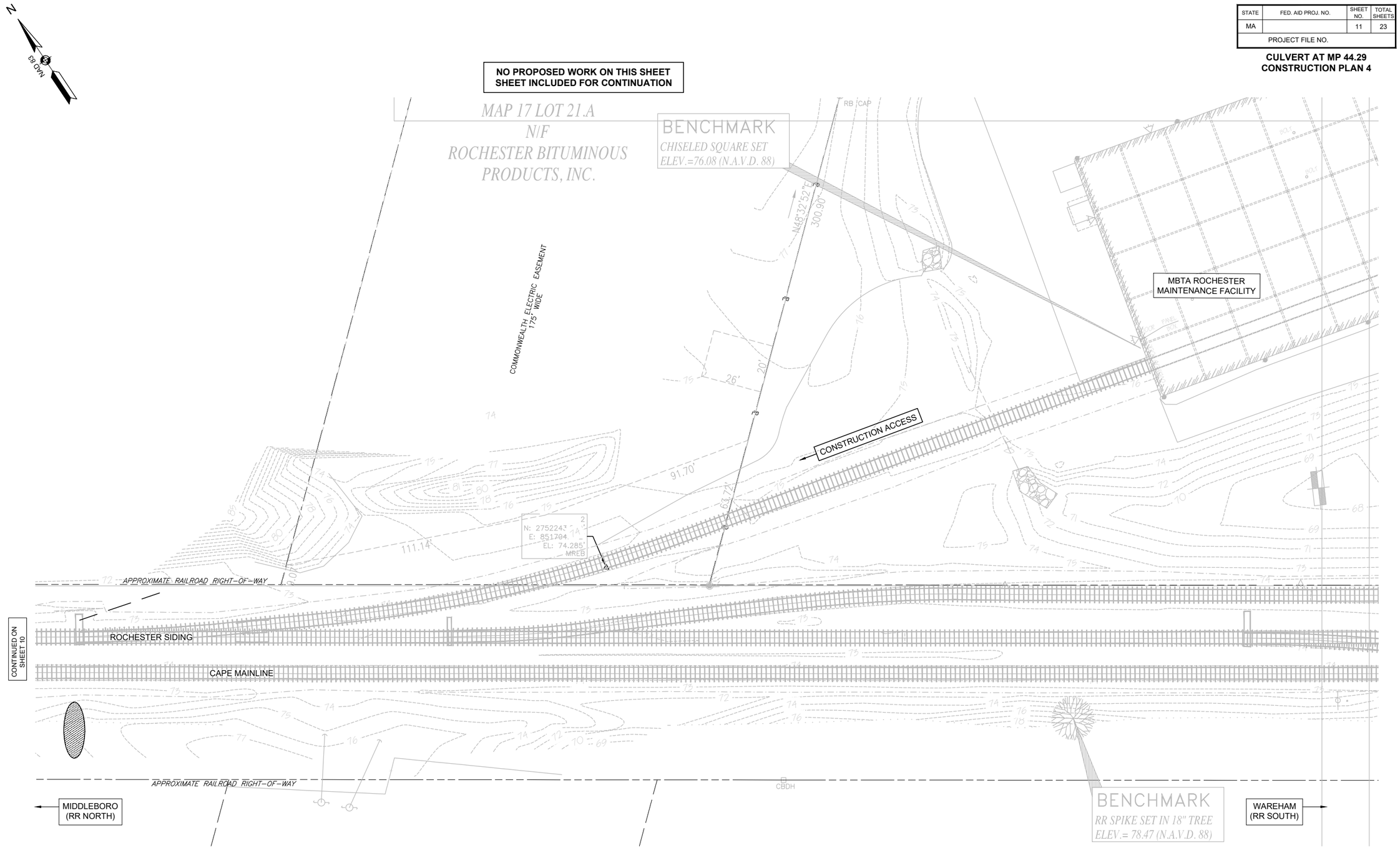
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		11	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
CONSTRUCTION PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



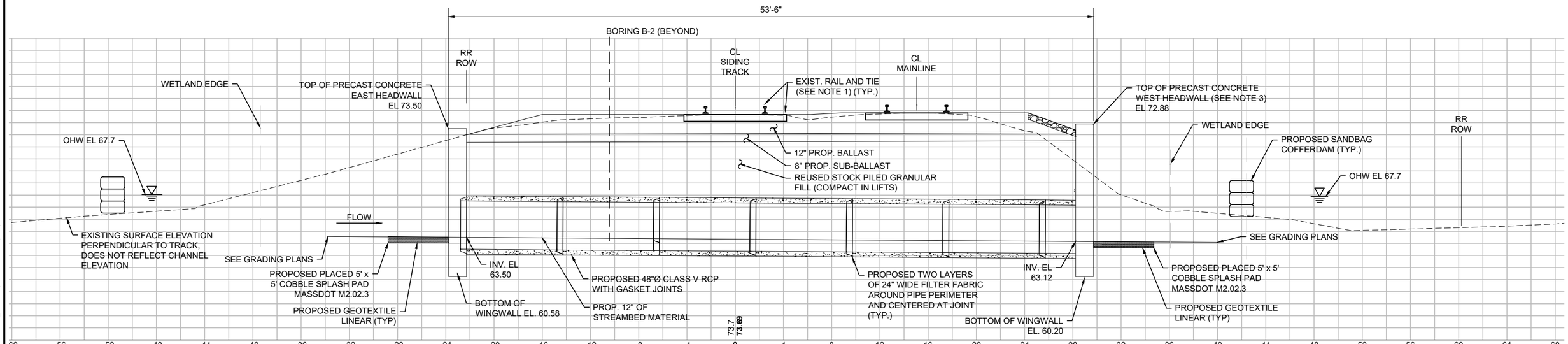
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 1:56 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\D0060431T03-MP44.29_PERMIT(CONST-PLANS).dwg
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		12	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
SECTION



NOTES:

1. EXISTING TRACKS (RAILS AND TIES) TO BE REMOVED AND RESET AS NECESSARY FOR CULVERT CONSTRUCTION.
2. EXISTING TRACK SWITCH TO BE REMOVED AND RESET AS NECESSARY FOR CULVERT CONSTRUCTION.
3. PROPOSED WINGWALLS NOT SHOWN FOR CLARITY.

HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8

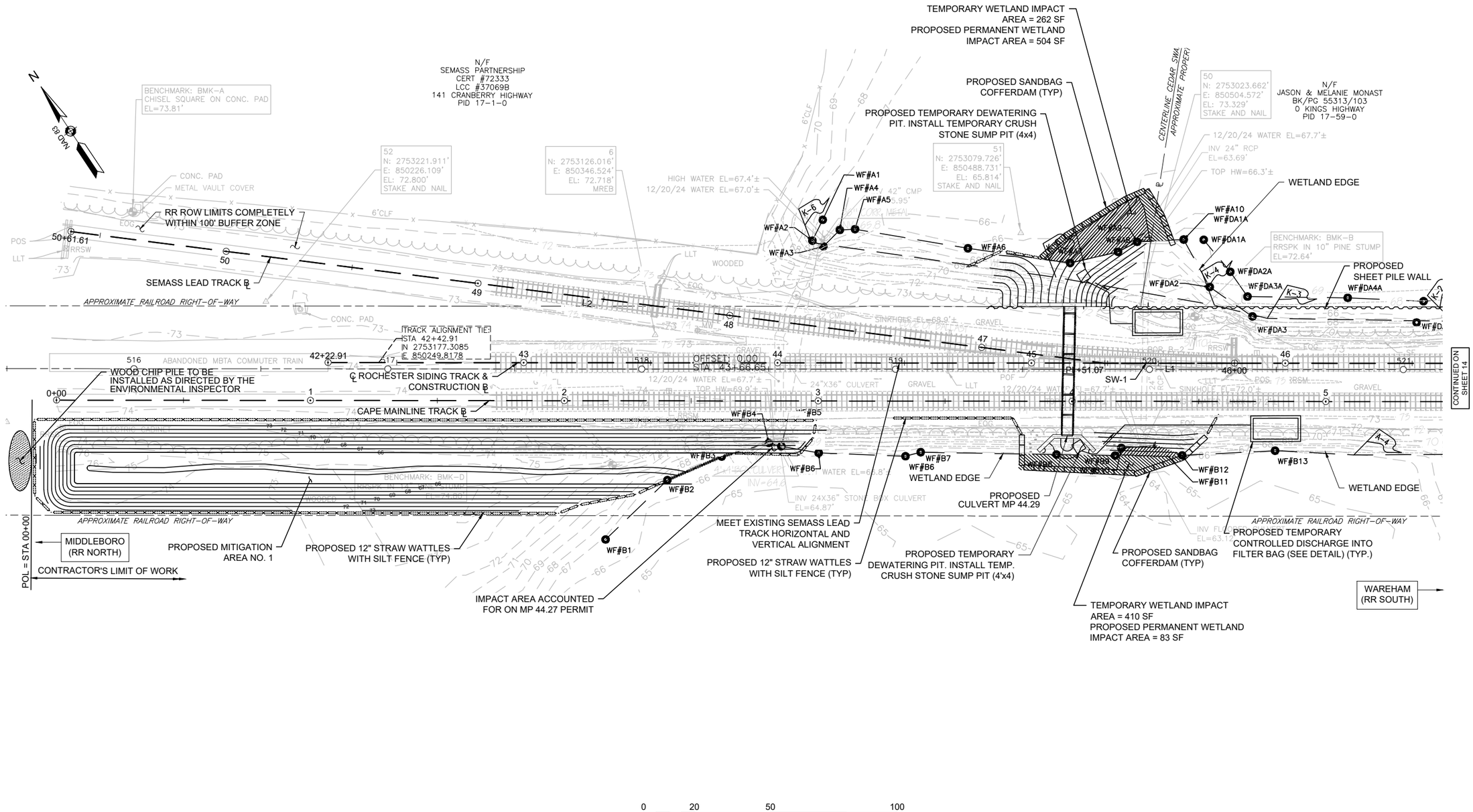
Plotted on 13-Mar-2025 2:28 PM

Last Saved by: USDM682745 on: Mar 13, 2025 2:02 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid100606431\T03-MP44.29_PERMIT(CLVRT-SECT1).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		13	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 1



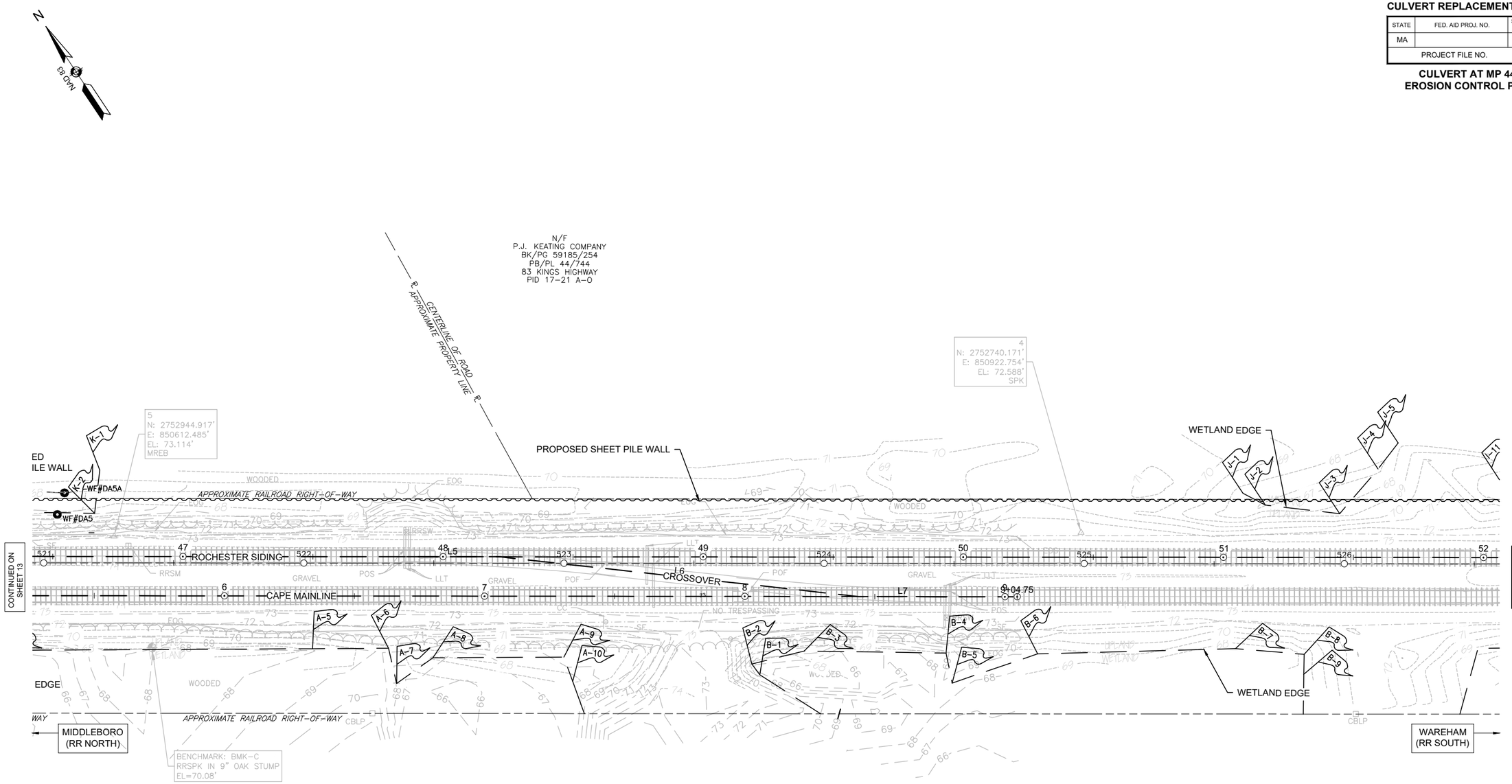
Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaid100604317O3-MP44.29_PERMIT\EC-PLANS).dwg

Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		14	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 2



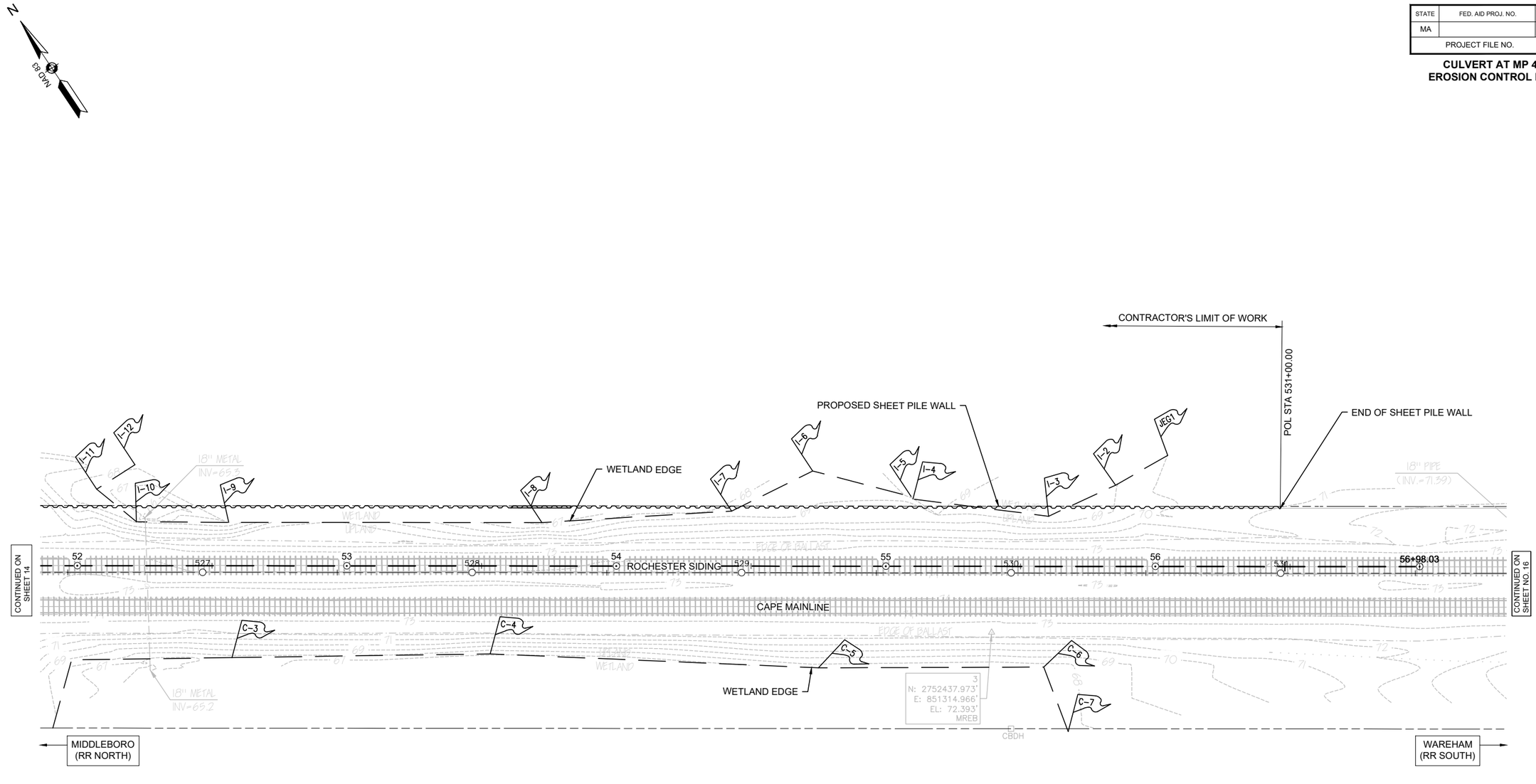
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondad100060431T03-MP44.29_PERMIT\EC-PLANS).dwg
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		15	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 3



0 20 50 100

SCALE: 1" = 20'

Plotted on 13-Mar-2025 2:28 PM

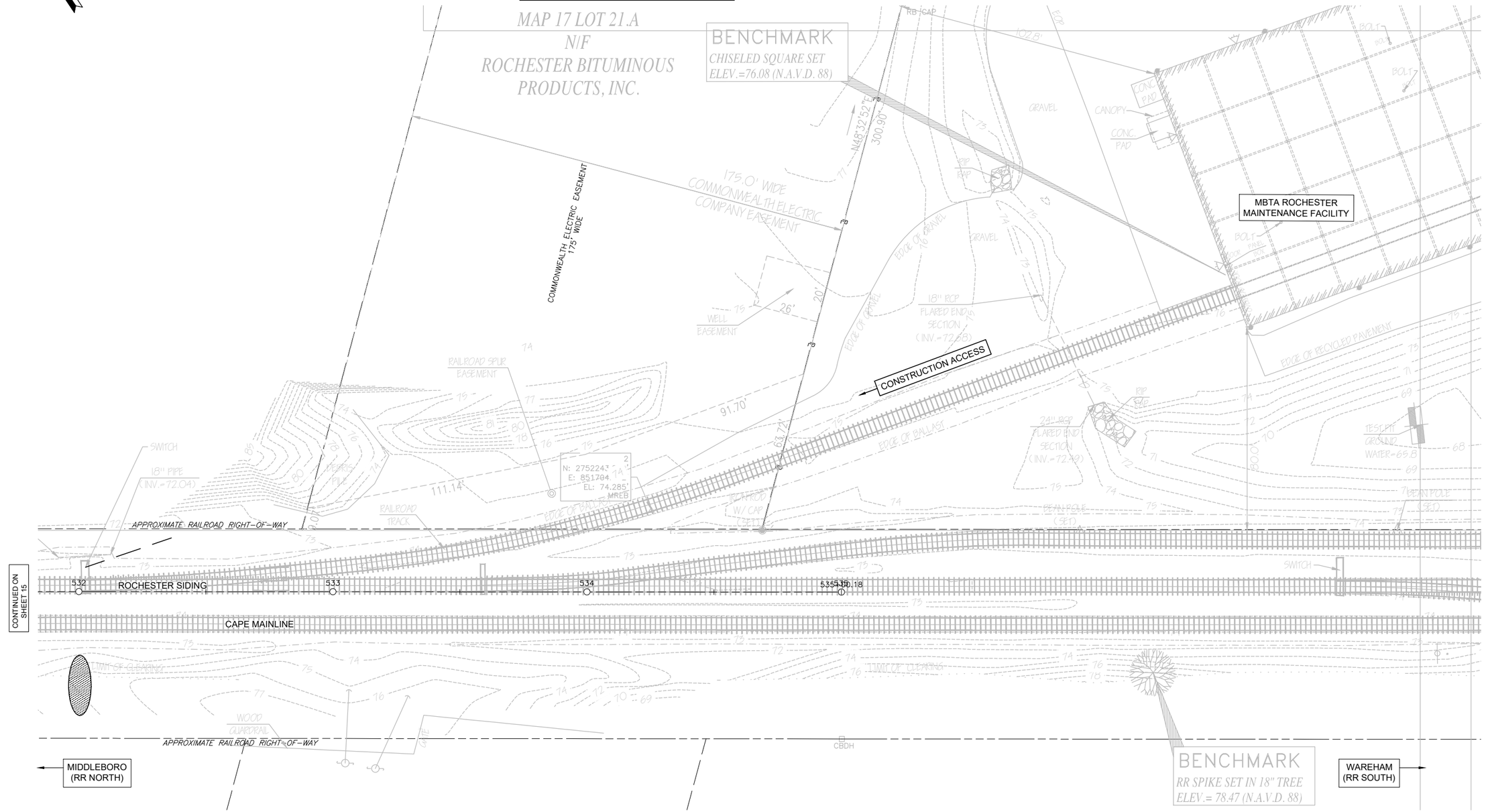
Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d10060431TO3-MP44.29_PERMIT(EC-PLANS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		16	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
EROSION CONTROL PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



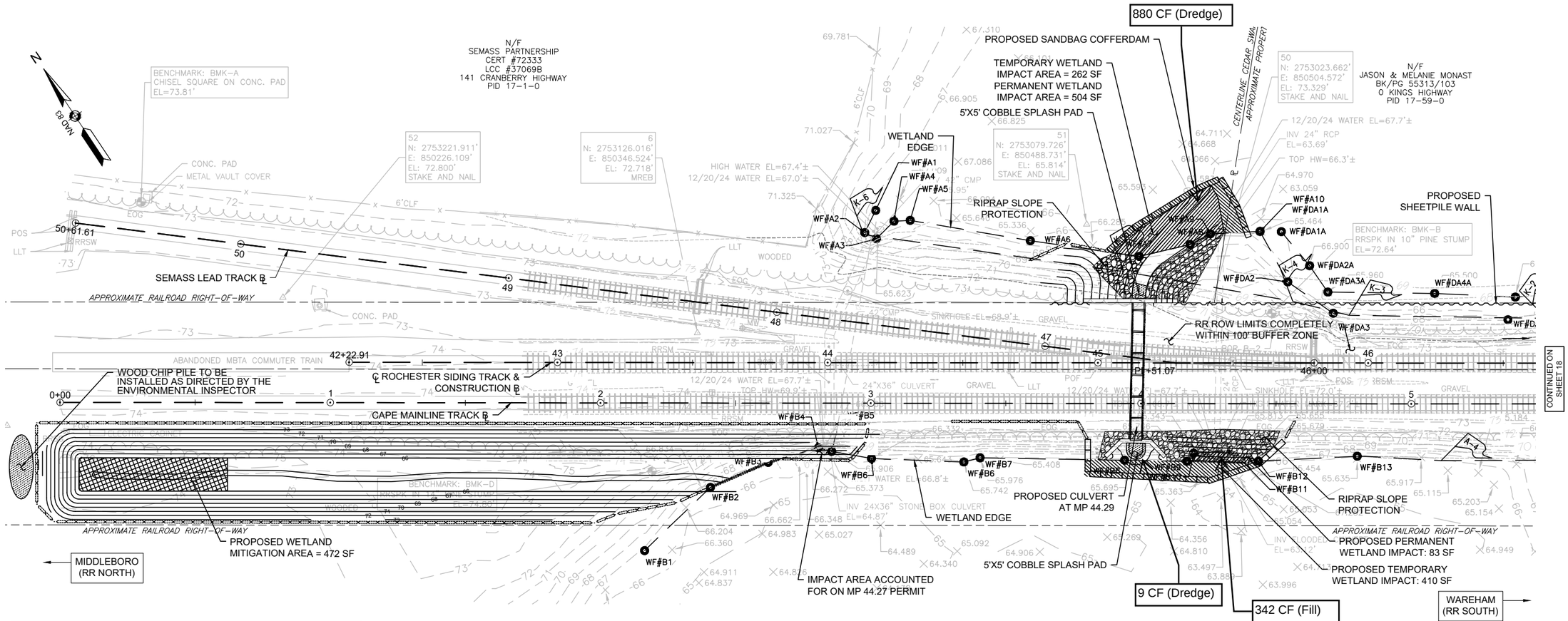
0 20 50 100
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 2:26 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\10060431T03-MP44.29_PERMIT(TEC-PLANS).dwg
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		17	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 1



WETLAND REPLICATION AREA PLANTING SCHEDULE				
Common Name	Scientific Name	Type	Spacing	Number
Red Maple	Acer rubrum	Bag n Ball	10 ft	15
Silver Maple	Acer saccharum	Bag n Ball	10 ft	15
Pussy Willow	Salix discolor	Tube	10 ft	20
Sweet pepperbush	Clethra alnifolia	1-gallon	8 ft	15
Lowbush blueberry	Vaccinium angustifolium	1-gallon	8 ft	15
Highbush blueberry	Vaccinium corymbosum	1-gallon	8 ft	15
Steeplebush	Spiraea tomentosa	1-gallon	8 ft	20
Tussock sedge	Carex stricta	Plug	12 in	30
New England Wetmix		Seed rate: 2500 sf/lb		

0 20 50 100
SCALE: 1" = 20'

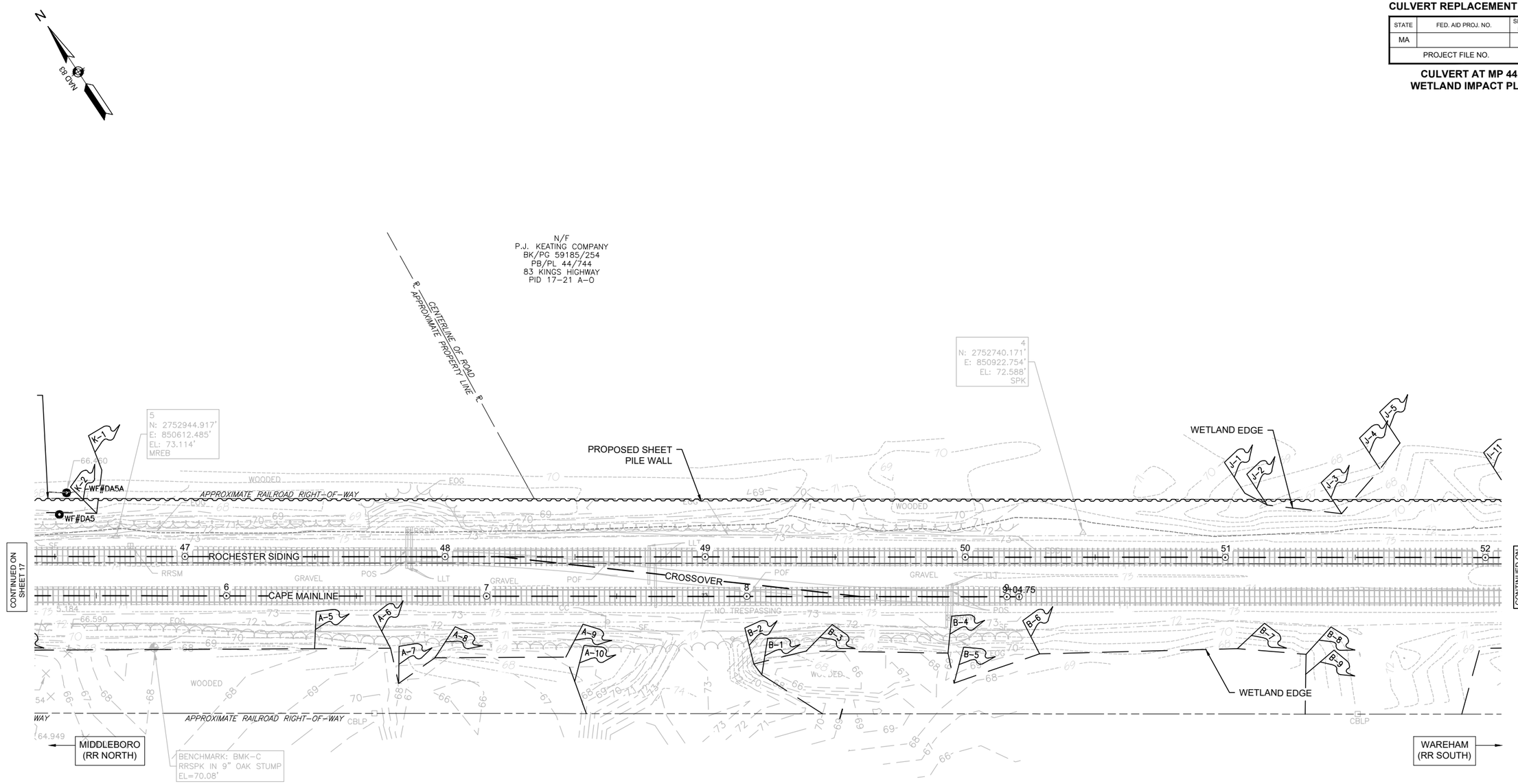
Plotted on 13-Mar-2025 2:28 PM

Last Saved by: USDM682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondaId1006043\T03-MP44.29_PERMIT\[WET-IMPACT-PLN].dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		18	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 2



0 20 50 100
SCALE: 1" = 20'

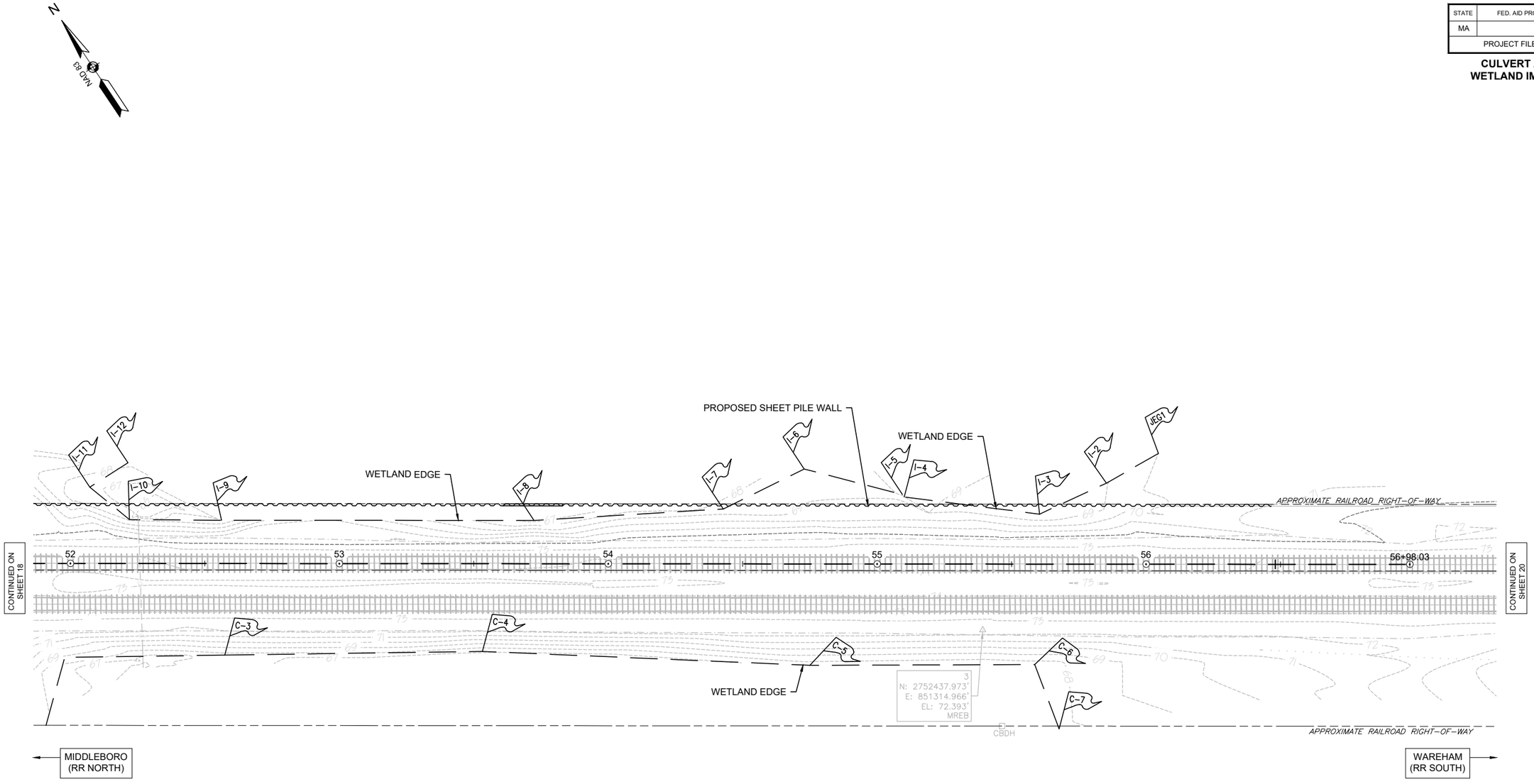
Plotted on 13-Mar-2025 2:28 PM

Last Saved by: USDM682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondad100060431\TO3-MP44.29_PERMIT\WET-IMPACT-PLN\.dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		19	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 3



0 20 50 100

SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d10060431TO3-MP44.29_PERMIT(WET-IMPACT-PLN).dwg

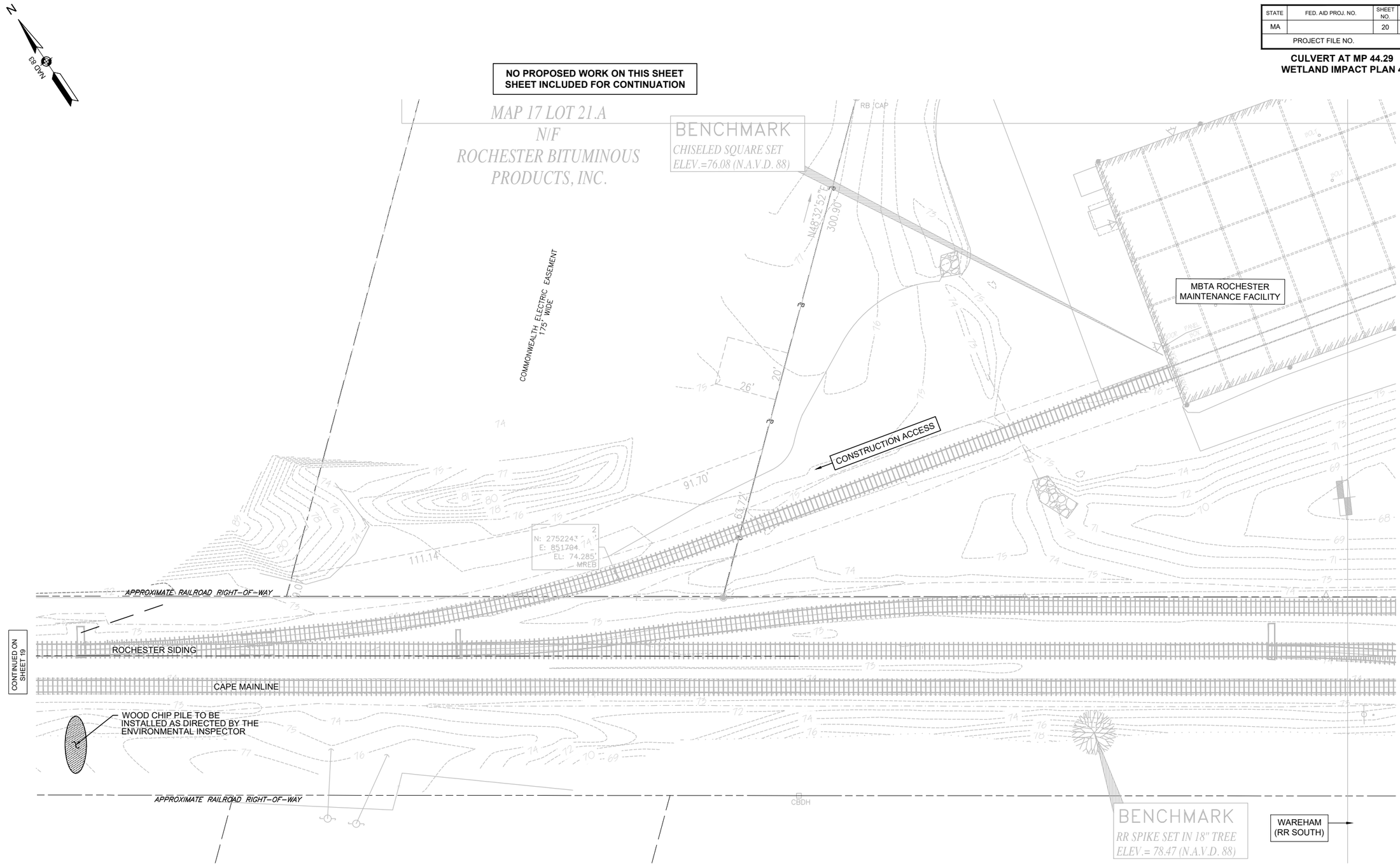
Plotted on 13-Mar-2025 2:28 PM

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		20	23
PROJECT FILE NO.			

CULVERT AT MP 44.29
WETLAND IMPACT PLAN 4

NO PROPOSED WORK ON THIS SHEET
SHEET INCLUDED FOR CONTINUATION



0 20 50 100

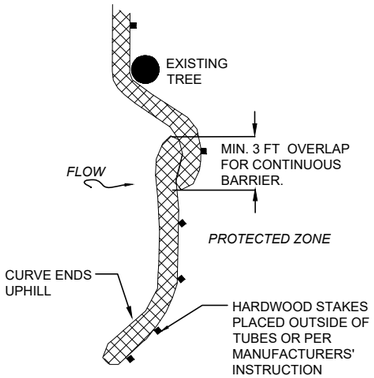
SCALE: 1" = 20'

Last Saved by: USDM682745 on: Mar 13, 2025 2:16 PM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondat\10060431T03-MP44.29_PERMIT\WET-IMPACT-PLN).dwg
Plotted on 13-Mar-2025 2:28 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		21	23
PROJECT FILE NO.			

EROSION PROTECTION AND WETLAND MITIGATION DETAILS

Plotted on 13-Mar-2025 2:29 PM



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE.

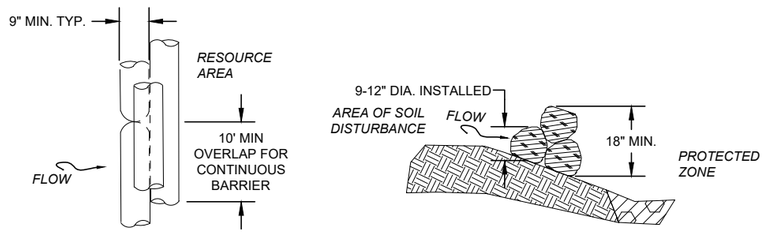
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

SEDIMENT BARRIER INSTALLATION

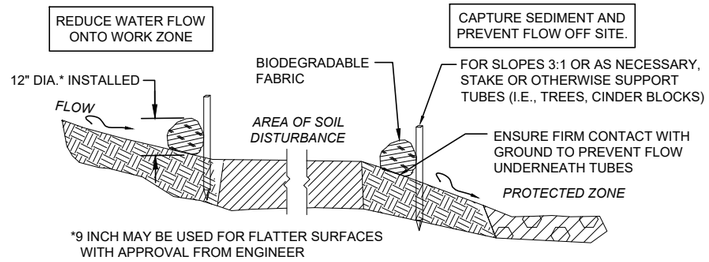
NOT TO SCALE



PLAN VIEW SECTION

SEDIMENTATION CONTROL BARRIER BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE



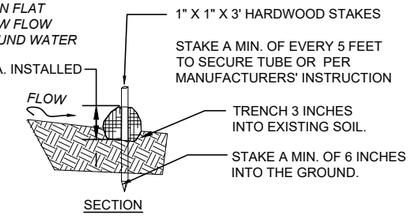
SECTION

SEDIMENT CONTROL BARRIER - STAKED STRAW WATTLE

NOT TO SCALE

12 INCH STRAW WATTLE

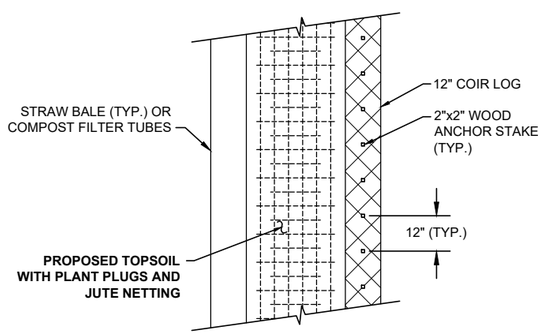
TO BE USED ONLY ON FLAT SURFACES WITH LOW FLOW TO DIVERT OR IMPOUND WATER FLOW



SECTION

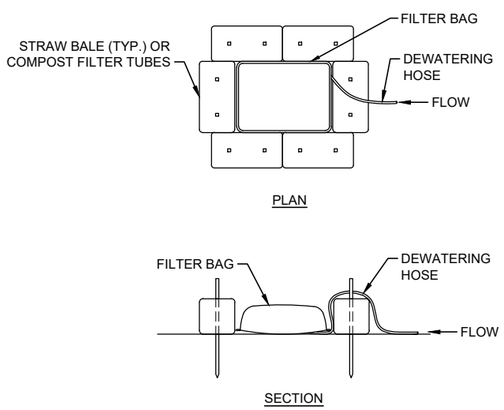
STRAW WATTLE - SEDIMENT BARRIER

NOT TO SCALE



WETLAND MITIGATION DETAIL

NOT TO SCALE



DEWATERING CONTAINMENT AREA DETAIL

NOT TO SCALE

NOTES:

1. SEE SHEETS 2 AND 3 FOR GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS.
2. SEE SHEET 13 FOR THE EROSION CONTROL PLAN AND SHEET # FOR THE WETLAND IMPACT PLAN.
3. SEE SHEET 22 FOR EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES.
4. ALL EROSION AND SEDIMENT CONTROLS SHALL BE PLACED AND MAINTAINED IN ACCORDANCE WITH MASSDOT STANDARDS.
5. SEDIMENT BARRIERS SHALL BE PLACED AT LOCATIONS SHOWN ON EROSION CONTROL PLANS AND/OR AS DIRECTED BY THE ENGINEER.

Last Saved by: USDM682745 on: Mar 13, 2025 11:46 AM File: c:\bms\wsp-pb-us-pw-02\wsp__data\david.melchionda\d10080043\TO3-MP44.29_PERMIT(EC-DETAILS).dwg

MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		22	23
PROJECT FILE NO.			

EROSION CONTROL, WETLAND REPLICATION AND PLANTING NOTES

WETLAND REPLICATION AREA NOTES:

1. WETLAND REPLICATION WORK SHALL BE PERFORMED VIA LOW-INTENSITY METHODS INCLUDING THE USE OF HAND TOOLS AND LIMITED PERSONNEL.
2. FINAL GRADES IN THE REPLICATION AREA SHALL CONFORM TO TARGET ELEVATIONS AS SHOWN ON THE PLANS AND AS APPROVED BY THE WETLAND SPECIALIST. THE FINISHED GRADE SHALL BE AT AN ELEVATION THAT WILL PROVIDE A HYDROLOGIC CONNECTION BETWEEN THE REPLACEMENT AREA AND ADJACENT RESOURCE AREAS. THE CONTRACTOR SHALL VERIFY THAT THIS ELEVATION IS NOT AT A LEVEL THAT COULD ALTER THE HYDROLOGY OF AN ADJACENT WETLAND. RESTORATION AREAS SHALL CONFORM TO EXISTING AND/OR ADJACENT GRADES.
3. THE REPLICATION AREA SHALL BE STAKED AND GRADES SET FOR APPROVAL BY THE WETLAND SPECIALIST PRIOR TO EXCAVATION. TO THE EXTENT POSSIBLE, LIMITS SHALL BE A MINIMUM OF 6 FEET FROM TRUNK OF TREES. ACTUAL LIMITS OF THE REPLICATION AREA MAY BE ADJUSTED IN THE FIELD TO PROTECT ROOT SYSTEMS OF EXISTING TREES. HOWEVER, THE TOTAL AREA OF THE REPLICATION AREA REQUIRED BY ALL PERMITS SHALL NOT BE REDUCED.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY EXISTING AREAS OF ESTABLISHED INVASIVE PLANTS AND NOTIFY THE ENGINEER AND WETLAND SCIENTIST OF THE CONDITION. SOIL CONTAINING INVASIVE PLANT MATERIAL SHALL BE EXCAVATED AND DISPOSED OF OFF-SITE AT AN APPROVED FACILITY.
5. ALL CUT TREES, STUMPS, BRUSH, WRACK OR VEGETATION NOT SPECIFIED TO REMAIN SHALL BE REMOVED FROM THE REPLICATION AREA UNLESS DIRECTED OTHERWISE BY THE ENGINEER. MATERIALS SHALL NOT TO BE STOCKPILED IN THE RESOURCE AREAS OR BUFFER ZONE WHILE AWAITING DISPOSAL.
6. SEQUENCE AND EXECUTION OF WORK SHALL ENSURE MINIMAL COMPACTION AND HEAVY EQUIPMENT MOVING OVER PLACED PLANTING SOIL. IF HEAVY EQUIPMENT IS REQUIRED TO TRAVEL OVER EXISTING WETLAND SOILS, WOOD MATS SHALL BE PLACED TO MINIMIZE IMPACTS. UPON ACCEPTANCE OF FINAL GRADES, NO HEAVY EQUIPMENT SHALL TRAVEL ACROSS PLACED SOIL. DO NOT WORK WITH WET OR MOIST SOILS. WORK THAT RESULTS IN COMPACTION OF SOILS SHALL RESULT IN REPLACEMENT OF WETLAND SOILS AT NO ADDITIONAL COST TO THE CONTRACT.

ENVIRONMENTAL NOTES:

1. VEGETATED WETLAND RESOURCE AREAS WITHIN THE PROJECT AREA WERE IDENTIFIED AND FIELD DELINEATED BY WSP IN DECEMBER 2024. THE DELINEATION WAS COMPLETED IN CONFORMANCE WITH THE STANDARDS AND METHODS OUTLINED IN THE U.S. ARMY CORPS OF ENGINEERS (USACE) 1987 WETLANDS DELINEATION MANUAL AND ASSOCIATED NORTHEAST AND NORTHCENTRAL REGIONAL SUPPLEMENT (USACE 2012).
2. ALL PLANS REFERENCE MASSACHUSETTS STATE PLANE, MAINLAND STANDARD COORDINATION SYSTEM.

EROSION CONTROL NOTES:

1. PRIOR TO PROJECT IMPLEMENTATION, THE CONTRACTOR SHALL SUBMIT FOR ACCEPTANCE A GENERAL WORK SCHEDULE, CONSTRUCTION SEQUENCE AND PLAN WHICH INDICATES PLANNING IMPLEMENTATION OF TEMPORARY AND PERMANENT EROSION CONTROL MEASURES. THIS PLAN SHALL INCLUDE PROPOSED METHODS OF SOILS MANAGEMENT AND DISPOSAL OF WASTE MATERIALS.
2. BEFORE CONSTRUCTION BEGINS, AN EROSION CONTROL BARRIER WILL BE ERECTED AROUND THE ENTIRE PROPOSED WETLAND REPLACEMENT SITE, EXCEPT THE UPGRADIENT EDGE TO ALLOW MACHINERY ACCESS TO THE SITE. THE EROSION CONTROL BARRIER PREVENTS EROSION OF DISTURBED SOILS AND SEDIMENTATION INTO THE ADJACENT EXISTING WETLAND AREAS.
3. EROSION CONTROLS SHALL BE FINALIZED BASED ON ACTUAL FIELD CONDITIONS.
4. NO SEDIMENT OR SILT SHALL BE DISCHARGED TO THE WETLAND AT ANY TIME.
5. NO DEWATERING IS PERMITTED UNLESS THE CONTRACTOR PREPARES A DEWATERING PLAN THAT INCLUDES PUMPING WATER TO AN UPLAND SITE WITH ADEQUATE SILTATION CONTROLS, AND THAT PLAN IS APPROVED BY THE DEP. CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING ALL TEMPORARY SEDIMENTATION AND EROSION CONTROLS.
6. FOR EROSION CONTROL INSTALLATION REQUIREMENTS, REFER TO EROSION PROTECTION PLAN. TEMPORARY TREATMENTS SHALL CONSIST OF COMPOST FILTER TUBE, SILT FENCE, FIBER MULCH OR PROTECTIVE COVER SUCH AS FABRIC MATS.
7. THE TOE OF ANY SLOPE IS TO REMAIN AT LEAST ONE FOOT INSIDE OF ALL EROSION CONTROLS. UNDER NO CIRCUMSTANCE SHALL THE CONTRACTOR COVER ANY PORTION OF THE EROSION CONTROLS WITH MATERIAL. ANY MATERIAL THAT IS PLACE ON ANY EROSION CONTROLS BY THE CONTRACTOR, OR ANY AGENT OF THE CONTRACTOR, SHALL BE IMMEDIATELY REMOVED BY THE CONTRACTOR, AND ANY NECESSARY REPAIRS TO THE EROSION CONTROLS ACCOMPLISHED, AT NO COST TO THE OWNER.
8. ADDITIONAL EROSION CONTROLS SHALL BE INSTALLED AS CONDITIONS WARRANT, OR AS DIRECTED BY THE ENGINEER.
9. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EROSION CONTROL MAINTENANCE AND SHALL INSPECT AND/OR REPLACE ALL CONTROLS AS NEEDED. MAINTENANCE WILL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS AND PERMIT CONDITIONS. THE CONTRACTOR IS RESPONSIBLE FOR CARRYING OUT NECESSARY MAINTENANCE DURING ALL PHASES OF PROJECT COMPLETION.
10. SEDIMENTATION CONTROL DEVICES SHALL BE INSPECTED CLOSELY AND MAINTAINED PROMPTLY AS DESCRIBED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES ON A WEEKLY BASIS AND WITHIN 24 HOURS OF EACH STORM EVENT.
11. DISTURBED SLOPES ALONG THE EMBANKMENT WITHIN THE WORK ZONE SHALL BE STABILIZED WITH LOAM AND SEED.
12. UPON PROJECT COMPLETION, IMPACTED WETLANDS SHALL BE RESTORED TO EXISTING CONDITIONS. THE CONTRACTOR MUST REPAIR AND/OR RESEED ANY AREAS THAT DO NOT DEVELOP WITHIN ONE YEAR OF PLANTING.

PLANTING AND SEEDING NOTES:

1. SEEDING WITHIN THE WETLAND REPLICATION AREA AND ADJACENT UPLANDS WILL CONFORM TO THE PLANS OR WILL BE COMPLETED IN ACCORDANCE WITH DIRECTIONS PROVIDED IN THE FIELD. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION WILL BE USED. USE OF CULTIVARS WILL BE PROHIBITED. SPECIES NOT SPECIFIED IN THE FINAL SEEDING PLAN WILL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE WETLAND SCIENTIST AND PERMITTING AGENCY.
2. MANUFACTURED HYDRIC SOIL SHALL BE PLACED WITHIN THE WETLAND REPLICATION AREA. WETLAND SOILS ARE CREATED FROM A MIXTURE OF ORGANIC AND MINERAL MATERIALS, WITH THE FINAL PRODUCT CONTAINING AT LEAST 12 PERCENT ORGANIC MATTER CONTENT BY WEIGHT. THE CONTRACTOR MUST PROVIDE ANALYSIS OF THE PREPARED TOPSOIL TO THE WETLAND SCIENTIST FOR APPROVAL PRIOR TO INSTALLATION. WHERE EMPIRICAL DATA ARE LACKING, COMPOST TO SOIL RATIO SHALL BE 1:1 BY VOLUME. SOIL MUST BE FREE OF SEEDS, ROOTS, STEMS OR OTHER VIABLE PARTS OF INVASIVE PLANT SPECIES. SOIL SHALL NOT CONTAIN KILN-DRIED WOOD OR CONSTRUCTION DEBRIS. SOIL SHALL BE FREE OF SOLID MATERIALS LARGER THAN 4-INCHES IN DIAMETER.
3. COMPOST SHALL BE COMPOST MEETING THE REQUIREMENTS FOR ORGANIC SOIL ADDITIVES, SECTION M 1.06.0 OF THE STANDARD SPECIFICATIONS AND THE FOLLOWING:
4. MOISTURE CONTENT SHALL BE 40-60 PERCENT AS MEASURED BY ASTM D2216 STANDARD TEST METHOD FOR LABORATORY DETERMINATION OF WATER CONTENT OF SOIL AND ROCK AND ASTM D2974 (CITED ABOVE).
5. NO SOIL FROM ANY AREA SUPPORTING INVASIVE SPECIES SHALL BE USED IN THE REPLICATION AREA.
6. CONTRACTOR SHALL SPREAD APPROXIMATELY SIX (6) INCHES OF MANUFACTURED WETLAND SOIL WITHIN THE REPLICATION AREA, RAKE IN SEED AND INSTALL ROLLED EROSION CONTROL PRODUCT TO SLOPES ACCORDING TO THE DETAIL. AN APPROVED, NATIVE CONSERVATION SEED MIX SHALL BE USED IN UPLANDS AND AN APPROVED, NATIVE WETLAND MIX SHALL BE USED IN WETLAND AREAS.
7. THE SUPERVISING WETLAND SCIENTIST WILL INSPECT PLANTING STOCK TO ENSURE THAT THE SPECIMENS ARE HEALTHY, FREE FROM PESTS AND ANY INVASIVE PLANT MATERIAL, AND SUITABLE FOR USE WITHIN THE WETLAND RESTORATION SITE. UNSUITABLE SPECIMENS WILL BE REJECTED AND REPLACED WITH SUITABLE SPECIMENS. THE SUPERVISING WETLAND SCIENTIST MUST APPROVE ANY PLANTING SUBSTITUTIONS. WOODY PLANT STOCK WILL BE EITHER BARE ROOT STOCK OR CONTAINER GROWN.
8. TRANSPLANTS AND PLANT MATERIAL COLLECTED FROM THE WILD IS PROHIBITED UNLESS APPROVED IN WRITING BY THE WETLAND SCIENTIST. ALL PLANT MATERIAL USED SHALL BE NURSERY-GROWN AND HEALTHY, SOUND AND FREE OF DISEASE, INSECT PESTS, EGGS OR LARVAE AND DISCOLORATIONS.
9. CONTAINER-GROWN STOCK SHALL NOT HAVE WILTING OR CURLING LEAVES OR WEEDS. CONTAINTER-GROWN STOCK SHALL HAVE BEEN GROWN IN A CONTAINER LONG ENOUGH FOR THE ROOT SYSTEM TO HAVE DEVELOPED SUFFICIENTLY TO HOLD ITS SOIL AFTER REMOVAL FROM THE CONTAINER. ROOTS SHALL VISIBLY EXTEND TO THE INSIDE FACE OF THE GROWING CONTAINER BUT SHALL NOT BE ROOT-BOUND OR GIRDLING.
10. ALL PLANTS SHALL BE DELIVERED TO THE SITE AS LIVE, ACTIVELY GROWING, OR JUST BREAKING DORMANCY, AND ARRIVE TO THE PROJECT SITE READY FOR PLANTING. THE WETLAND SCIENTIST MAY REJECT PLANTS DAMAGED IN HANDLING OR TRANSPORT. PLANT MATERIAL SHALL BE INSTALLED AS SOON AS POSSIBLE AFTER IT HAS BEEN DELIVERED TO THE SITE. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
11. SOIL AND ROOTMASS SHALL BE WATERED AND MOIST ON DELIVERY TO THE JOB SITE. PLANTS WITH DRY SOIL AND ROOTS SHALL NOT BE ACCEPTABLE. ALL PLANT MATERIALS TEMPORARILY STORED AT THE SITE PRIOR TO PLANTING SHALL BE STORED OUT OF DIRECT EXPOSURE TO SUN AND WIND, SHALL BE MAINTAINED BY CAREFUL WATERING, AND SHALL BE PROTECTED FROM DAMAGE DUE TO CONSTRUCTION ACTIVITIES AND ADVERSE WEATHER.
12. TREE AND SHRUB PLANTING TO OCCUR BETWEEN MAY 1 AND JUNE 15 (SPRING SEASON) OR SEPTEMBER 1 AND NOVEMBER 15 (FALL SEASON).
13. UPON COMPLETION OF PLANTING, THE AREAS AROUND EACH TREE OR SHRUB PLANT WILL BE MULCHED WITH A 3-INCH-THICK LAYER OF LEAF LITTER OR OTHER NATURAL ORGANIC MATERIAL (NOT FRESH WOOD CHIPS). THE LEAF LITTER OR OTHER NATURAL ORGANIC MATERIAL SHALL BE SPREAD TO THE WIDEST EXTENT OF THE PLANT DRIP LINE.
14. CONTRACTOR SHALL SUPPLY A WETLAND SEED MIX INCLUDING A MAJORITY OF THE SPECIES LISTED IN THE WETLAND SEED MIX TABLE. 75% OF THE SEED MIX, BY WEIGHT, SHALL BE INDIGENOUS GRASSES AND SEDGES. SEEDS MUST BE FROM PLANTS GROWN WITHIN 200 MILES OF THE MITIGATION SITE.
15. CONTRACTOR SHALL PROVIDE A WRITTEN ANALYSIS OF THE SEED MIXTURE TO THE WETLAND SCIENTIST. NO SEEDING IS PERMITTED WITHOUT APPROVAL OF THE WETLAND SCIENTIST.
16. CONTRACTOR SHALL SUPPLY AN UPLAND SEED MIX INCLUDING A MAJORITY OF THE SPECIES LISTED IN THE UPLAND SEED MIX TABLE. 75% OF THE SEED MIX, BY WEIGHT, SHALL BE INDIGENOUS GRASSES AND, SEEDS MUST BE FROM PLANTS GROWN WITHIN 200 MILES OF THE MITIGATION SITE, CONTRACTOR SHALL PROVIDE A WRITTEN ANALYSIS OF THE SEED MIXTURE TO THE WETLAND SCIENTIST. NO SEEDING IS PERMITTED WITHOUT APPROVAL OF THE WETLAND SCIENTIST.
17. THE UPLAND SEED MIX SHALL BE APPLIED TO ALL DISTURBED SOILS WITHIN UPLANDS ADJACENT TO THE WETLAND MITIGATION AREA, 5, THE SEED MIXES SHALL BE APPLIED AT A RATE OF 1 LB PER 2,500 SQUARE FEET.
18. WATERING SHALL BE REQUIRED DURING THE GROWING SEASON (MAY 1 - NOV 1) WHEN NATURAL RAINFALL IS BELOW ONE INCH PER WEEK. WATER SHALL BE APPLIED IN SUFFICIENT QUANTITY TO THOROUGHLY SATURATE THE SOIL IN THE ROOT ZONE OF EACH PLANT. FOLLOWING THE FIRST MONTH OF PLANTING, WATERING WILL BE LIMITED TO PERIODS OF DECLARED DROUGHT. WATER SHALL BE PROVIDED BY THE CONTRACTOR AND NOT BE SOURCED FROM WATERWAYS ON SITE.
19. THE EROSION CONTROL BARRIERS WILL BE DISASSEMBLED AND PROPERLY DISPOSED OF BEFORE NOVEMBER 1 OF THE THIRD FULL GROWING SEASON AFTER PLANTING OF THE WETLAND REPLICATION AREA. SEDIMENT COLLECTED BY THE BARRIERS WILL BE REMOVED AND DISPOSED OF IN A MANNER THAT PREVENTS EROSION AND TRANSPORT TO A WETLAND OR WATERWAY. IF MINOR GRADING IS REQUIRED IN THE IMMEDIATE ZONE AROUND THE EROSION CONTROL BARRIER TO PROVIDE SURFACE HYDROLOGIC CONNECTION BETWEEN THE WETLAND ESTABLISHMENT SITE AND THE EXISTING WETLAND AREA, IT WILL BE DONE BY HAND AND STABILIZED BY MULCH.

Plotted on 13-Mar-2025 2:29 PM
Last Saved by: USDM682745 on: Mar 13, 2025 10:20 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchiondal\1006043\TO3-MP44.29_PERMIT\EC-NOTES).dwg

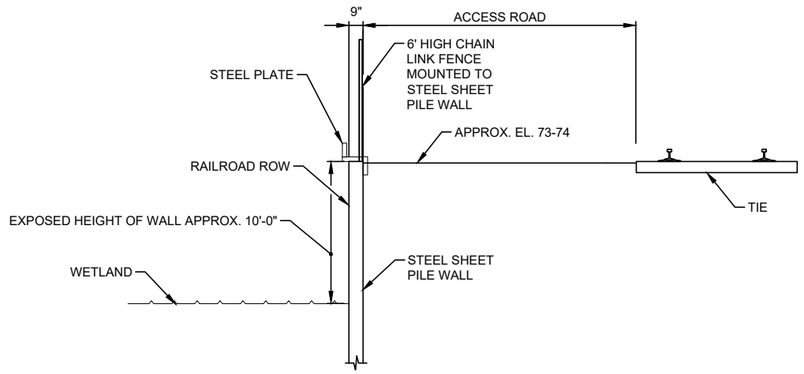
MASSDOT CAPE MAIN
ROCHESTER, MA
CULVERT REPLACEMENT MP 44.29

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA		23	23
PROJECT FILE NO.			

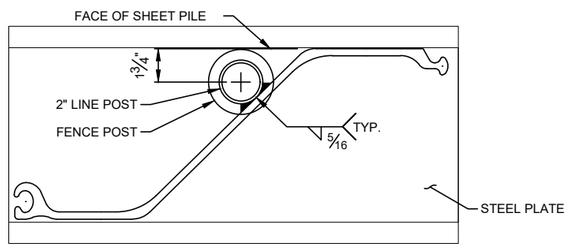
CULVERT AT MP 44.29 SHEET PILE RETAINING WALL DETAILS AND SECTIONS

NOTES:

1. FOR GENERAL CULVERT NOTES, SEE SHEET 3.
2. FOR CHAIN LINK FENCE DETAILS, SEE CIVIL PLANS.



A S-321 SECTION
SCALE: 1/4"=1'-0"



2 - DETAIL
SCALE: 3"=1'-0"

Last Saved by: USDM682745 on: Mar 13, 2025 10:15 AM File: c:\bms\wsp-pb-us-pw-02\wsp__david.melchionda\d1006043\TO3-MP44.29_PERMIT\(WALL-DETAILS).dwg

Plotted on 13-Mar-2025 2:29 PM

APPENDIX C

USFWS IPAC EFFECT DETERMINATION

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: 02/25/2025 16:40:37 UTC
Project Code: 2025-0060588
Project Name: Cape Main MM 44.29 Culvert Replacement

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Updated 4/12/2023 - Please review this letter each time you request an Official Species List, we will continue to update it with additional information and links to websites may change.

About Official Species Lists

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Federal and non-Federal project proponents have responsibilities under the Act to consider effects on listed species.

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested by returning to an existing project's page in IPaC.

Endangered Species Act Project Review

Please visit the "**New England Field Office Endangered Species Project Review and Consultation**" website for step-by-step instructions on how to consider effects on listed

species and prepare and submit a project review package if necessary:

https://www.fws.gov/office/new-england-ecological-services/endangered-species-project-review

NOTE Please do not use the **Consultation Package Builder** tool in IPaC except in specific situations following coordination with our office. Please follow the project review guidance on our website instead and reference your **Project Code** in all correspondence.

Northern Long-eared Bat - (**Updated 4/12/2023**) The Service published a final rule to reclassify the northern long-eared bat (NLEB) as endangered on November 30, 2022. The final rule went into effect on March 31, 2023. You may utilize the **Northern Long-eared Bat Rangewide Determination Key** available in IPaC. More information about this Determination Key and the Interim Consultation Framework are available on the northern long-eared bat species page:

https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis

For projects that previously utilized the 4(d) Determination Key, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective. If your project was not completed by March 31, 2023, and may result in incidental take of NLEB, please reach out to our office at newengland@fws.gov to see if reinitiation is necessary.

Additional Info About Section 7 of the Act
Under section 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether projects may affect threatened and endangered species and/or designated critical habitat. If a Federal agency, or its non-Federal representative, determines that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Federal agency also may need to consider proposed species and proposed critical habitat in the consultation. 50 CFR 402.14(c)(1) specifies the information required for consultation under the Act regardless of the format of the evaluation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/service/section-7-consultations

In addition to consultation requirements under Section 7(a)(2) of the ESA, please note that under sections 7(a)(1) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Please contact NEFO if you would like more information.

Candidate species that appear on the enclosed species list have no current protections under the ESA. The species' occurrence on an official species list does not convey a requirement to

consider impacts to this species as you would a proposed, threatened, or endangered species. The ESA does not provide for interagency consultations on candidate species under section 7, however, the Service recommends that all project proponents incorporate measures into projects to benefit candidate species and their habitats wherever possible.

Migratory Birds

In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see:

https://www.fws.gov/program/migratory-bird-permit

https://www.fws.gov/library/collections/bald-and-golden-eagle-management

Please feel free to contact us at **newengland@fws.gov** with your **Project Code** in the subject line if you need more information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat.

Attachment(s): Official Species List

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

PROJECT SUMMARY

Project Code: 2025-0060588
Project Name: Cape Main MM 44.29 Culvert Replacement
Project Type: Culvert Repair/Replacement/Maintenance
Project Description: Culvert replacement and embankment stabilization
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@41.79920745,-70.78534393968926,14z



Counties: Plymouth County, Massachusetts

ENDANGERED SPECIES ACT SPECIES

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

REPTILES

NAME	STATUS
Plymouth Redbelly Turtle = Plymouth Redbelly Cooter *Pseudemys rubriventris bangsi* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/451	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency:	Private Entity
Name:	Kimberly Degutis
Address:	100 Summer Street
Address Line 2:	13th Floor
City:	Boston
State:	MA
Zip:	02110
Email	kimberly.degutis@wsp.com
Phone:	9732946875

APPENDIX D

SECTION 106 / HISTORIC COORDINATION

2025-02-21

Via Email: thpo@wampanoagtribe-nsn.gov

Ms. Bettina Washington
Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

Subject: MassDOT Cape Main MP 44.29
Culvert Replacement Project
Section 106 Review: Project Notification Form

Dear Ms. Washington:

On behalf of the Massachusetts Department of Transportation, Rail and Transit Division (MassDOT), WSP is submitting a Project Notification Form (PNF) for the replacement of an existing culvert on the MassDOT-owned Cape Main railroad at Mile Post 44.29 in the Town of Rochester, Massachusetts. This PNF has been provided in accordance with the permit requirements of the U.S. Army Corps of Engineers pertaining to Section 106 of the National Historic Preservation Act of 1966.

The proposed project includes the replacement of an existing stone box / concrete pipe culvert under a railroad embankment with a larger concrete pipe culvert with headwall and retaining walls. In addition, MassDOT is proposing to install a steel sheet pile retaining wall to allow safe access along the north edge of the embankment to the culvert for future maintenance activities.

As part of the permit process, we are submitting project information to your office to be reviewed for the presence of historical or archaeological resources that may be impacted by the project.

Should you have any questions or comments regarding this submittal, or if you require additional information, please contact our office at 617.426.7330.

Yours sincerely,

Kimberly K Degutis, PWS
Assistant Vice President
Energy & Environment

cc: Chalita Belfield, MassDOT
Benny D'Artista, WSP

Encl.
WSP ref.: US0027674.0609

WSP USA Environment & Infrastructure, Inc.
100 Summer Street, 13th Floor
Boston, Massachusetts 02110
T: 617-426-7330
wsp.com

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Cape Main MP 44.29 Culvert Replacement

Location / Address: Cape Main MP 44.29

City / Town: Rochester

Project Proponent

Name: MassDOT Rail and Transit Division

Address: 10 Park Plaza, Room 4160

City/Town/Zip/Telephone: Boston, MA 02116 857.368.8957

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)
MassDEP	401 Water Quality Certificate
US Army Corps of Engineers	404 Self-Verification Notification

Project Description (narrative):

Replacement of existing 2'x4' stone box / 30" concrete pipe culvert single pipe)with a 48" concrete pipe culvert in the same location. Installation of steel sheet pile wall.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Removal of the existing culvert will necessitate excavation of the existing railroad embankment

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.

No rehabilitation of existing buildings

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

No new construction is proposed

APPENDIX A (continued)

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.

No mapped resources on MACRIS

What is the total acreage of the project area?

Woodland	0.2 acres	Productive Resources:	
Wetland	0.1 acres	Agriculture	0 acres
Floodplain	0.1 acres	Forestry	0 acres
Open space	0 acres	Mining/Extraction	0 acres
Developed	0.5 acres	Total Project Acreage	0.9 acres

What is the acreage of the proposed new construction? .1 acres

What is the present land use of the project area?

Railroad track and embankment

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: 02/21/25

Name: Kimberly K Degutis, PWS

Address: 100 Summer Street, 13th Floor

City/Town/Zip: Boston, MA 02110

Telephone: 617.426.7330

REGULATORY AUTHORITY

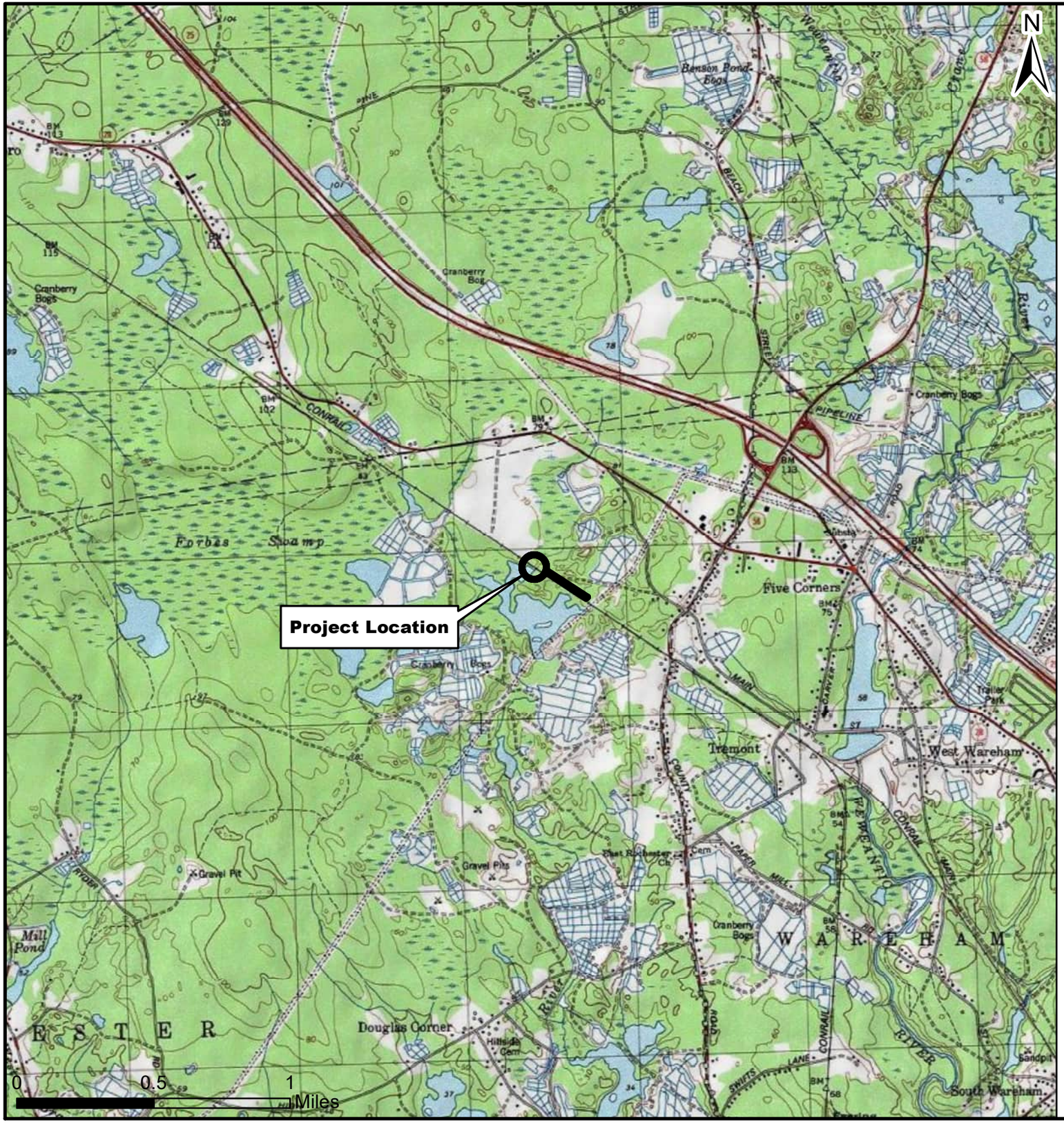
950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

USGS SITE LOCUS

MassDOT Rail and Transit

Cape Main
MP 44.29

Rochester, MA



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Copyright:© 2013 National Geographic Society, i-cubed

Site Locus





U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

OFFICIAL USE

Certified Mail Fee $4.85
Extra Services & Fees (check box, add fee as appropriate)
- ☐ Return Receipt (hardcopy) $ $0.00
- ☐ Return Receipt (electronic) $ $0.00
- ☐ Certified Mail Restricted Delivery $ $0.00
- ☐ Adult Signature Required $ $0.00
- ☐ Adult Signature Restricted Delivery $

Postage $1.50
Total Postage and Fees $6.35

BACK BAY STATION BOSTON, MA 02116
FEB 27 2025
Postmark Here
02/27/2025

Sent To MASS Archives
Street and Apt. No., or PO Box No. 220 Morrissey Blvd
City, State, ZIP+4® Boston MA 02125

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0002 2077 5604

2025-02-21

Via Email: david.s.robinson@mass.gov

Massachusetts Board of Underwater Archaeological Resources (BUAR)
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Subject: MassDOT Cape Main MP 44.29
Culvert Replacement Project
Section 106 Review: Project Notification Form

Dear Mr. Robinson:

On behalf of the Massachusetts Department of Transportation, Rail and Transit Division (MassDOT), WSP is submitting a Project Notification Form (PNF) for the replacement of an existing culvert on the MassDOT-owned Cape Main railroad at Mile Post 44.29 in the Town of Rochester, Massachusetts. This PNF has been provided in accordance with the permit requirements of the U.S. Army Corps of Engineers pertaining to Section 106 of the National Historic Preservation Act of 1966.

The proposed project includes the replacement of an existing stone box / concrete pipe culvert under a railroad embankment with a larger concrete pipe culvert with headwall and retaining walls. In addition, MassDOT is proposing to install a steel sheet pile retaining wall to allow safe access along the north edge of the embankment to the culvert for future maintenance activities.

As part of the permit process, we are submitting project information to your office to be reviewed for the presence of historical or archaeological resources that may be impacted by the project.

Should you have any questions or comments regarding this submittal, or if you require additional information, please contact our office at 617.426.7330.

Yours sincerely,



Kimberly K Degutis, PWS
Assistant Vice President
Energy & Environment

cc: Chalita Belfield, MassDOT
Benny D'Artista, WSP

Encl.
WSP ref.: US0027674.0609

WSP USA Environment & Infrastructure, Inc.
100 Summer Street, 13th Floor
Boston, Massachusetts 02110
T: 617-426-7330
wsp.com

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Cape Main MP 44.29 Culvert Replacement

Location / Address: Cape Main MP 44.29

City / Town: Rochester

Project Proponent

Name: MassDOT Rail and Transit Division

Address: 10 Park Plaza, Room 4160

City/Town/Zip/Telephone: Boston, MA 02116 857.368.8957

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)
MassDEP	401 Water Quality Certificate
US Army Corps of Engineers	404 Self-Verification Notification

Project Description (narrative):

Replacement of existing 2'x4' stone box / 30" concrete pipe culvert single pipe)with a 48" concrete pipe culvert in the same location. Installation of steel sheet pile wall.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Removal of the existing culvert will necessitate excavation of the existing railroad embankment

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.

No rehabilitation of existing buildings

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

No new construction is proposed

APPENDIX A (continued)

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.

No mapped resources on MACRIS

What is the total acreage of the project area?

Woodland	0.2 acres	Productive Resources:	
Wetland	0.1 acres	Agriculture	0 acres
Floodplain	0.1 acres	Forestry	0 acres
Open space	0 acres	Mining/Extraction	0 acres
Developed	0.5 acres	Total Project Acreage	0.9 acres

What is the acreage of the proposed new construction? .1 acres

What is the present land use of the project area?

Railroad track and embankment

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: 02/21/25

Name: Kimberly K Degutis, PWS

Address: 100 Summer Street, 13th Floor

City/Town/Zip: Boston, MA 02110

Telephone: 617.426.7330

REGULATORY AUTHORITY

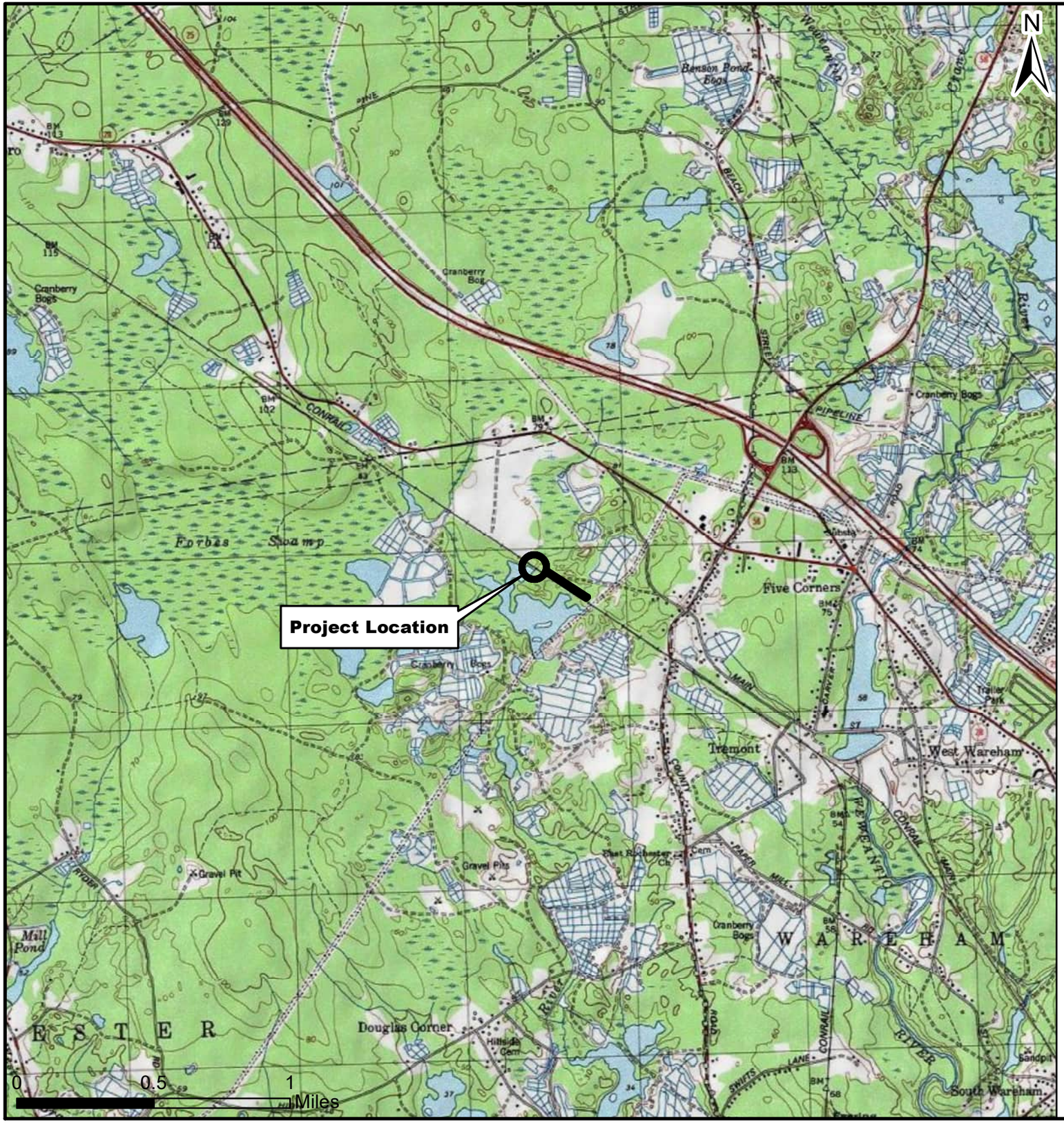
950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

USGS SITE LOCUS

MassDOT Rail and Transit

Cape Main
MP 44.29

Rochester, MA



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Copyright:© 2013 National Geographic Society, i-cubed

Site Locus



2025-02-21

Via Email: 106review@mwtribe-nsn.gov
David.weeden@mwtribe-nsn.gov

Mr. David Weeden
Tribal Historic Preservation Officer (THPO)
483 Great Neck Road South
Mashpee, Massachusetts 02649

Subject: MassDOT Cape Main MP 44.29
Culvert Replacement Project
Section 106 Review: Project Notification Form

Dear Mr. Weeden:

On behalf of the Massachusetts Department of Transportation, Rail and Transit Division (MassDOT), WSP is submitting a Project Notification Form (PNF) for the replacement of an existing culvert on the MassDOT-owned Cape Main railroad at Mile Post 44.29 in the Town of Rochester, Massachusetts. This PNF has been provided in accordance with the permit requirements of the U.S. Army Corps of Engineers pertaining to Section 106 of the National Historic Preservation Act of 1966.

The proposed project includes the replacement of an existing stone box / concrete pipe culvert under a railroad embankment with a larger concrete pipe culvert with headwall and retaining walls. In addition, MassDOT is proposing to install a steel sheet pile retaining wall to allow safe access along the north edge of the embankment to the culvert for future maintenance activities.

As part of the permit process, we are submitting project information to your office to be reviewed for the presence of historical or archaeological resources that may be impacted by the project.

Should you have any questions or comments regarding this submittal, or if you require additional information, please contact our office at 617.426.7330.

Yours sincerely,



Kimberly K Degutis, PWS
Assistant Vice President
Energy & Environment

cc: Chalita Belfield, MassDOT
Benny D'Artista, WSP

Encl.
WSP ref.: US0027674.0609

WSP USA Environment & Infrastructure, Inc.
100 Summer Street, 13th Floor
Boston, Massachusetts 02110
T: 617-426-7330
wsp.com

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Cape Main MP 44.29 Culvert Replacement

Location / Address: Cape Main MP 44.29

City / Town: Rochester

Project Proponent

Name: MassDOT Rail and Transit Division

Address: 10 Park Plaza, Room 4160

City/Town/Zip/Telephone: Boston, MA 02116 857.368.8957

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)
MassDEP	401 Water Quality Certificate
US Army Corps of Engineers	404 Self-Verification Notification

Project Description (narrative):

Replacement of existing 2'x4' stone box / 30" concrete pipe culvert single pipe)with a 48" concrete pipe culvert in the same location. Installation of steel sheet pile wall.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Removal of the existing culvert will necessitate excavation of the existing railroad embankment

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.

No rehabilitation of existing buildings

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

No new construction is proposed

APPENDIX A (continued)

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.

No mapped resources on MACRIS

What is the total acreage of the project area?

Woodland	0.2 acres	Productive Resources:	
Wetland	0.1 acres	Agriculture	0 acres
Floodplain	0.1 acres	Forestry	0 acres
Open space	0 acres	Mining/Extraction	0 acres
Developed	0.5 acres	Total Project Acreage	0.9 acres

What is the acreage of the proposed new construction? .1 acres

What is the present land use of the project area?

Railroad track and embankment

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: 02/21/25

Name: Kimberly K Degutis, PWS

Address: 100 Summer Street, 13th Floor

City/Town/Zip: Boston, MA 02110

Telephone: 617.426.7330

REGULATORY AUTHORITY

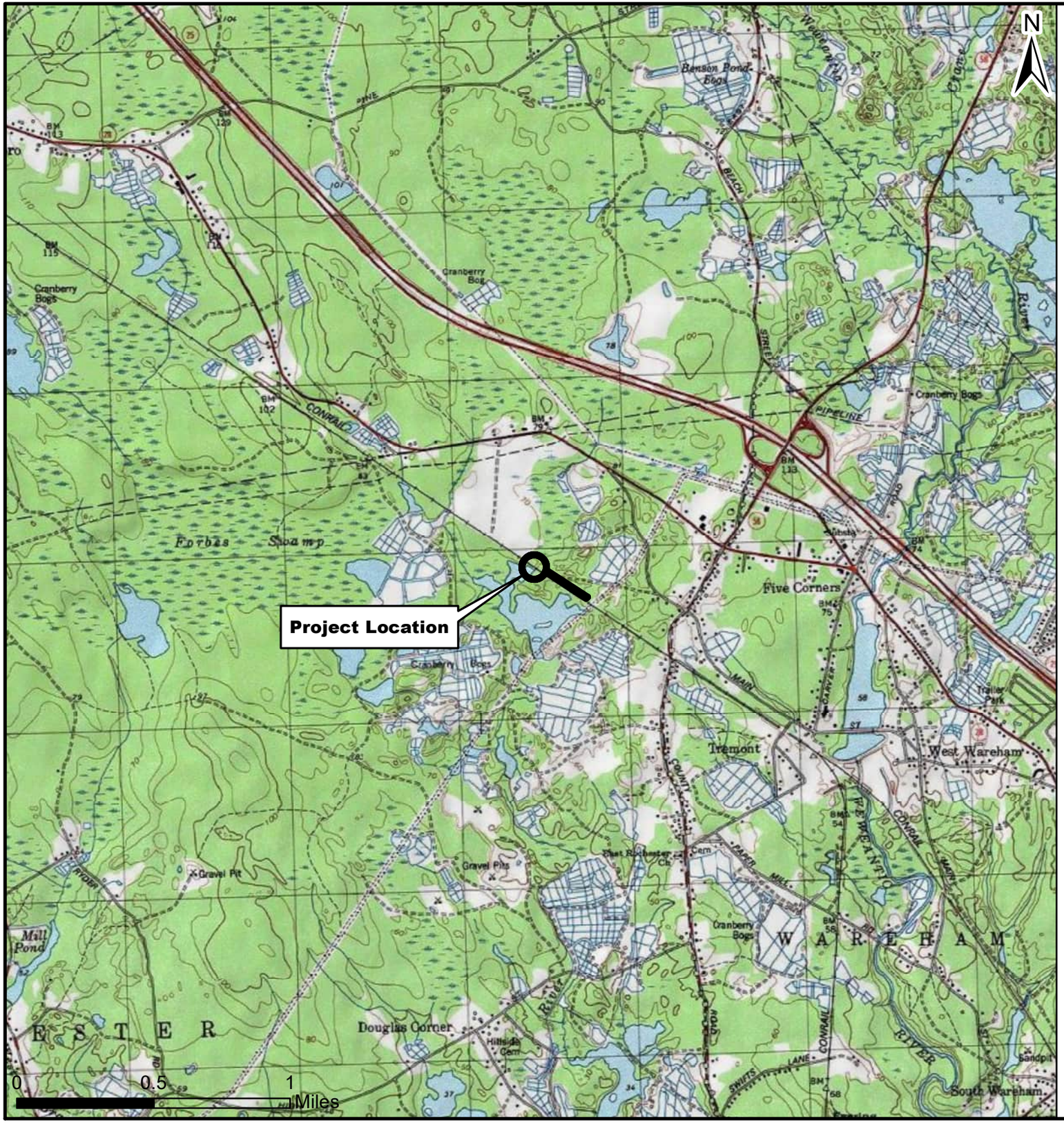
950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

USGS SITE LOCUS

MassDOT Rail and Transit

Cape Main
MP 44.29

Rochester, MA



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Copyright:© 2013 National Geographic Society, i-cubed

Site Locus



2025-02-21

The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

Subject: MassDOT Cape Main MP 44.29
Culvert Replacement Project
Section 106 Review: Project Notification Form

To whom it may concern:

On behalf of the Massachusetts Department of Transportation, Rail and Transit Division (MassDOT), WSP is submitting a Project Notification Form (PNF) for the replacement of an existing culvert on the MassDOT-owned Cape Main railroad at Mile Post 44.29 in the Town of Rochester, Massachusetts. This PNF has been provided in accordance with the permit requirements of the U.S. Army Corps of Engineers pertaining to Section 106 of the National Historic Preservation Act of 1966.

The proposed project includes the replacement of an existing stone box / concrete pipe culvert under a railroad embankment with a larger concrete pipe culvert with headwall and retaining walls. In addition, MassDOT is proposing to install a steel sheet pile retaining wall to allow safe access along the north edge of the embankment to the culvert for future maintenance activities.

As part of the permit process, we are submitting project information to your office to be reviewed for the presence of historical or archaeological resources that may be impacted by the project.

Should you have any questions or comments regarding this submittal, or if you require additional information, please contact our office at 617.426.7330.

Yours sincerely,



Kimberly K Degutis, PWS
Assistant Vice President
Energy & Environment

cc: Chalita Belfield, MassDOT
Benny D'Artista, WSP

Encl.
WSP ref.: US0027674.0609

WSP USA Environment & Infrastructure, Inc.
100 Summer Street, 13th Floor
Boston, Massachusetts 02110
T: 617-426-7330
wsp.com

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Cape Main MP 44.29 Culvert Replacement

Location / Address: Cape Main MP 44.29

City / Town: Rochester

Project Proponent

Name: MassDOT Rail and Transit Division

Address: 10 Park Plaza, Room 4160

City/Town/Zip/Telephone: Boston, MA 02116 857.368.8957

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)
MassDEP	401 Water Quality Certificate
US Army Corps of Engineers	404 Self-Verification Notification

Project Description (narrative):

Replacement of existing 2'x4' stone box / 30" concrete pipe culvert single pipe)with a 48" concrete pipe culvert in the same location. Installation of steel sheet pile wall.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Removal of the existing culvert will necessitate excavation of the existing railroad embankment

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.

No rehabilitation of existing buildings

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

No new construction is proposed

APPENDIX A (continued)

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.

No mapped resources on MACRIS

What is the total acreage of the project area?

Woodland	0.2 acres	Productive Resources:	
Wetland	0.1 acres	Agriculture	0 acres
Floodplain	0.1 acres	Forestry	0 acres
Open space	0 acres	Mining/Extraction	0 acres
Developed	0.5 acres	Total Project Acreage	0.9 acres

What is the acreage of the proposed new construction? .1 acres

What is the present land use of the project area?

Railroad track and embankment

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: 02/21/25

Name: Kimberly K Degutis, PWS

Address: 100 Summer Street, 13th Floor

City/Town/Zip: Boston, MA 02110

Telephone: 617.426.7330

REGULATORY AUTHORITY

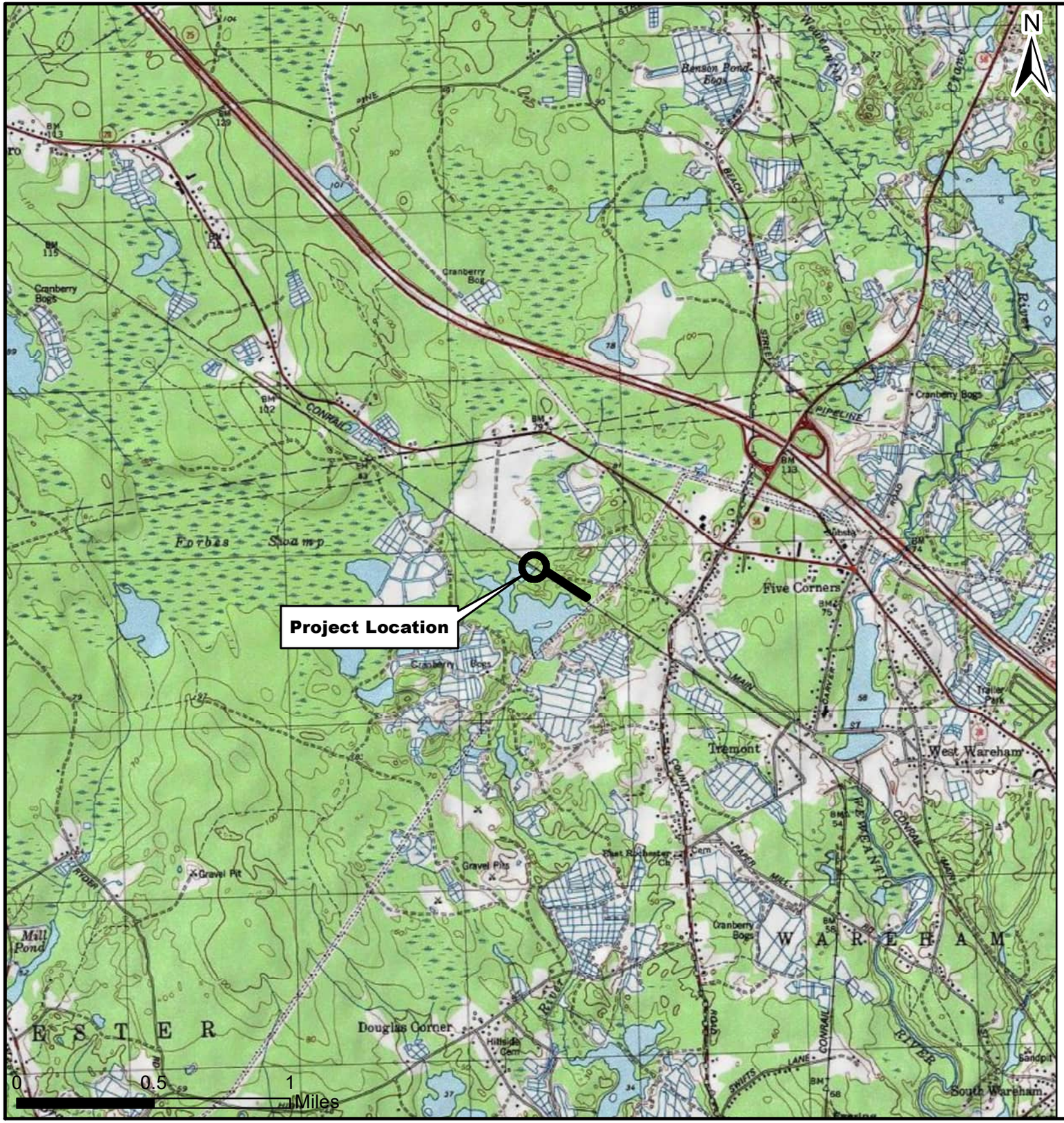
950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

USGS SITE LOCUS

MassDOT Rail and Transit

Cape Main
MP 44.29

Rochester, MA



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Copyright:© 2013 National Geographic Society, i-cubed

Site Locus



2025-02-21

Via Email: tashtesook@aol.com

Mr. John Brown
Tribal Historic Preservation Officer (THPO)
Narragansett Indian Longhouse
4425 South County Trail
Charlestown, Rhode Island 02813

Subject: MassDOT Cape Main MP 44.29
Culvert Replacement Project
Section 106 Review: Project Notification Form

Dear Mr. Brown:

On behalf of the Massachusetts Department of Transportation, Rail and Transit Division (MassDOT), WSP is submitting a Project Notification Form (PNF) for the replacement of an existing culvert on the MassDOT-owned Cape Main railroad at Mile Post 44.29 in the Town of Rochester, Massachusetts. This PNF has been provided in accordance with the permit requirements of the U.S. Army Corps of Engineers pertaining to Section 106 of the National Historic Preservation Act of 1966.

The proposed project includes the replacement of an existing stone box / concrete pipe culvert under a railroad embankment with a larger concrete pipe culvert with headwall and retaining walls. In addition, MassDOT is proposing to install a steel sheet pile retaining wall to allow safe access along the north edge of the embankment to the culvert for future maintenance activities.

As part of the permit process, we are submitting project information to your office to be reviewed for the presence of historical or archaeological resources that may be impacted by the project.

Should you have any questions or comments regarding this submittal, or if you require additional information, please contact our office at 617.426.7330.

Yours sincerely,

Kimberly K Degutis, PWS
Assistant Vice President
Energy & Environment

cc: Chalita Belfield, MassDOT
Benny D'Artista, WSP

WSP USA Environment & Infrastructure, Inc.
100 Summer Street, 13th Floor
Boston, Massachusetts 02110
T: 617-426-7330
wsp.com

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Cape Main MP 44.29 Culvert Replacement

Location / Address: Cape Main MP 44.29

City / Town: Rochester

Project Proponent

Name: MassDOT Rail and Transit Division

Address: 10 Park Plaza, Room 4160

City/Town/Zip/Telephone: Boston, MA 02116 857.368.8957

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)
MassDEP	401 Water Quality Certificate
US Army Corps of Engineers	404 Self-Verification Notification

Project Description (narrative):

Replacement of existing 2'x4' stone box / 30" concrete pipe culvert single pipe)with a 48" concrete pipe culvert in the same location. Installation of steel sheet pile wall.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Removal of the existing culvert will necessitate excavation of the existing railroad embankment

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.

No rehabilitation of existing buildings

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

No new construction is proposed

APPENDIX A (continued)

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.

No mapped resources on MACRIS

What is the total acreage of the project area?

Woodland	0.2 acres	Productive Resources:	
Wetland	0.1 acres	Agriculture	0 acres
Floodplain	0.1 acres	Forestry	0 acres
Open space	0 acres	Mining/Extraction	0 acres
Developed	0.5 acres	Total Project Acreage	0.9 acres

What is the acreage of the proposed new construction? .1 acres

What is the present land use of the project area?

Railroad track and embankment

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: 02/21/25

Name: Kimberly K Degutis, PWS

Address: 100 Summer Street, 13th Floor

City/Town/Zip: Boston, MA 02110

Telephone: 617.426.7330

REGULATORY AUTHORITY

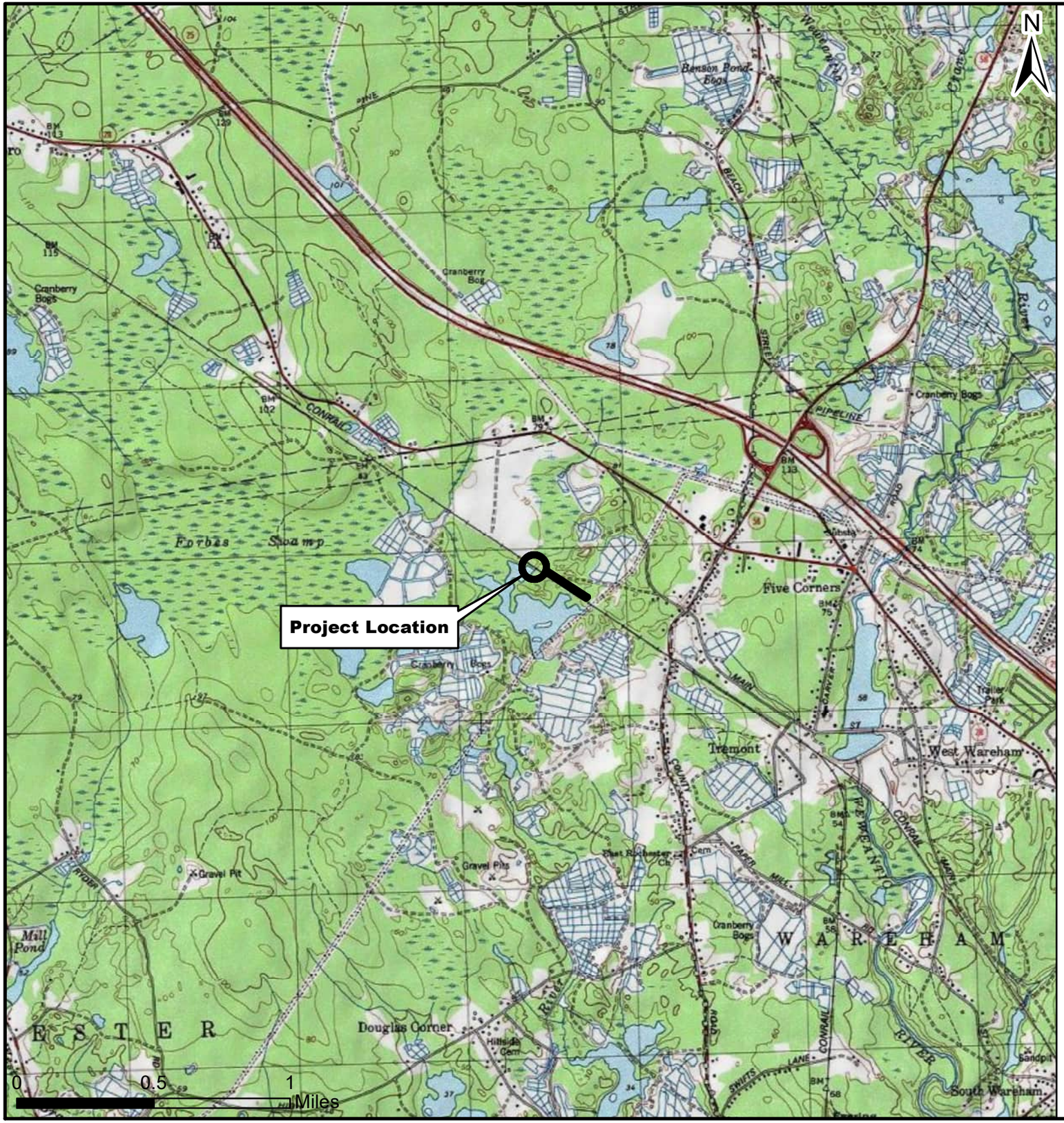
950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

USGS SITE LOCUS

MassDOT Rail and Transit

Cape Main
MP 44.29

Rochester, MA



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Copyright:© 2013 National Geographic Society, i-cubed

Site Locus



APPENDIX E

PUBLIC NOTICE TO ENVIRONMENTAL MONITOR

Outlook

Please publish in the next Environmental Monitor

From Degutis, Kimberly <Kimberly.Degutis@wsp.com>
Date Tue 2/25/2025 8:43 AM
To MEPA@mass.gov <MEPA@mass.gov>
Cc Moroney, Brian <Brian.Moroney@wsp.com>; Cruz, Peter <Peter.Cruz@wsp.com>; Bulger, Nikole <Nikole.Bulger@wsp.com>; Christopher Ross <rossenvironmental.chrisross@gmail.com> <rossenvironmental.chrisross@gmail.com>

1 attachment (7 KB)
EM NOTICE_4429.pdf;

Kimberly Degutis, PWS
Assistant Vice President
Senior Lead Environmental Scientist

T +1 781-400-8276
M +1 973-294-6875

WSP
100 Summer Street, 13th Floor
Boston, Massachusetts
02110

wsp.com



Massachusetts Department of Environmental Protection
Division of Wetlands and Waterways
Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347
508-946-2700

Public Notice

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 an existing stone box culvert by the Massachusetts Department of Transportation, Rail and Transit Division on Cape Main Line Mile Post 44.29 in Rochester for a partially failed culvert. Additional information may be obtained from the Massachusetts Department of Transportation, Rail and Transit Division, 10 Park Plaza, Boston, MA, 857-368-8957. Written comments should be sent to MassDEP Southeast Regional Office, Division of Wetlands and Waterways, 20 Riverside Drive, Lakeville, MA 02347 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.

TOWN OF ROCHESTER
CONSERVATION COMMISSION
Notice of Application

Notice is hereby given that the Massachusetts Department of Transportation, Rail and Transit Division, has filed a 401 Water Quality Certification application for the proposed culvert replacement and sheet pile retaining wall installation on the MassDOT- owned Cape Main Railroad at Mile Post 44.29, located approximately 500-feet south of the SEMASS recycling facility, Rochester, MA.

According to c. 79 § 24 of the (Massachusetts) Acts of 2014, the project qualifies for using the Footprint Bridge Exemption. As stated in the cited regulation, the “bridge” shall include any structure spanning and providing passage over water, railroad right-of-way, public or private way, other vehicular facility or other area”. As the culvert meets the definition of a bridge, the exemption is applicable and eliminates the need for the review under Massachusetts Environmental Policy Act, Wetlands Protection Act and Waterways Regulations (Chapter 91). The project plans may be reviewed at the Commission office at 16 Jan Sebastian Drive during regular business hours.

Christopher Gerrior, Chairman Rochester
Conservation Commission

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00896

MASSDOT MW - 1

THIS PAGE INTENTIONALLY LEFT BLANK

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

Rev. 1 - July 2018

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK



Document No. _____

Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

Director of Railroad Properties
Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

Effective July 1, 2018

Chalita Belfield

Chalita Belfield
Director of Railroad Properties

Date: July 1, 2018

This page intentionally left blank

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

This Manual belongs to:

Name: _____

Employee #: _____

Address: _____

_____

_____

Phone:_____

If this Manual is found,
please return it to the address below:

Director of Railroad Properties
Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

This page intentionally left blank

MassDOT MW-1

MANUAL REVISIONS

We welcome your comments on the MassDOT Manual. Please send all suggestions to:

Director of Railroad Properties
Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

Suggested revisions to this Manual should be submitted in writing in accordance with the following format.

Section/Paragraph Number _____

Page Number _____

Recommended Changes, Corrections, or Questions:

_____

_____

_____

Submitted by:

Name _____

Operating Railroad Company _____

Address _____

_____

_____

Phone _____

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

The Massachusetts Department of Transportation (MassDOT) is committed to providing the safest and most efficient rail service to our customers by maintaining and upgrading the Commonwealth's track infrastructure and assets using best industry recommended practice.

MassDOT has sought to contract with Operating Railroad Companies that will work cooperatively with MassDOT, and that will maintain the Commonwealth's track system at the required standards with competent and dedicated employees.

MassDOT requires their designated Operating Railroad Companies to perform diligent inspections, prepare maintenance and repair programs, and ensure the proper maintenance of track in accordance with the governing operating agreements.

Recommended Practice is based on the best practice developed by and in current use on the United States and Canadian passenger and freight railroads. They allow for a common language amongst railroad administrators, maintenance personnel, contractors, material and equipment suppliers and all others concerned with railroad safety.

Each of the Operating Railroad Companies are currently under agreement with MassDOT. The information found in this Manual contains tables, instructions, and references designed for track and special trackwork as a guide for maintenance personnel in their everyday efforts to maintain a safe and efficient plant.

The MassDOT Manual is a manual of recommended practice. We recognize that best practice of maintenance of way (MOW) continues to change due to the location, environment, operation, and geographic conditions of individual railroads.

The MassDOT Recommended Practice Manual is meant to aid and assist the Operating Railroad Companies to maintain MassDOT-owned tracks in a safe and efficient manner at a reasonable cost. Performing maintenance in accordance with the recommended practice in the MW-1 will meet the expectations of the Commonwealth and provide uniform practice between the different properties of the Operating Railroad Companies.

As of July 2018, the Operating Railroad Companies operate rail freight service and maintain the MassDOT-owned track infrastructure pursuant to License and Operating Agreements with MassDOT on the following line segments:

- Adams Industrial Track: MP 0.0 to MP 5.2
- Conn River Main Line: MP 0.38 to MP 49.7
- Housatonic Railroad: MP 50.0 to MP 85.9
- Massachusetts Central Railroad: MP 1.6 to MP 25.0
- Framingham Secondary: MP 0.0 to MP 21.05
- Middleboro Subdivision:
    - Attleboro Secondary: MP 0.0 to MP 8.6
    - New Bedford Secondary: MP 8.6 to MP 13.3
    - Middleboro Branch: MP 13.3 to MP 21.1
- New Bedford Secondary: MP 13.3 to MP 31.8
- Fall River Secondary: MP 0.0 to MP 12.0
- Cape Main Line:
    - Buzzards Bay Secondary: MP 36.3 to MP 54.7
    - Hyannis Secondary: MP 55.0 to 78.5
- Falmouth Secondary: MP 0.0 to MP 6.8
- South Dennis Secondary: MP 0.0 to MP 2.8
- Dean Street Industrial Track: MP 0.0 to MP 1.5
- Watuppa Branch: MP 6.0 to MP 8.0

MassDOT MW-1

PURPOSE AND USE

The MassDOT MW-1 was developed for MassDOT Rail and Transit Division and selected Operating Railroad Companies who have contracted with MassDOT Rail and Transit Division to operate and maintain lines of track owned by the Commonwealth, as a manual of best practice for the maintenance of track and associated trackwork components. Materials presented in this handbook establish and define MassDOT Rail and Transit Division recommended practice for maintenance of track owned by MassDOT Rail and Transit Division and operated by Operating Railroad Companies under contractual agreements with MassDOT Rail and Transit Division. These practices have been developed to meet the needs of the MassDOT Rail and Transit Division and may be used exactly as presented or modified as is necessary and desirable to meet the present and future needs of the Railroads operating and maintaining MassDOT Rail and Transit Division rail lines, in accordance with the terms of the governing License and Operating Agreements.

In all cases, inspection and restoration of track must be performed in accordance with Federal Railroad Administration (FRA) Part 213, Track Safety Standards.

The intent of the recommended practice is not to establish artificially rigid procedures governing track maintenance but rather to serve as guidelines for prudent track maintenance practice. These guidelines must be used in concert with proper exercise of judgment based upon experience and knowledge of service requirements.

The maintenance limits in the MassDOT MW-1 are unique and are intended to supersede the inspection and restoration limits given in FRA Part 213, provided that the more restrictive practices should be followed. For example, the track gage limits given in the MassDOT MW-1 (53.0(M)) are more restrictive than the track gage limits found in FRA Part 213 (§213.53).

Track maintenance limits and recommended practice in the MassDOT MW-1 are to be used for everyday maintenance activities. The limits act as a trigger to prompt the maintenance or reconstruction of track. The track and related rail infrastructure must be maintained in accordance with the requirements of the relevant License and Operating Agreement between MassDOT Rail and Transit Division and the Operating Railroad

Company. The Commonwealth expects that wherever possible, track shall be maintained so that the track structure does not fall below track maintenance limits established in the MassDOT MW-1.

In all cases, MassDOT Operating Railroad Companies will strive to restore track, make track repairs, and maintain track at or above the respective maintenance limits given in the MassDOT MW-1.

The development of the MassDOT MW-1 involved many hours of input from railroad professionals, and represents the latest recommended practice approved by the MassDOT Director of Railroad Properties. It is understood that these practices are subject to revisions as new technology and improved techniques are established. Other practices may be found to be equally acceptable and, as a result, the materials contained in the MassDOT MW-1 may be modified from time to time to promote the understanding of and efficiency and economy of maintenance of MassDOT-owned rail lines.

The MW-1 is an interactive document. It is expected that every individual that has reason to use this document will constantly strive to offer suggestions and constructive criticism to improve the overall understanding, use, and quality of this Manual.

Modifications to these recommended practice materials must be made in writing, and incorporated into the Manual following approval by MassDOT Rail and Transit Division.

MassDOT MW-1

TABLE OF CONTENTS

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF TRACK

SUBPART A	GENERAL	1
SUBPART B	ROADBED AND RIGHT-OF-WAY	4
SUBPART C	TRACK GEOMETRY	11
SUBPART D	TRACK STRUCTURE AND MATERIALS	26
SUBPART E	TOOLS	69

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF SPECIAL TRACKWORK

SUBPART A	GENERAL	81
SUBPART B	MAINTENANCE PROGRAM	84
SUBPART C	SCHEDULED SITE MAINTENANCE ACTIVITIES	85
SUBPART D	MAINTENANCE LIMITS	86
SUBPART E	GENERAL MAINTENANCE REQUIREMENTS	87
SUBPART F	SCHEDULED MAINTENANCE ACTIVITIES	95
SUBPART G	TURNOUTS IN SIGNALIZED TRACK	99
SUBPART H	MECHANISMS, APPLIANCES, AND DEVICES	100
SUBPART I	SCHEMATICS / PHOTOGRAPHS	104

APPENDIX A	CONTINUOUS WELDED RAIL (CWR) PROCEDURES
APPENDIX B	UNDERBALANCE TABLES – MAXIMUM ALLOWABLE OPERATING SPEED ON CURVES (3" UNDERBALANCE)
APPENDIX C	GLOSSARY
APPENDIX D	PLACEMENT OF TEMPORARY SPEED SIGNS
APPENDIX E	WEIGHTS AND MEASURES
APPENDIX F	FORMS

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK



This page intentionally left blank

SUBPARTS A-E

RECOMMENDED PRACTICE
FOR THE
MAINTENANCE OF TRACK

This page intentionally left blank
.

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF TRACK SUBPARTS A-E

TABLE OF CONTENTS

Page

SUBPART A GENERAL....1
1.0(M) SCOPE....1
3.0(M) APPLICATION....1
5.0(M) MAINTENANCE....1
7.0(M) DESIGNATION OF QUALIFIED PERSONS TO SUPERVISE CERTAIN RENEWALS AND INSPECT TRACK....2
8.0(M) QUALITY CONTROL....3
10.0(M) SIDINGS....3

SUBPART B ROADBED AND RIGHT-OF-WAY....4
31.0(M) SEASONAL PREPARATION AND MAINTENANCE....4
33.0(M) DRAINAGE....4
33.1(M) Culverts....5
35.0(M) CROSS SECTION (ROADWAY)....5
37.0(M) VEGETATION....5
39.0(M) SIGNS....6
41.0(M) HIGHWAY GRADE CROSSINGS....7
41.1(M) Placement of Devices at Grade Crossings....7
41.2(M) Highway Grade Crossing Maintenance....7

SUBPART C TRACK GEOMETRY....11
53.0(M) GAGE....11
53.1(M) Standard for Gage....11
53.2(M) Maintenance of Gage....11
55.0(M) ALIGNMENT....11
55.1(M) Maintenance of Alignment....12
55.2(M) Stringlining Curves....13
55.2.1(M) Stringline Procedures: Road Worker Protection (RWP) and Personal Protection Equipment (PPE)....13
55.2.2(M) Stringline Procedures: Items/Tools Required....14
55.2.3(M) Stationing Curves and Obtaining Stringline Data....14
55.2.4(M) Stringline Data Form....17
57.0(M) CURVES: ELEVATION AND SPEED LIMITATIONS....19
57.1(M) General....19
57.2(M) Superelevation....19
57.3(M) Superelevation Tags....19
59.0(M) Elevation of Curved Track; Runoff....19
61.0(M) CLEARANCES AND TRACK CENTERS....20
61.1(M) Track Centers....20
61.2(M) Horizontal Clearances....21
61.3(M) Vertical Clearances....21
61.4(M) Clearance Limiting Objects....22
62.0(M) GRADES....22
62.1(M) Grade Limitations....22
62.3(M) Horizontal Curves/Minimum Tangent Lengths....23

63.0(M) TRACK SURFACE 23
63.1(M) General 23
63.2(M) Maintenance of Track Surface 23
63.3(M) Surfacing Areas That Require Special Attention 25
63.4(M) Surfacing Track 25

SUBPART D TRACK STRUCTURE AND MATERIALS 26
100.0(M) MATERIALS 26
100.1(M) Handling and Care of Materials 26
100.2(M) Classification of Materials 26
100.3(M) Removal and Disposition of Materials 26
103.0(M) BALLAST; GENERAL 27
103.1(M) Ballast Characteristics 27
103.2(M) Ballast Unloading 27
103.3(M) Ballast Section 27
103.4(M) Fouled Ballast 28
103.5(M) Ballast Cleaning 29
103.6(M) Ballast Gradation 29
109.0(M) CROSSTIES 29
109.1(M) Dimensions of Crossties 30
109.2(M) Use of Crossties 30
109.3(M) Placement of Crossties 31
109.4(M) Preventing Crosstie Damage 31
110.0(M) Switch Timber 32
111.0(M) Bridge Timber 32
113.0(M) RAIL 32
113.1(M) Branding and Stamping 32
113.2(M) Rail End Drilling and Bolt Hole Sizes 33
113.3(M) Recommended Maintenance Wear Limits for Rail 37
113.3.1(M) Maximum Head and Gage Face Wear or Rail (In and Out of Track) 37
113.3.2(M) Railway Limits for the Welding of Relay Rail 37
113.3.3(M) Classification and Identification of Rail for Reuse (In and Out of Track) 40
113.3.4(M) Transposing and Turning Rail on Curves 41
113.3.5(M) Gage Face Angle (Worn Rail) 41
113.4(M) Rail Classifications 42
113.4.1(M) Defective Rails 42
113.4.2(M) New Rails 43
113.4.3(M) Cropped or Relay Rails 43
113.5(M) Disposition and Shipment of Rails 43
113.6(M) Distributing Rail 43
113.7(M) Preparation and Care 44
113.8(M) Laying Jointed Rails 44
113.9(M) Rail End Bolt Holes 46
113.10(M) Cutting and Electric Arc Welding of Rail 46
113.11(M) Bonding Rails for Track Circuits 47
113.12(M) Maintenance of Rail By Grinding 47
113.13(M) Repair of Welds and Rail Head Depressions by Welding or Grinding 48
113.13.1(M) Cross Cutting (Slotting) of Bolted Joints 48
113.14(M) Passing Trains Over Broken Rails and/or Pull-Aparts 48
115.0(M) RAIL END MISMATCH 49
117.0(M) RAIL END BATTER/BEVELING OF RAIL ENDS 49

118.0(M) RAIL LUBRICATION....52
119.0(M) CONTINUOUS WELDED RAIL PROCEDURES....52
121.0(M) RAIL JOINTS....52
121.1(M) Field Welding of Rail Joints....52
121.1.1(M) Thermite Field Welding....53
121.1.2(M) Electric Flash Butt Welding....55
121.2(M) Bolted Rail Joints....55
121.3(M) Insulated Rail Joints....58
123.0(M) TIE PLATES....59
124.0(M) TIE PADS....61
125.0(M) RAIL ANCHORS/ELASTIC FASTENERS....61
125.1(M) Anchor Placement....61
125.2(M) Fasteners Required....61
125.3(M) Anchor Maintenance....63
125.4(M) Anchor Use....64
127.0(M) RAIL FASTENING SYSTEMS....64
127.1(M) Number Required....64
127.2(M) Installation of Fasteners....64
127.2.1(M) Elastic Fasteners/Clips....64
127.2.2(M) Screw Spikes....65
127.2.3(M) Cut Track Spikes....65
127.3(M) Rail Fasteners Required....66
129.0(M) TRACK SHIMS....67
145.0(M) BRIDGE GUARD RAILS....67
145.1(M) Location....67
145.2(M) Materials....67
145.3(M) Application....68
145.4(M) Inspection and Maintenance....68

SUBPART E TOOLS....69
150.0(M) TOOL REQUIREMENTS....69
150.1(M) Inspection Tools....69

This page intentionally left blank.

Subpart A - General

§1.0(M) SCOPE

(a) Maintenance is both spot and out-of-face replacement of components of the track structure such as laying new or relay rail or installing ties so as to maintain the infrastructure in a state-of-good repair.

(1) Maintenance limits are to be used as a triggering mechanism that prompts maintenance or reconstruction.

(2) It is MassDOT's policy to have a track structure that stays between new construction and maintenance limits.

(3) As the track structure wears, maintenance should be programmed before the track reaches the MassDOT maintenance limits.

(4) Should these maintenance limits be exceeded, maintenance must be completed prior to reaching the limits found in FRA Part 213.

(5) Whenever possible, track should be repaired or reconstructed to new track tolerances.

(b) This subpart provides practices that will be used for the maintenance of track. It is for the guidance of Operating Railroad Companies that maintain and repair track.

(c) This subpart contains "maintenance limits" that are to be used when maintaining track and are not to be confused with the minimum limits found in FRA Part 213 or with new track tolerances.

§3.0(M) APPLICATION

The MW-1 applies to all operating railroads that have maintenance and compliance responsibility on MassDOT-owned railroad property.

§5.0(M) MAINTENANCE

(a) The responsible personnel in charge of performing the maintenance work for the Operating Railroad Companies shall be qualified to maintain, restore, or renew trackwork in accordance with FRA §213.7(a), (b), (c) and (d).

(b) The person responsible for the work shall coordinate and report all maintenance work on the appropriate form to the Operating Railroad Company and MassDOT Rail and Transit Division.

(c) A record of all maintenance performed and all required inspection reports shall be maintained by the Operating Railroad Company for the duration of their operating contract. Reports to be provided are as follows:

(1) Track Inspection Reports (planned and special)

(2) Switch Inspection Reports (planned and special)

(3) Rail Defect Inspection Reports:

- Detector Car Report (car to be ridden by Operating Railroad Company Official)
- Rail Failure Report

(4) Reports included in CWR procedures section (see Appendix A, "Continuous Welded Rail (CWR) Procedures").

§7.0(M) DESIGNATION OF QUALIFIED PERSONS TO SUPERVISE CERTAIN RENEWALS AND INSPECT TRACK

(a) Each Operating Railroad Company to which this Part applies shall designate qualified persons to supervise restorations and renewals of track under traffic conditions. Each person designated shall have:

(1) At least:

(i) 1 year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he or she:

(i) Knows and understands the requirements of this Part that apply to the restoration and renewal of the track for which he or she is responsible;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this Part.

(b) Each Operating Railroad Company to which this Part applies shall designate qualified persons to inspect track for defects. Each person designated shall have:

(1) At least:

(i) 1 year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he or she:

(i) Knows and understands the requirements of this Part that apply to the inspection of track for which he or she is responsible; and

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this Part, pending review by a qualified person designated under Paragraph (a) of this section.

(c) Individuals designated under Paragraphs (a) or (b) of this section that inspect continuous welded rail (CWR) track or supervise the installation, adjustment, and maintenance of CWR track in accordance with the written procedures of the track owner shall have:

(1) Current qualifications under either Paragraphs (a) or (b) of this section;

(2) Successfully completed a comprehensive training course specifically developed for the application of written CWR procedure issued by the track owner;

(3) Demonstrated to the Operating Railroad Company that the individual:

(i) Knows and understands the requirements of those written CWR procedures; and

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(4) Written authorization from the Operating Railroad Company to prescribe remedial actions to correct or safely compensate for deviations from the requirements in those procedures and successfully completed a recorded examination on those procedures as part of the qualified process.

(d) Persons not fully qualified to supervise certain renewals and inspect track as required in Paragraphs (a) through (c) of this section, but with at least one year of maintenance of way (MOW) or signal experience, may pass trains over broken rails and pull-aparts provided that:

(1) The Operating Railroad Company determines the person to be qualified and, as part of doing so, trains, examines, and re-examines the person periodically within two years after each prior examination on the following topics as they relate to the safe passage of trains over broken rails or pull-aparts: rail defect identification, crosstie condition, track surface and alignment, gage restraint, rail end mismatch, joint bars, and maximum distance between rail ends over which trains may be allowed to pass. The sole purpose of the examination is to ascertain the person's ability to effectively apply these requirements and the examination may not be used to disqualify the person from other duties. A minimum of four hours training is required for initial training;

(2) The person deems it safe and train speeds are limited to a maximum of 10 MPH over the broken rail or pull apart;

(3) The person shall watch all movements over the broken rail or pull apart and be prepared to stop the train if necessary; and

(4) Person(s) fully qualified under FRA §213.7 are notified and dispatched to the location promptly for the purpose of authorizing movements and effecting temporary or permanent repairs.

§8.0(M) QUALITY CONTROL

(a) The person in charge of performing the maintenance activity or repair shall be responsible for the overall quality of the work performed.

(b) All maintenance work shall be performed in accordance with this Part.

(c) The Operating Railroad Company shall review the work performed for quality, consistency, and compliance to this Part.

(d) Trackwork repairs that are deficient:

(1) Shall be brought to the attention of the Operating Railroad Company.

(2) May be cause for remedial action.

(e) The Operating Railroad Company shall see that any additional work necessary is performed to bring the repair into compliance with this Part.

(f) The Operating Railroad Company shall be responsible to re-inspect the corrected work to ensure that it is in compliance with this Part.

(g) The Operating Railroad Company is encouraged to make recommendations to the MassDOT Rail and Transit Division as to required modifications to methods, procedures, and practice to improve the overall quality of the work.

§10.0(M) SIDINGS

Maintenance of Way (MOW) forces maintain up to the derail and/or property line on industrial siding tracks.

Subpart B - Roadbed and Right-of-Way

§31.0(M) SEASONAL PREPARATION AND MAINTENANCE

(a) Fall/Winter

(1) Dig out switch (gas, electric) rods

(2) Check heaters

(3) Before winter, clean sand out of flange ways at all highway grade crossings

(4) Keep crossing ends and flanges clear of snow and ice

(5) Ensure adequate supplies of materials/tools and snow equipment

(6) Order frost spikes/shims

(7) Order rope and drift pins from approved supplier and prepare for usage (to heat rail)

(8) Clean snow from switches at switch points, frog points and guard rails

(9) Obtain cleaner and lubricate Sargeant and Greenleaf switch locks

(b) Spring/Summer (Special Inspections after Acts of Nature)

(1) Verify proper neutral temperature of rail installed at less than the desired neutral temperature range and adjust as required (see Appendix A, "Continuous Welded Rail (CWR) Procedures").

(2) Plan vegetation control.

(3) Remove temporary shims/spikes.

(4) Bring winter equipment back to central headquarters.

(5) Perform heat patrol (kinks).

(6) Perform rain storm patrols – inspection and cleaning of culverts.

(7) Check and cross-cut joints in track.

(8) Lubricate main line hand throw and yard switches.

§33.0(M) DRAINAGE

(a) Drainage is of prime importance for the maintenance of track. Water mixing with materials in the roadbed tends to make the entire track structure unstable.

(b) Water seeping or flowing toward the track should be carried across and off the roadbed or be intercepted and diverted before it reaches the roadbed.

(c) Water falling upon the roadbed should be quickly drained off to side ditches or drainage structures.

(d) Every effort should be made to see that water from adjacent property does not drain on the MassDOT right-of-way. In areas where this condition is observed the MassDOT Rail and Transit Division shall be notified.

(e) Cross drains should be installed and maintained, particularly where bridges, road crossings, and sags interfere with longitudinal drainage.

(f) Maintenance of drainage systems must satisfy the requirements of FRA §213.33.

(g) Distribution of track or construction materials, and the disposal of fouled ballast and ditch materials, should be handled in such a manner that they no longer interfere with track drainage.

(h) Operating Railroad Company shall notify the MassDOT Rail and Transit Division any time debris is dumped on MassDOT property by abutters.

§33.1(M) Culverts

(a) Culverts require regular inspection and maintenance as do other railroad structures. When making inspections of track and roadway, MassDOT' s Operating Railroad Companies should:

(1) Railroad shall have and maintain an updated list of all culvert locations within the right-of-way. Inspectors should be aware of the location of culverts within the right-of-way.

(2) The tie over the culvert should be painted white and web of rail shall be marked with mile post location.

(3) Be aware that culverts must not only support the live load of trains but the dead load of the track structure.

(4) Report the backup of water near culverts or any abnormal conditions around the ends of culverts (e.g., water seeping through ballast structure).

(5) Report any abnormal conditions found in the track structure at a culvert (e.g., loss of ballast). Operating Railroad Company shall then notify the MassDOT Rail and Transit Division.

(6) If unusual conditions are found at culvert locations, take appropriate remedial action. Appropriate remedial action shall be taken by a Operating Railroad Company qualified individual.

(7) For additional information on culverts, see American Railway Engineering and Maintenance Association (AREMA), Chapter I, Part 4, "Culverts."

§35.0(M) CROSS SECTION (ROADWAY)

Wherever possible, roadbeds, embankments, and excavations should be maintained in accordance with the Massachusetts Bay Transportation Authority (MBTA) Book of Standard Plans. Deviation from approved cross sections should not be made without authorization from the MassDOT Rail and Transit Division.

§37.0(M) VEGETATION

(a) Growth of vegetation should be encouraged on slopes of embankments, cuts, and deep ditches to prevent erosion and to maintain stability.

(b) Vegetation growth must be controlled in accordance with the requirements of FRA §213.37.

(c) The goal of MassDOT is to have the right-of-way cleared of both brush and vegetation in the track and to within 25' of the track centerline. This should be accomplished using a combination of brush cutting and weed spraying.

(d) Vegetation on railroad property, which is on or immediately adjacent to roadbed, must be controlled so that it does not:

(1) Become a fire hazard to track-carrying structures;

(2) Obstruct visibility of railroad signs and signals;

(i) Along the right-of-way

(ii) At highway-rail crossings

(3) Interfere with railroad employees performing normal trackside duties;

(4) Prevent proper functioning of signal and communication lines; or

(5) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

(e) The Operating Railroad Companies shall develop and carry out vegetation management programs as required by MassDOT.

(f) The Operating Railroad Companies shall provide copies of their approved management programs to the MassDOT Rail and Transit Division.

§39.0(M) SIGNS

(a) Track signs and posts must be placed and maintained in accordance with either the MBTA Book of Standard Plans and/or AREMA Chapter 1, Part 7 Roadway Signs and operating special instructions. They should not be installed so as to interfere with signals or safety appliances.

(b) The following is a list of the common signs, which are maintained by the Operating Railroad's Maintenance of Way Department:

(1) Whistle Posts (see Paragraph (c) for placement)

(2) Permanent Speed Restriction Signs (see Operating Railroad Company Time Table Special Instructions) (MBTA Standard Plan No. 3304)

(3) Temporary Speed Signs (see Appendix D)

(4) Mile Posts (see appropriate Track Charts) (MBTA Standard Plan No. 3302)

(5) Station Markers (see Operating Railroad Company Time Table Special Instructions)

(6) End of Block (see Operating Railroad Company Time Table)

(7) Stop Boards (see Operating Railroad Company Time Table)

(8) Clearance Marker (fouling point) painted rail or ties in yellow

(9) Close Clearance Markers (MBTA Standard Plan No. 3312)

(10) Yard Limit Signs (see Operating Railroad Company Time Table) (MBTA Standard Plan No. 3304)

(11) Switch Targets (MBTA Standard Plan No. 3030)

(12) Spring Switch Markers (SS) (MBTA Standard Plan No. 3304)

(13) No Trespassing/No Dumping Signs (MBTA Standard Plan No. 3208)

(14) Cross Bucks (Passive) (MBTA Standard Plan No. 3388)

(15) Crossing Approach Circuit Signage (XC) at Highway Grade Crossing

(16) Emergency Notification Sign at all Public and Private Grade Crossings (as per FRA Requirements) (Manual on Uniform Traffic Control Devices (MUTCD) Figure 8B-5)

(17) Bridge Markers (undergrade and overhead bridges)

(18) Culvert Markers (mark on web of rail and paint ties white)

(19) Track Lubricator Signage

(20) Buried Cable Signs (MBTA Standard Plan No. 3344)

(21) Low Ground Clearance at Grade Crossings (MUTCD Figure W10-5 and W10-5P)

(22) Snow Flanger Sign (MBTA Standard Plan No. 3304)

(23) Will Not Clear Man on Side of Car (MBTA Standard Plan No. 3314)

(c) Whistle post placement:

(1) Whistle posts are placed 1,320' in advance of a public grade crossing so as to comply with Massachusetts General Law (MGL), Chapter 160 "Railroads," Section 138 "Warning to Public."

§41.0(M) HIGHWAY GRADE CROSSINGS

(a) Typical grade crossing surfaces found on the MassDOT are as follows (see also MBTA Standard Plan Nos. 3100, 3106, 3108, 3120):

(1) Timber

(2) Timber and asphalt

(3) Asphalt with cut flangeways

(4) Asphalt with rubber rail seal

(5) Full depth rubber

(6) Full depth concrete

(7) Full depth rubber on the gage and rail seal and asphalt on the field side

(8) Special products as approved by the MassDOT Rail and Transit Division at grade crossings or at pedestrian crossings

§41.1(M) Placement of Devices at Grade Crossings

(a) Whistle signs shall be installed in accordance with Commonwealth of Massachusetts requirements (see §39.0(M)(c)).

(b) The design and placement of grade crossing signage, roadway signage, and appliances at both public and private grade crossings are governed by the Manual on Uniform Traffic Control Devices (MUTCD, see Part 8).

(c) Low ground clearance at grade crossings (see the MUTCD).

§41.2(M) Highway Grade Crossing Maintenance

(a) All roadway signs, highway traffic signal systems, and pavement markings are maintained by the municipality and/or Commonwealth.

(b) The railroad warning devices whether passive or active are maintained by the Operating Railroad Companies.

(c) At private grade crossings, any paving markings or highway signage is the responsibility of the roadway owner. The Emergency Notification Sign is the responsibility of the Operating Railroad Companies.

(d) Crossings should be kept clean and attention given to the following:

(1) Drainage: sloping the surface, if necessary, and constructing underground drains, as required.

(2) Surface water flowing along the highway toward the railroad should be diverted before it reaches the tracks.

(3) The ends of the crossing shall extend at least 2' beyond the width of the highway. Crossing surface installed in a gated pedestrian walkway area should be restricted to the width of the sidewalk gate.

(4) It is recommended that the ends of the crossing surfaces be protected by either end deflector plate/ballast or asphalt to prevent against dragging equipment.

(5) Flangeways shall be 2-1/2" wide and not less than 2" deep. They must be kept clean at all times and free of debris, ice, and snow.

(6) Crossing surface materials and components should be inspected, aligned, and properly secured to the track structure so that the materials cannot damage rolling stock and/or motor vehicles. Crossing surface material that cannot be properly secured and/or repaired shall be removed and temporarily replaced with cold patch or asphalt.

(7) The four quadrant site distances for vehicles approaching the highway grade crossing shall be kept as clear as practicable.

(8) When installing or making general repairs to crossings, track alignment should be established by transit and/or mechanical lining devices.

(9) The condition of crossing approaches is vital to the performance of a grade crossing. Special attention should be paid to the surface and alignment on the crossing approaches so that the ties are tamped and there is a smooth transition into the crossing area.

(10) Special attention should be paid to the maintenance of joints and welds at crossing ends. This includes insulated and conventional track joints, as well as field and plant welds. When performing maintenance, track joints should be eliminated as soon as possible.

(11) Joints must be avoided within the area of the crossing panel.

(12) When working at a crossing, rail should be observed under load to determine if there is excessive rail movement. As track deflects under load, cut spikes tend to loosen. Loose and worn fastening systems should be repaired and/or replaced as necessary to minimize all track and crossing surface movement.

(13) In an emergency (broken weld or rail), when welding joints within the limits of the crossing panel, closure welds may be made by the thermite process.

(14) When changing a broken rail in a crossing, ensure that all clips, spikes, plates, and excessively worn components are replaced and secured. Galvanized clips should be installed. Ties should be tamped. Rails temporarily joined with joint bars should be field welded as soon as practicable. If the broken rail is replaced in CWR territory refer to Appendix A, “Continuous Welded Rail (CWR) Procedures” for proper rail adjustment procedures.

(15) Use of gage rods in crossings is prohibited.

(16) Fastening and clipping devices shall be used that do not interfere with the installation of the crossing surface materials.

(17) Galvanized clips should be used in crossings with an elastic fastening system.

(18) Seasonal clearing of silt and other debris from both crossing approaches.

(19) Clean out flangeways in the Fall (e.g., sand and dirt).

(e) All new crossings must be complaint with the Americans with Disabilities Act (ADA).

(f) MassDOT has a number of different types of highway grade crossings types. Pictures of the more common types are shown below:

(1) Asphalt With Cut Flangeway (not recommended for mainline track except overnight during crossing renewals or for emergency repairs).



(2) Timber and Asphalt



(3) Timber



(4a) Full Depth Rubber with Rail Seal



(4b) Full Depth Rubber with Rail Seal



(5) Full Depth Concrete on Wood or Concrete Ties



(6) Rubber Flangeway and Asphalt



Subpart C - Track Geometry

§53.0(M) GAGE

§53.1(M) Standard for Gage

(a) The standard gage for track, measured between the running rails at right angles to the track, 5/8" below the top of rail, is 56-1/2".

(b) Gage will be 56-1/2" unless specified by the MassDOT Rail and Transit Division.

(c) When gaging is required, care should be taken to not adversely affect the alignment of the track. Changes in prescribed gage should be made in uniform increments as given in §53.2(M).

(d) Gage shall be changed by adjustment of the rail opposite the line rail (preferred method).

(e) In some cases, gage may be adjusted on the line rail only if the adjustment will improve line and ride quality (e.g., joint elbowed out on the line rail).

(f) In cases where the line rail is re-aligned, re-spike line high rail and then re-gage the low rail.

§53.2(M) Maintenance of Gage

(a) Gage shall be measured with a standard track gauge or other authorized devices. These devices must be checked daily prior to use for accuracy.

(b) Maintenance shall be performed when gage reaches the following limits:

Gage Maintenance Limits			
Class of Track	**Minimum (Inches)**	**Maximum (Inches)**	**Maximum Rate of Change in Gage per 31' (Inches)**
1	56-1/8	57-1/2	1
2	56-1/8	57-1/4	3/4
3	56-1/4	57-1/4	3/4
4	56-1/4	57	1/2
5	56-1/4	57	1/2

(c) Gage rods shall be applied only in emergency situations for temporary repair. Permanent repairs to gage should be completed as soon as possible. On main line tracks, gage rods shall only be installed in an emergency and removed as soon as possible.

(d) When using gage rods in signal territory, insulated rods are to be tested by the Signal Maintainer prior to installation. When permanent repairs are completed, gage rods are to be completely removed.

§55.0(M) ALIGNMENT

Alignment is the horizontal location of a railroad as described by curves, spirals, and tangents.

§55.1(M) Maintenance of Alignment

(a) Outer rails of curves and field side rails on tangents should be selected as the line rails. On single tangent track, either rail may be used as the line rail, however, the north or east rail is the preferred line rail. The same line rail shall be used for the full length of the track tangent.

(b) In general, alignment information may be obtained using the following:

(1) The stringline method.

(2) Surveying equipment or a rail-mounted laser.

(3) The automatic geometry system on an approved tamper.

(4) Track geometry car.

(c) Maintenance shall be performed when alignment values reach the limits given in the table below.

(1) Alignment deviation in curves, as defined in this table, is the difference in mid-ordinate value between adjacent stations and not the average of multiple stations (uniformity) as defined in FRA §213.55.

(2) The definition of alignment deviation used in this paragraph, allows the maintainer to achieve alignment tolerances that are more restrictive than those defined in FRA §213.55.

Alignment Maintenance Limits			
	Tangent Track	**Curved Track**	
Class of Track	**The deviation of the mid-offset from a 62' chord[(1)] may not be more than (Inches):**	**The deviation of the mid-ordinate from a 31' chord[(2)] may not be more than (Inches):**	**The deviation of the mid-ordinate from a 62' chord[(2)] may not be more than (Inches):**
1	3-3/4	N/A[(3)]	3-3/4
2	2-1/4	N/A[(3)]	2-1/4
3	1-1/4	7/8	1-1/4
4	1	3/4	1
5	1/2	3/8	1/2

Notes:

[(1)] The ends of the line shall be at points on the gage side of the line rail, 5/8" below the top of the railhead. Either rail may be used as the line rail; however, the same rail shall be used for the full length of that tangential segment of track.

[(2)] The ends of the line or chord must be at points on the gage side of the line rail, 5/8" below the top of the rail head. Use line rail in accordance with §55.1(M).

[(3)] N/A – Not Applicable.

(d) Designation of line rail:

(1) On tangent track in single track either rail or rail on the mile post side.

(2) On tangent track and multiple tracks the field side rail.

(3) In single or multiple tracks in curves on the high/outer rail.

(e) Curve realignment changes in CWR territory must be made in accordance with Appendix A, "Continuous Welded Rail (CWR) Procedures."

(f) Alignments must be maintained within the prescribed limits given above. Roadway clearances are prescribed in AREMA, Chapter 28 (see Table 28-3-3, "Legal Clearance Requirements by State" (in English Units)).

§55.2(M) Stringlining Curves

(a) Stringlining of curves is a method for determining the most advantageous alignment that can be obtained with reasonable amounts of throw.

(b) Any of the established numerical or mathematical methods, such as the automated geometry system on tampers, the "Bartlett Method" or "Bracket Method," may be used to calculate the throws of curves.

(c) The practical relationship between station and chord length, mid-ordinate value, and degree of curvature for station lengths most commonly used is shown below:

Degree of Curve	Mid-Ordinate	Station Length	Chord Length
1°	1"	31'	62'
1°	1/4"	15'-6"	31'

(d) In higher degree curves, shorter station lengths and chords are to be used. It may be desirable to use longer station lengths and chords for curves less than 30 minutes.

(e) Basic stringlining principles:

(1) The mid-ordinates of a curve are indicative of its degree of curvature.

(2) The mid-ordinates of a uniform circular curve are equal when measuring offsets using chords of equal length.

(3) The mid-ordinate varies directly with the degree of curvature.

(4) Where track is thrown in or out at any single station on the curve, the mid-ordinate of the curve at the station is affected by the amount of the throw and the mid-ordinates at the adjacent stations are affected by half the throw amount, but in the opposite direction.

(5) All calculations should be checked to ascertain that the calculated throws will actually produce the required changes in mid-ordinates.

§55.2.1(M) Stringline Procedures: Road Worker Protection (RWP) and Personal Protection Equipment (PPE)

(a) Ensure area to be stringlined has the proper RWP Procedures in effect.

(b) A minimum of three people is required when using conventional stringline equipment.

(c) Many curves have grease on the rails with residual amounts on the ties and ballast so caution needs to be taken when walking in areas to be stringlined.

(d) Wear Operating Railroad Company's designated PPE, to include gloves that protect hands from getting dirty.

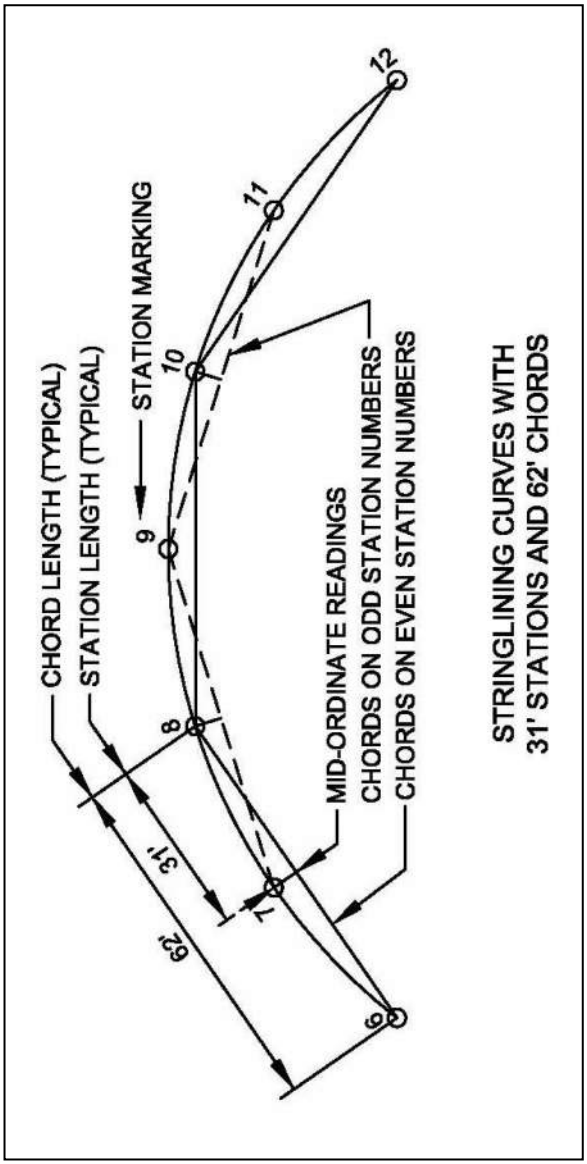
(e) Ensure that all stringline equipment is cleaned after use.

§55.2.2(M) Stringline Procedures: Items/Tools Required:

(a) Keel or crayon marker
(b) Writing instrument
(c) Stringline data sheet (as given below) with clip board
(d) 100' cloth tape with 6' folding wood ruler
(e) Stringline paddles with string
(f) Ordinate ruler
(g) Level board

§55.2.3(M) Stationing Curves and Obtaining Stringline Data

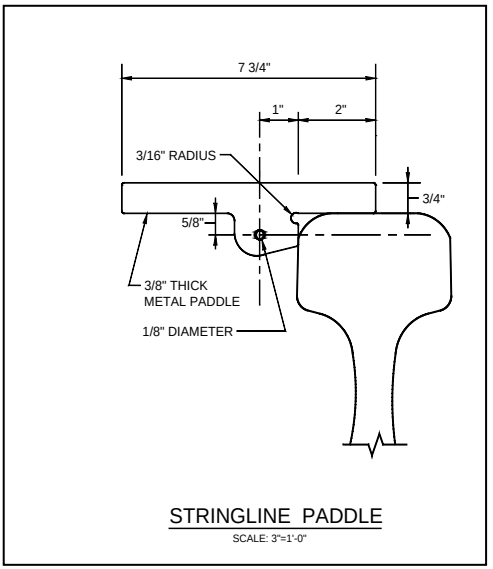
(a) The figure below shows a typical curve with stationing marked out in keel and the chords in place for measurement of mid-ordinates.
(b) Ordinate readings are taken at odd and even stations.
(c) A chord length of 62' is the chord used for this stationing.



Stringlining of Curves

(d) Stationing shall begin at a point on the tangent far enough ahead of the curve to permit the measurement of any reverse curvature or “dog-leg.” Stationing shall continue throughout the curve to a point on the tangent five stations beyond the tangent point to permit measurement of any reverse curvature. Mark stations on rail web with keel.

(e) When obtaining mid-ordinate date, stringline paddles should be used to position the string a distance of 1" away from the gage line of the rail, so as to locate and permit measurement of any local deviations in the curve. A typical stringline paddle is shown below.



Note: In curved track, measurements are taken on the gage side of the high rail (line rail) if possible. If not, field side of low rail may be used.

(f) The Stringline Data Form should be used to record field measurements and for making mathematical calculation (see §55.2.4(M)).

(g) When a conventional ruler is used to measure the mid-ordinate, the actual scale reading should be recorded and a correction made to the mid-ordinate value to compensate for any offset of the stringline from the rail. Conventional stringline paddles require that 1" be subtracted from the readings taken to give the correct mid-ordinate value.

(h) Mid-ordinate measurements should be taken (with an accuracy of 1/16"+/-) with the stringline pulled taut, not affected by the wind, and with the stringline paddles and the scale held horizontal and perpendicular to the gage face of the rail.

(i) Track center lines should be measured and recorded at every station in a two or more track territory. The distance from centerline of track to any obstruction that might interfere with the lining of the curve should be measured and recorded so that limiting throws for these tight spots may be determined.

(j) The apparent location of the curve points Tangent to Spiral (TS), Spiral to Curve (SC), Curve to Spiral (CS) and Spiral to Tangent (ST) should be noted when stationing the curve as appropriate so that the relationship between alignment and required superelevation can be determined.

(k) At all station locations record:

(1) Crosslevel as read by a level board.

(2) Gage as read from the 6' ruler (or calibrated level board).

(3) Track centers if in multiple track territory.

(4) Physical features in the field such as crossings, turnouts, field or plant welds, joints, curve tags, bridge girders, grease pots, impedance boxes, etc., that may affect the ability to throw a curve.

55.2.4(M) Stringline Data Form

(a) Below is an example of a Stringline Data Form to be filled out when stringlining a curve.

CURVE ID. _____

MassDOT RAILROAD STRINGLINE DATA FORM

BRANCH _____ MP_____ TRACK _____ CHORD (Ft.) _____ STATION (Ft.) _____ ORDINATE _____

DEGREE: _____ **PRES. ELEV: _____** **PROP. ELEV: _____**	**DATE MEASURED: _____** **DATE LINED: _____**	**DATE TAGGED: _____** **COMPUTED BY: _____**	**APPROVED BY: _____** **DATE: _____** **STATION 0 AT _____ END**

STA. NO.	TRACK CENTERS	EXIST. GAGE	EXIST. ELEV.	EXIST. ORD.	NOTES	CLEARANCE TO FIXED OBJECT	FINAL ORD.	PROP. ELEV.	THROW	STA.

§57.0(M) CURVES: ELEVATION AND SPEED LIMITATIONS

§57.1(M) General

(a) Elevation, or superelevation, is the vertical distance of the outer rail of a curve above the inner rail. It is provided to overcome or partially overcome the effects of curvature and speed.

(b) Passenger railroads primarily elevate curves to provide adequate ride quality.

(c) Freight railroads primarily elevate curves to provide ride quality and reduce rail wear.

(d) Maximum authorized speed (MAS) for a curve is that specified in the current Operating Railroad Company's Employee Timetable.

§57.2(M) Superelevation

(a) The MassDOT Rail and Transit Division shall establish the amount of superelevation and underbalance to be placed and maintained on each curve.

(b) The superelevation should not exceed values given in Appendix C, "Underbalance Table - Maximum Allowable Operating Speed On Curves."

(c) MAS shall be determined using 3" of unbalance (E_u).

§57.3(M) Superelevation Tags

(a) Curves should be tagged in the field. Points to be marked or tagged on the curves are: TS, SC, CS, and ST.

(b) Information on curve tags shall include the maximum design superelevation and the date the curve is elevated.

(c) Superelevation tags are placed as follows:

(1) The TS and the ST tags are placed 1" off the tie plate and/or elastic fastener perpendicular to the high rail.

(2) The SC and CS tags are placed 1" off the tie plate and/or elastic fastener parallel to the high rail.

§59.0(M) Elevation of Curved Track; Runoff

(a) If a curve or segment of a compound curve is elevated, the full elevation must be provided between points of full curvature throughout the curve, unless physical conditions do not permit. If the elevation does not extend throughout the curve, or segment of a compound curve, the minimum elevation must be used in determining the maximum allowable operating speed under FRA §213.57(b).

(b) Elevation runoff must be at a uniform rate, within the limits of track surface deviation prescribed in FRA §213.63 and it must extend at least the full length of the spiral. If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, a maximum of 1" elevation may be run off in tangent track.

Maximum Authorized Speed (MAS)	Maximum Rate of Change in 31'
Up to 59 MPH	1/2"
60 to 90 MPH	3/8"

(3) At least 100' of tangent track, with zero crosslevel, shall be provided between the zero superelevation points in adjacent curves of opposite direction, or facing same hand turnouts, where practicable.

§61.0(M) CLEARANCES AND TRACK CENTERS

§61.1(M) Track Centers

(a) In maintaining alignment, the existing track centers, including equivalent centers on curves, must not be reduced below the minimum established for the territory.

(b) When surfacing track, any changes in track centers must be immediately reported to the Operating Railroad Company and the MassDOT Rail and Transit Division.

(c) In maintaining alignment, existing track center distances, including equivalent distances on curves, should not be decreased without the authority of the MassDOT Rail and Transit Division.

(d) If the measured track center in tangent track is less than 12'-6" notify the MassDOT Rail and Transit Division for guidance.

(e) On curves, the tangent track center must be increased as follows (see MassDOT MBTA Plan 1018):

(1) Where the amount of superelevation is the same on adjacent tracks or the superelevation of the inner track is greater than the superelevation of the outer track, increase the tangent track center distance at a rate of 2" per degree of curve (CRDS(6)(D)(2)).[1]

(2) Where the amount of the superelevation of the outer track is greater than the superelevation of the inner track:

(i) Increase the tangent track center distance at a rate of 2" per degree of curve and 3-1/2" for each 1" difference in elevation between the outer and inner tracks (and/or tracks under consideration) (CRDS(6)(D)(4)).[1]

(3) When aligning and super-elevating curves, the required increase in track centers should be as given in Paragraphs (e) (1) and (2) of this Part.

(4) Track centers that do not meet the requirements of the MBTA Plan 1018 should be reported to the MassDOT Rail and Transit Division.

(f) Standard Tangent Track Center Dimensions:

(1) The standard track center for tangent main line tracks is 14'-0".

(2) Track centers of 13'-0" are permissible where 14'-0" centers are not possible as approved by the MassDOT Rail and Transit Division (CRDS (6)(D)(1)).[1]

(g) Track clearance information is given in the MBTA Book of Standard Plans. See:

(1) Dwg. No. 1012: "Standard Clearances General Roadway Obstructions – Tangent Track"

(2) Dwg. No. 1013: "Standard Clearances at Stations – Tangent Track"

(3) Dwg. No. 1014: "Standard Clearances Tangent Track Signal Equipment & Utility Crossings"

(4) Dwg. No. 1015: "Clearances for New Overhead Bridges"

(5) Dwg. No. 1017: "Standard Clearances Tangent Track Bridges"

(6) Dwg. No. 1018: "Standard Track Centers & Side Clearance Increases for Curved Track"

(7) Dwg. No. 1019: "Clearances at Passenger Platforms"

[1] MBTA Commuter Rail Design Standards Manuals, Vol. I, Revision 1, April 19, 1996.

§61.2(M) Horizontal Clearances

(a) Side Clearance Increase Because of Curvature:

(1) Side clearances must be increased on both the inside and outside of curves. This is to maintain equivalent tangent clearance on curves which is decreased due to:

(i) End overhang of equipment on the outside of curves, and;

(ii) Mid-ordinate swing-in on the inside or curves.

(2) Required side clearances increase on both inside and outside of curves:

(i) 1.5" per degree of curve (AREMA Chapter 28, Section 1.1).

(3) On curved track, side clearances shall be increased 1" per degree of curve. As recommended by AREMA Chapter 28, Section 1.1., Special Notes (1984), clearances to fixed obstructions should be increased within 80' of the curve (from TS and/or ST):

(i) Clearances to fixed objects within 80' of a curve should be increased at least as given in the table below:

Distance from Fixed Obstruction to Curve (TS and/or ST) (Feet)	**Increase in Clearance Per Degree of Curve (Inches)**
20	1-1/2
40	1-1/8
60	3/4
80	3/8

(4) Also see MBTA Standard Plan No. 1018.

(b) Side Clearance Increase Because of Superelevation:

(1) Side clearances on the inside or low side of the curve must be increased to compensate for the inward lean of the equipment when a curve has superelevation.

(2) The increased side clearance amount required to clear an object and/or obstruction is:

(i) Increased side clearances required in inches

$$= h/5 \times E_A,$$

Where:

h = height of obstruction/object in feet above top of rail.

E_A = actual elevation in curve at point in question in inches.

(3) See MBTA Standard Plan No. 1018.

§61.3(M) Vertical Clearances

(a) The minimum preferred vertical clearance required by the Commonwealth of Massachusetts is 22'-6" above top of rail.

(1) See AREMA, Section 3.6, “Legal Clearance Requirements by State.”

(2) See Table 28-33, for Massachusetts for both horizontal and vertical clearances.

(b) Compensation for Superelevation:

(1) If tracks are superelevated under an overhead (OH) structure:

(i) Vertical clearance must be increased to accommodate the required vertical clearance out to a point 7'-0" from the centerline of track on a plane parallel to the top of rail of the superelevated track (CRDS (6)(B)(3)).[2]

(2) Relative to the low rail and/or grade rail, the required vertical clearance in superelevated curves is increased by the amount (inches) calculated below:

(i) Increase in Vertical Clearance Required = 143 E_A

Where:

E_A = Superelevation in curve at point of interest

(c) Compensation in Vertical Clearance for Vertical Curves:

(1) When a vertical curve exists under an overhead structure and/or obstruction, additional clearance is required to:

(i) Accommodate the vertical mid-ordinate of railway equipment (cars and locomotives)

(2) For railway equipment up to 90' in length, the required increase in vertical clearance can be calculated as follows (CRDS(6)(B)(4)).[2]

(i) Increase in Vertical Clearance Required = $\frac{0.90 \times G_1 - G_2}{8}$

Where:

G_1 = Grade at point on vertical curve (PVC) in percent

G_2 = Grade at point on vertical tangent (PVT) in percent

§61.4(M) Clearance Limiting Objects

(a) For clearance limiting objects, see AREMA, Chapter 28, Table 28-3-3 "Legal Clearance Requirements by State" and the MBTA Book of Standard Plans.

(b) The clearance from the center line of track to objects within the right-of-way such as: signal appliances, signal bridge foundations, bridge abutments and platforms shall not be reduced without ascertaining that the final clearance to the object is no less than given in AREMA, Chapter 28, Table 28-3-3, "Legal Clearance Requirements by State" and the MBTA Book of Standard Plans.

§62.0(M) GRADES

§62.1(M) Grade Limitations

(a) The maximum design gradient shall be 1-1/2% and may be exceeded only with the approval of the MassDOT Rail and Transit Division.

(b) Storage and/or yard track grades shall be level where existing grades and obstructions permit.

(c) When reconstructing track, the existing profile must be retained except where it is possible to reduce the severity, length or the number of grades.

(d) Frequent changes in gradient shall be avoided as this introduces more vertical curves into the geometry and may degrade ride quality and increase train resistance.

(e) The preferred minimum length of vertical tangent is 300'**.**

(f) However, an absolute minimum length of 100' is required (unless approved by the MassDOT Rail and Transit Division).

[2] MBTA Commuter Rail Design Standards Manuals, Vol. I, Revision 1, April 19, 1996.

§62.3(M) Horizontal Curves/Minimum Tangent Lengths

(a) For spiraled compound or reverse curves, the above minimum tangent length between spirals and/or curves is as follows:

(1) A minimum tangent length of 100' on main tracks.

(2) A minimum tangent length of 85' on secondary tracks.

(3) An absolute minimum tangent length of 65', if approved by the MassDOT Rail and Transit Division.

§63.0(M) TRACK SURFACE

§63.1(M) General

(a) Track surface is the relationship of opposite rails to each other in profile and crosslevel.

(b) Track profile is the running surface along the top of the grade rail.

(c) Crosslevel is the difference in elevation across opposite rail heads measured at right angles to the track alignment.

(d) The ideal surface is a uniform profile consisting of constant grades connected by vertical curves, with zero crosslevel on tangents and predetermined crosslevel on curves.

(e) The profile of track being surfaced should not be raised above established grades, except as approved by the MassDOT Rail and Transit Division, who will give consideration to the required elevations and clearances:

(1) In tunnels; and

(2) Under overhead bridges/structures; and

(3) At interlocking plants; and

(4) Highway grade crossings.

(f) Any encroachment upon the published minimum overhead or side clearances from a track will not be permitted.

(1) See AREMA, Chapter 28, Table 28-3-3, “Legal Clearance Requirements by State.”

§63.2(M) Maintenance of Track Surface

(a) The following criteria will serve as a practical guide for maintaining smooth riding conditions on existing tracks.

(b) The basic tools for determining correct track surface are the standard track level and stringline. The track level should be checked by the employee inspecting the track prior to use. If found to be incorrect, it must be accurately adjusted or replaced. Other approved devices may be used for determining crosslevel, but their accuracy should be determined by comparison with a standard track level in correct adjustment.

(c) When surfacing or raising track, one rail, which shall be the low rail on curves and usually the line rail on tangents, shall be selected as the grade rail. The other rail must be brought to surface by adjusting the crosslevel as required.

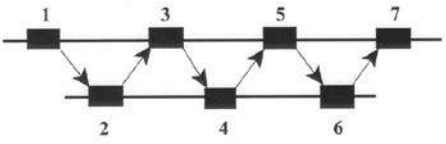
(d) For Track Classes 1-5 track, surface may not deviate more than the amount prescribed in the following table.

Surface Maintenance Limits					
Track Surface	**Class of Track**				
	1	**2**	**3**	**4**	**5**
The runoff in any 31' of rail at the end of a raise may not be more than (inches):	2-5/8	2-1/4	1-1/2	1-1/8	3/4
The deviation from uniform profile on either rail at the mid-ordinate of a 62' chord may not be more than (inches):	2-1/4	2	1-5/8	1-1/2	1
The deviation from zero crosslevel at any point on a tangent or the reverse elevation on curves may not be more than (inches):	2-1/4	1-1/2	1-1/4	1	3/4
The difference in crosslevel between any two points less than 62' apart may not be more than (inches):*(1, 2)	2-1/4	1-1/2	1-1/4	1	3/4
*Where determined by engineering decision prior to June 22, 1998 due to physical restrictions on spiral length and operating practices and experience, the variation in crosslevel on spirals per 31' may not be more than (inches):	2	1-3/4	1-1/4	1	

Notes:

(1) Except as limited by Part I, FRA §213.57(a), where the elevation at any point in a curve equals or exceeds 6", the difference in crosslevel within 62' between that point and a point with greater elevation may not be more than 1-1/2".

(2) However, to control harmonics on Track Classes 2-5 jointed track with staggered joints, the crosslevel differences shall not exceed 1-1/4" in all of six consecutive pairs of joints, as created by seven low joints (see diagram below). Track with joints staggered less than 10' shall not be considered as having staggered joints. Joints within the seven low joints outside of the regular joint spacing shall not be considered as joints for purposes of this footnote.



§63.3(M) Surfacing Areas That Require Special Attention

(a) Special attention must be given to the surface and line of track at the ends and approaches of bridges, crossings, and platforms.

(b) When surfacing, installing or tamping ties, particularly in interlocking plants, care must be taken to avoid breaking or damaging bond wires, pipes, cables or wire connections to the tracks. The Signal Maintainer must be notified prior to any work and all signal appliances are to be marked with high-visibility paint. Notify the Signal Maintainer immediately if damage occurs. Care shall be exercised to avoid the dropping or laying of metal tools or objects across the rails and causing a shunt of the signal circuits.

(c) In hot weather when surfacing track, the requirements of FRA §213.119 and Appendix A, “Continuous Welded Rail (CWR) Procedures” must be followed.

(d) During freezing and thawing weather, attention must be given to the surface of track likely to be affected by heaving due to frost action. Surface irregularities due to frost action that cannot be corrected by usual procedures may be temporarily corrected by use of track shims or by de-icing the ballast. Shimming must be performed in compliance with FRA Part 213 and §129.0(M).

(e) Undercutting, out-of-face track surfacing, and out-of-face tie renewal shall be performed in accordance with Appendix A, “Continuous Welded Rail (CWR) Procedures.”

§63.4(M) Surfacing Track

(a) When track is given a general raise, both rails should be raised at the same time. When track jacks are used, they should be placed opposite each other on the field side of the rail and must not be placed between the rails, except when absolutely necessary.

(b) Surfacing track with automated tamping equipment causes ballast breakdown and, therefore, should only be performed where it is determined to be an effective solution to correct track geometry defects or to raise the track to a required profile. Surfacing work shall be executed in a manner that assures maximum durability of the track raise and the ballast materials.

(c) When track is given a general raise, it is important to consider the relationship between the amount of lift and durability of results. In general, average lifts between 1" to 2" are desirable. Higher raises may be performed, with multiple passes, under the authority of the MassDOT Rail and Transit Division.

(d) Adequate ballast for dressing to the required ballast cross section should be distributed in advance of surfacing and aligning track.

(e) CWR track that has been surfaced and aligned and is being returned to service will be inspected by a qualified person before releasing and in accordance with Appendix A, “Continuous Welded Rail (CWR) Procedures.”

(f) Track should not be raised in interlockings or in signal territory until advance notice has been given to the Signal Maintainer so that switches, or other appliances, can be protected and then re-inspected when the work is completed.

Subpart D - Track Structure and Materials

§100.0(M) MATERIALS

"Track structure" materials include: sub-ballast, ballast, ties, rails, rail fastenings, and other track materials (OTM).

§100.1(M) Handling and Care of Materials

(a) Moving materials from place to place and caring for materials on hand is costly and requires careful planning. Therefore, the amount of material on hand and the number of handlings should be kept to a minimum.

(b) Threaded and/or insulated materials and parts should be kept under cover and protected from the weather.

(c) Materials should be distributed in such a manner so as not to become a tripping hazard or be lost prior to installation in track.

(d) Whenever possible, CWR distributed for installation should be distributed clear of the track.

  (1) When necessary to be placed in the center line of the track, the rail ends should be protected by bending them towards the center line of track (proper nosing).

  (2) When unloaded, CWR should be secured and insulated in such a manner as to prevent shunting of the signal system.

  (3) The top of the CWR, when distributed in the center line of track, should not exceed the height of the running rails.

§100.2(M) Classification of Materials

(a) Materials are classified as follows:

  (1) New: Unused, as manufactured.

  (2) Rehabilitated: Worn materials removed from track and repaired to a relay condition for reuse (e.g., rebuilt frogs).

  (3) Relay: Usable (second-hand) material removed from track to be reused with no required work to be performed before re-installation into track, such as:

    - relay ties,
    - relay rail,
    - relay frogs,
    - relay joints,
    - relay fasteners,
    - relay turnouts, and
    - other special trackwork.

  (4) Scrap: Materials removed from tracks that are not suitable for reuse.

§100.3(M) Removal and Disposition of Materials

(a) Materials removed from track shall be classified as relay or scrap (see §100.2(M)).

(b) Relay materials shall be sorted and stored properly and safely at the Operating Railroad Company's designated MOW materials area for reuse.

(c) Scrap materials shall be disposed of by the Operating Railroad Company in accordance with MassDOT, local, State, and Federal regulations.

(d) Reroller materials are used to fabricate other steel products (see §113.4.1(M)).

(e) Materials shall be removed from the work area as quickly as practicable so as to provide for a clean, safe, right-of-way, and stored securely.

§103.0(M) BALLAST; GENERAL

§103.1(M) Ballast Characteristics

(a) Unless supported by a structure, all track must be supported on a material that will:

(1) Transmit and distribute the load of the track and railroad rolling equipment to the sub-ballast and then to sub-grade.

(2) Provide lateral, longitudinal, and vertical restraint for the track.

(3) Provide drainage for the track structure.

(4) Facilitate the maintenance of track elevation, crosslevel, surface, and alignment.

(b) Ballast shall conform to the AREMA recommended practice Chapter 1 and Part 2, Section 2.4 to include Tables 2-1 and 2-2. Ballast may be obtained only from MassDOT Rail and Transit Division approved quarries.

(c) When ballast received is of inferior quality, has improper grading, or contains quantities of screenings, dirt, or foreign matter, it shall be rejected and shall be reported to the Track Supervisor, so that corrective action may be taken.

§103.2(M) Ballast Unloading

(a) To the extent practicable, ballast should be unloaded in position for use with a minimum of rehandling and dressing.

(b) Ballast must be distributed and immediately dressed so that adequate clearance below top of rail is provided for the movement of rolling stock and track equipment. Switches are not to be fouled and guard rails are not to be obstructed.

(c) When unloading ballast cars, caution should be used to ensure that both sides of the car are unloaded equally to maintain the stability of the car while unloading.

(d) Use the table given below to determine typical ballast quantities for track panels and special trackwork renewals.

Renewal Type	Number of Ballast Cars
Track Panels (3 each)	1
Crossing Frogs	1
No. 7, 8, 9, 10 Turnouts	2
No. 15 Turnouts	3
No. 20 and 24 Turnouts	4

§103.3(M) Ballast Section

(a) Ballast and sub-ballast cross sections should conform to AREMA, Chapter 1, Section 2.1, “Design,” Figures 1-2-1 through 1-2-4.

(b) Minimum ballast shoulder widths are:

Jointed Rail 12" shoulder	2:1 slope
CWR Rail 12" shoulder	2:1 slope
CWR on curves 16" shoulder	2:1 slope

(c) On CWR track, take remedial action where there is insufficient ballast (see Appendix A, "Continuous Welded Rail Procedures").

§103.4(M) Fouled Ballast

(a) Ballast may consist of crushed slag, crushed stone, screened gravel, pit-run gravel, chat, cinders, scoria, pumice, sand, mine waste, or other native material, and is an integral part of the track structure.

(b) Ballast, regardless of the material, must satisfy all four of the requirements stated in the FRA Track Safety Standards.

(c) The sole appearance of fouled ballast (ballast contaminated with broken down ballast particles, mud, coal dust, or any foreign particles), does not warrant a defect or violation to be written, if the ballast section is properly transmitting the load, restraining the track, providing adequate drainage, and maintaining proper geometry.

(d) However, fouled ballast that is unable to provide adequate drainage is of particular concern because it compromises the ability of ballast to meet its other three functions (i.e., to distribute load, restrain track, and maintain proper geometry).

(e) When fouled ballast with inadequate drainage is present, wheel loads are likely to be concentrated, rather than distributed, causing deterioration of components and instability in the area of the defective ballast.

(f) This deterioration of components and instability increases the risk of track shift (such as a track buckle), and also increases the rate of degradation of geometry, and may result in a derailment.

(g) Factors that affect the rate of degradation of components and geometry include the tonnage, traffic density, and operating speeds, as higher tonnage, traffic density, and operating speeds increase the amount and/or frequency the forces exerted on the components

(h) Operating Railroad MOW personnel should look for indicators that the ballast is not performing its four functions, such as the existence of a crosstie and/or geometry condition.

(1) The term "geometry condition" used here means a track surface, gage, or alignment irregularity that does not exceed the allowable threshold for the designated track class in the Track Safety Standards.

(2) Operating Railroad MOW personnel are encouraged to use their technical knowledge and professional experience in recognizing fouled ballast, and should take into account the severity of a geometry condition along with the following factors when considering the action and/or remedial action required:

- Track class and operating speed
- Traffic density and wheel loads
- Adequacy of shoulder ballast and crib ballast
- Track type: route for passenger and/or hazardous materials
- Potential that the track may deteriorate very rapidly following heavy rains
- Center-bound cross ties, if observable
- Rail and fastener conditions
- Sub-grade condition, if observable
- Surrounding track structure (embankment or cut, obvious/observable variation of track stiffness of the left from right side of the track, and from the adjacent areas along the track)

- Proximity of the defective ballast locations to switches (special work), joints, bridges, or grade crossings
- Existence of standing water or indications that water had been standing (as water sometimes get trapped beneath the ties and may not be visible on the surface)

§103.5(M) Ballast Cleaning

(a) When ballast in track becomes fouled, it should be mechanically cleaned, or removed, and then replaced to restore performance and proper drainage.

(b) The type of cleaning procedure employed should depend on the nature and extent of the fouling.

(c) Types of ballast cleaning and/or removal activities are described below:

(1) Shoulder ballast cleaning promotes lateral drainage of the track structure. A proper cycle of shoulder cleaning can aid in extending the cycle between undercutting operations.

(2) Undercutting cleans the ballast under the track to include the ties, cribs, and shoulders.

(3) A portion of the ballast removed may be returned to the track for reuse if approved by the MassDOT Rail and Transit Division.

(4) See Appendix A, "Continuous Welded Rail (CWR) Procedures," for the proper procedures for shoulder cleaning and undercutting of track with CWR.

§103.6(M) Ballast Gradation

(a) The nominal size of crushed stone used for ballast in maintenance and new construction shall be as follows (unless otherwise directed by the MassDOT Rail and Transit Division):

All tracks:

Ballast Size AREMA No. 4 3-4" to 1-1/2"

§109.0(M) CROSSTIES

(a) Crossties shall be made of a material for which rail can be securely fastened. A crosstie must have effective rail fasteners on both the gage and field side of both rails to be considered an effective tie.

(b) Each 39' segment shall have:

(1) A sufficient number of cross ties which in combination provide effective support that will:

(i) Hold gage within limits prescribed in FRA §213.53(b);

(ii) Maintain service within the surface limits prescribed in FRA §213.63; and

(iii) Maintain alignment within the limits prescribed in FRA §213.55.

(2) The minimum number and type of crossties specified in this section must be effectively distributed to support the entire segment; and

(3) At least one non-defective crosstie of the type specified in this section that is located at a joint.

(4) The minimum number of effective crossties as listed in the table below:

Minimum Number of Effective Crossties			Maximum Distance Between Effective Ties (Center to Center) (Inches)	Maximum Number of Successive Defective Ties (Normal Spacing)
Class of Track	**Tangent Track and Curves ≤ 2°**	**Turnouts and Curve Track > 2°**		
1	5	6	100	3
2	8	9	74	2
3	8	10	74	2
4 and 5	12	14	50	1

§109.1(M) Dimensions of Crossties

(a) Wood crossties are 7" in depth, 9" in width and 8'-6" in length (unless otherwise authorized by the MassDOT Rail and Transit Division).

(b) Timber crossties shall be of the following sizes:

Type of Track	Size
Main Line Track	7" grade (7"x9" x 8'-6")
Other Than Main Track and Yard Tracks	6" grade (6"x8" x 8'x6")
Grade Crossings	7" x 9" x 9', 7" x 9" x 10'(1)
Note: (1) Or as recommended by manufacturer.	

(c) The specifications for wood crossties shall be in accordance with AREMA, Chapter 2.

(d) Wooden transition ties may be used at open deck bridge approaches. Transition tie layout is to be approved by the MassDOT Rail and Transit Division.

(e) Concrete and steel ties may be used with the approval of MassDOT Rail and Transit Division.

(1) Concrete ties shall be sized according to MBTA Standard Plan 1120.

§109.2(M) Use of Crossties

(a) The use of crossties, other than those described in §109.1(M), shall be approved by the MassDOT Rail and Transit Division.

(b) The type and spacing of ties for each line and class of track shall be designated by MassDOT.

(c) The number of ties and tie spacing for each line and class of track shall be designated by the MassDOT Rail and Transit Division in accordance with the service requirements. Center to center tie spacings are given in the table below:

Type of Track	Distance (Inches)
Main Tracks	19-1/2"
Within Grade Crossing[(1)]	18"
Other Tracks	22"
Concrete Ties	24"
Steel Ties[(1)]	20"-24"
Note: [(1)] Or as recommended by the manufacturer.	

(d) It is recognized that ties will not normally be re-spaced except during reconstruction.

(e) However, when ties are installed out-of-face, ties should be re-spaced wherever practicable.

§109.3(M) Placement of Crossties

(a) Wood Crossties

(1) Ties should be placed in track with the wider heart wood face down and square to the line of the rail.

(2) The ends of standard 8'-6" ties should be brought to a uniform line 18" from the edge of the base of rail on the line side as follows:

(i) On single tangent track, line the ties to the mile post side of the track.

(ii) On roads with two or more main tracks, line the field ends of ties.

(iii) On all curved track, ties shall be lined to the high rail.

(iv) When necessary to install non-standard length ties, they shall be centered in the track.

(b) Any Crossties

(1) Ties shall be kept sufficiently spaced and square to the line of rail to permit proper tamping and distribution of load.

(2) When necessary, ties should be re-set to standard spacing.

(3) Ties shall be square to the line of rail so that fastening systems are not subjected to a torsional load because of tie skewing.

(4) When installed, crossties shall be properly tamped 12" on both sides of the base of rail.

§109.4(M) Preventing Crosstie Damage

(a) General:

(1) When handling or spacing ties, care shall be taken not to damage them with MOW equipment, picks, and spiking hammers.

(2) Tie tongs, lining bars and other suitable tools or tie spacing equipment shall be used, so as to prevent tie damage.

(3) For additional information on fastener application see §127.0(M).

(b) Wood Crossties:

(1) Adze ties as required to obtain a sound and true bearing to support the tie plate.

(2) If a tie will be reused, cedar tie plugs or an approved hole filler must be used to fill holes where spikes, pins and lag screws have been removed. The tie shall be installed with hole side up.

(3) Square tie plugs (5/8") are used with spikes and pins, round tie plugs (3/4" diameter) are used with lag screws.

§110.0(M) Switch Timber

(a) Timber switch ties shall be 7" grade (7" x 9"), except for power switch machine timbers, which shall be a cross section of 9" x 10", with lengths as shown on the standards plans.

(b) Use of switch timbers of other material must be approved by the MassDOT Rail and Transit Division.

§111.0(M) Bridge Timber

(a) Oak or Southern Yellow Pine Timber, or approved equal by the MassDOT Rail and Transit Division, shall be used on all open deck bridges.

(b) Bridge ties shall be adzed, framed, and sized according to framing plans prior to treatment. Suitable holes must be bored for drive spikes that fasten tie spacing bars on timbers.

(c) Where ties are bored or adzed in the field, they shall be treated with an appropriate preservative.

(d) Bridge ties shall be fastened to the structure with galvanized hook bolts as follows:

- On tangent track every 4th tie shall have two hook bolts to connect the tie to the deck, or
- On curved track every 3rd tie shall have two hook bolts to connect the tie to the deck; or
- The MassDOT Rail and Transit Division shall specify how many ties shall have hook bolts that connect ties to the deck on any and all spans.

(e) Lag screws shall be used in holes bored to size to fasten galvanized tie spacing bars on timber (see MBTA "Standard Book of Plans").

(f) Tie spacing bar, spacer block, and hook bolt details are given on MBTA Standard Plan No. 1236 "Bridge Timber Anchoring Detail."

(g) All open deck bridges shall have spacer blocks between all timber (see MBTA "Standard Book of Plans").

§113.0(M) RAIL

§113.1(M) Branding and Stamping

(a) Branding shall be rolled in raised characters on the side of the web of each rail at a minimum of every 16' in accordance with the following requirements:

(1) The data and order of arrangement of the branding shall be as shown in the following typical brand:

136	RE	Manufacturer	2003	III or 3
(Weight)	(Section)	(Mill Brand)	(Year Rolled)	(Month Rolled)

(2) The method of hydrogen elimination shall be located in the brand when a hydrogen elimination method other than Vacuum Treated (VT) is used.

(b) The web of each rail shall be hot stamped a minimum of three times per rail (short rails must contain a minimum of one full stamp) on the side opposite the brand, and shall not occur within 2' of either end of rails, and in accordance with the following requirements:

(1) The data shall be shown in the following typical stamping. The height of the letters and numerals shall be 5/8".

SS, HH, LA, IH or LH	297165	PSTU	12	BC
(Rail Type)	(Heat Number)	(Rail Letter)	(Strand and Bloom Number)	(Method of Hydrogen Elimination, if indicated in stamping)
Notes: SS = Standard Strength HH = Head-Hardened LA = Low Alley Standard Strength IH = Low Alloy Intermediate LH = Low Alloy Head-Hardened				

(2) Rails from continuous cast blooms shall be identified by a designation for heat number, strand number, and bloom number. The rail shall be identified by an alphabetical designation beginning with “P”, and succeeding “S”, “T”, “U”, etc., consecutively, or any other identification of the position of the rail within the cast, as agreed between the purchaser and manufacturer.

(c) Markings:

(1) High-strength rails shall be marked by either a metal plate permanently attached to the neutral axis, hot stamped, or in the brand which gives the manufacturer, type, and/or method of treatment. Heat-treated rail shall be paint-marked orange. Alloy rail shall be paint-marked aluminum color.

(2) Non-AREMA (Industrial Quality) rails shall be paint-marked yellow.

(3) Short rails (less than 80') shall be paint-marked green.

(4) Trackwork rails shall be paint-marked white.

(5) Rail length shall be painted on the end faces or in a manner acceptable to the purchaser or manufacturer.

(6) Individual rails shall be paint-marked only one color, according to the order listed above.

(7) Industrial Quality (IQ) rails shall be permanently identified by grinding diagonally through every “RE” or other designation within the rails’ branding. Each designation brand shall be ground or milled diagonally from the top right hand corner to the bottom left hand corner, a minimum of 1/4" in width and to within 0.010" of the parent rail web surface.

(d) For further information on this subject see AREMA 2.1.6.

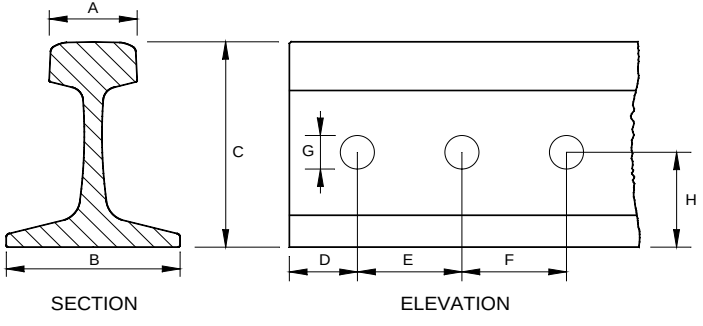
§113.2(M) Rail End Drilling and Bolt Hole Sizes

(a) Jointed rails consist of conventional length rails of 400' or less which are bolted together.

(b) CWR is continuous welded rail in strings of greater than 400' where the rails are welded by the flash butt process or by other methods as approved by MassDOT.

(c) Rail size dimensions and bolt hole drilling for typical rail sections are given in the following table.

(d) A rail and joint dimension table with some typical MassDOT rail sections is contained below.



RAIL DATA

Rail Data (Inches)														
Rail Section Dimensions In Inches	**80# A.S.**	**85# A.S.**	**100# NH**	**105# DY**	**107# NH**	**112# R.E.**	**115# R.E.**	**119# R.E.**	**130# R.E.**	**131# R.E.**	**132# R.E.**	**136# R.E.**	**140# R.E.**	**141# R.E.**
A - Head Width	2-1/2	2-9/16	2-3/4	3	2-3/4	2-23/32	2-23/32	2-21/32	2-15/16	3	3	2-15/16	3	3-1/16
B - Base Width	5	5-3/16	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	6	7	6	6	6	6
C - Height	5	5-3/16	6	6	6-1/8	6-5/8	6-5/8	6-13/16	6-3/4	7-1/8	7-1/8	7-5/16	7-5/16	7-7/16
D - Drilling (1st Hole)	1-15/16	1-15/16	2-1/2	2-3/4	2-1/2	2-7/16	3-1/2	3-1/2	2-3/8	2-1/2	3-1/2	3-1/2	3-12	3-1/2
E - Drilling (2nd Hole)	7	7	7	5-5/8	7	7	6	6	7	6-1/2	6	6	6	6
F - Drilling (3rd Hole)	-	-	-	5-5/8	-	6	6	6	NA	6-1/2	6	6	6	6
G - Diameter of Bolt Hole	1	1	1	1-1/16	1	1-1/8	1-1/8	1-1/8	1-11/32	1-1/8	1-1/4	1-1/4	1-1/4	1-1/4
H - Base to Center of Hole	2-3/16	2-9/32	2-39/64	2-5/8	2-39/64	2-7/8	2-7/8	2-7/8	2-3/4	3-3/32	3-3/32	3-3/32	3	3-3/32
I - Diam. of Bolt	7/8	7/8	7/8	15/16	7/8	1	1	1	1-1/8	1	1-1/8	1-1/8	1-1/8	1-1/8

Note:
[1] Source: AREMA Plan Nos. 4-1-6, 4-1-7, 4-3-13

§113.3(M) Recommended Maintenance Wear Limits for Rail

§113.3.1(M) Maximum Head and Gage Face Wear for Rail (In and Out of Track)

(a) With traffic, the rail head wears vertically and horizontally. As this wear increases, the cross section of the rail decreases. This decrease in rail section may overstress the rail causing rail failure.

(b) The following table contains the maintenance wear limits for maximum vertical wear and maximum gage face wear (both gage and field) for rail sections commonly found on MassDOT rail lines.

(c) Rail that has head and gage face wear, as given in the table below, shall be immediately removed from track and scrapped as soon as practicable.

(d) Rail replacement should be programmed prior to reaching the given maintenance rail wear limits.

§113.3.2(M) Railway Limits for the Welding of Relay Rail

(a) The table below gives the maximum head wear and gage face wear values recommended by AREMA for the welding of relay rail.

(b) Relay rail that has greater amounts of either head wear and/or gage face wear should not be welded.

(c) Maximum wear values are given for both mainlines and for other tracks to include light density mainlines, sidings, and other tracks.

Recommended Maintenance Maximum Rail Wear Limits [1]							
Rail Section	New Rail Height (Inches)	Allowable Head Wear (Inches)			Allowable Gage Face Wear (Inches)		
		Mainlines	Other Tracks	New Rail Head Width [2] (Inches)	Mainlines	Other Tracks	Total Head Width Wear [3] for Mainlines and Other Tracks
80 AS	5	5/16	3/8	2-1/2	5/16	3/8	1/2
85 AS	6	3/8	7/16	2-9/16	5/16	3/8	1/2
100 NH	6	1/2	5/8	2-3/4	3/8	1/2	1/2
105 DY	6	1/2	5/8	3	3/8	5/8	1/2
107 NH	6-1/8	1/2	5/8	2-3/4	3/8	1/2	1/2
112 RE	6-5/8	1/2	5/8	2-23/32	3/8	1/2	1/2
115 RE	6-5/8	1/2	5/8	2-23/32	3/8	1/2	1/2
119 RE	6-13/16	1/2	5/8	2-21/32	3/8	5/8	1/2
130 RE	6-3/4	1/2	5/8	2-15/16	3/8	3/4	3/4
131 RE	7-1/8	5/8	1/2	3	1/2	3/4	3/4
132 RE	7-1/8	5/8	1/2	3	1/2	3/4	3/4
136 RE	7-5/16	5/8	3/4	2-15/16	1/2	3/4	3/4
140 RE	7-5/16	5/8	3/4	3	1/2	3/4	3/4
141 RE	7-7/16	5/8	3/4	3-1/16	1/2	3/4	3/4

Notes:

(1) Rail that has maximum wear as given in this table shall be removed from track immediately and scrapped as soon as practicable.
(2) Measure gage face wear at 5/8" below top of crown of railhead.
(3) Combine field and gage side wear 5/8" below top of crown of railhead. This wear column only applies to rail that has been transposed.

Rail Wear Limits for the Welding of Relay Rail[5]

Rail Section	New Rail Height (Inches)	Maximum Allowable Head Wear (Inches)			Maximum Allowable Gage Face Wear[1] (Inches)		
		Mainlines/ AREMA Class 2	Other Tracks/ AREMA Class 3	New Rail Head Width[2] (Inches)	Mainlines/ AREMA One Side Class 2	Other Tracks/ AREMA One Side Class 3	Total Head Width Wear[3]/ AREMA Both Sides Classes 2 and 3
80 AS	5	N/A	N/A	2-1/2	N/A	N/A	N/A
85 AS	6	N/A	N/A	2-9/16	N/A	N/A	N/A
100 NH	6	1/8[4]	N/A	2-3/4	3/16[4]	N/A	3/16[4]
105 DY	6	1/8[4]	N/A	3	3/16[4]	N/A	3/16[4]
107 NH	6-1/8	1/8[4]	N/A	2-3/4	3/16[4]	N/A	3/16[4]
112 RE	6-5/8	1/4[4]	3/8[4]	2-23/32	3/16[4]	5/16[4]	3/16[4]
115 RE	6-5/8	1/4[4]	3/8[4]	2-23/32	3/16[4]	5/16[4]	3/16[4]
119 RE	6-13/16	1/4[4]	3/8[4]	2-21/32	3/16[4]	5/16[4]	3/16[4]
130 RE	6-3/4	N/A	N/A	2-15/16	N/A	N/A	N/A
131 RE	7-1/8	1/4[4]	1/2[4]	3	1/4[4]	3/8[4]	3/16[4]
132 RE	7-1/8	5/16[4]	9/16[4]	3	1/4[4]	3/8[4]	3/16[4]
136 RE	7-5/16	5/16[4]	9/16[4]	2-15/16	1/4[4]	3/8[4]	3/16[4]
140 RE	7-5/16[4]	5/16[4]	9/16[4]	3[4]	1/4[4]	3/8[4]	3/16[4]
141 RE	7-7/16[4]	3/8[4]	5/8[4]	3-1/16[4]	1/4[4]	3/8[4]	3/16[4]

Notes:

(1) Measure gage face wear at 5/8" below top of crown of railhead.
(2) Combine field and gage side wear 5/8" below top of crown of railhead. This wear column only applies to rail that has been transposed.
(3) Rail classified as AREMA Class 1 or 2 may be used in any track without restriction.
(4) Rail classified as AREMA Class 3 may be used in light density mainlines, sidings, and all other tracks.
(5) AREMA values from "Rail Grading Classification by Wear Table 4-3-17."

§113.3.3(M) Classification and Identification of Rail for Reuse (In and Out of Track)

(a) By mill inspection, rails are to be classified and identified by paint marking as follows:

Type of Rail	Marking
Standard Carbon Rails	None
Head-Hardened Rails	Orange
Rails not 39 ft. or 80 ft. in length	Green
Relay Rail Pre-Tested	Green
Relay Rail Not Tested	Yellow
Industrial Quality Rail	Per Mill

(1) High-strength rails shall be marked by either a metal plate permanently attached to the neutral axis, hot stamped, or in the brand. The information will include the manufacturer and type and/or method of treatment. (Fully heat-treated rails are no longer available and are not to be used unless approved by MassDOT Rail and Transit Division.)

(2) Individual rails shall be paint-marked only one color according to the above, or as agreed to by MassDOT Rail and Transit Division and the manufacturer.

(3) Paint marking will appear on the top of the head of one end of the rail only, at least 3' from the end.

(4) All short length rails produced shall have the length identified in a manner acceptable to MassDOT Rail and Transit Division and the manufacturer on top of the head of the rail approximately 1' from each end.

(b) Failed Rails:

(1) Rails removed from track on account of any defects listed in FRA §213.113(a), except end defects described in Paragraph (2) below, must have the top of the head noticeably damaged at the defect using a cutting torch or abrasive saw, so that they will not be mistakenly returned to service in track, or be butt welded in fabricating strings of fit CWR. These rails will also be marked with red paint on the running surface near the ends of the rail. Such failed rails, damaged as above, are to be classified for scrap in its proper category.

(2) Rails removed from track on account of end defects only, such as a bolt hole crack or head-web separation where a portion of the rail end is not physically broken out, must have the top of the rail head noticeably damaged at the location of the defect using a cutting torch or abrasive saw to insure that a rail of this type is not returned to service in track without cropping the defective end.

(3) Any rail containing longitudinal or transverse defects must be removed in its entirety (all rail between joints in bolted rail, and all rail between plant welds, between plant and field welds, or between field welds in CWR). These rails will also be marked with red paint on the running surface near the ends of the rail. The entire rail is then to be considered as scrap rail. Rails removed from track on account of any defects listed in FRA §213.113(a), except end defects described in Paragraph (2) above, must have the top of the head noticeably damaged at the defect using a cutting torch or abrasive saw, so that they will not be mistakenly returned to service in track, or be butt welded in fabricating strings of fit CWR.

§113.3.4(M) Transposing and Turning Rail on Curves

(a) To obtain the maximum service life of rails on curves, the high and low sides should be transposed before horizontal wear, vertical wear or flow of metal in the head makes this impractical because of undesirable rail head stresses that may be produced leading to possible failure of the rail itself.

(b) In general, high and low sides should be transposed when the horizontal wear on the high rail is between 3/8" and 5/8" in the full body of the curve, and before the metal in the low rail flows excessively.

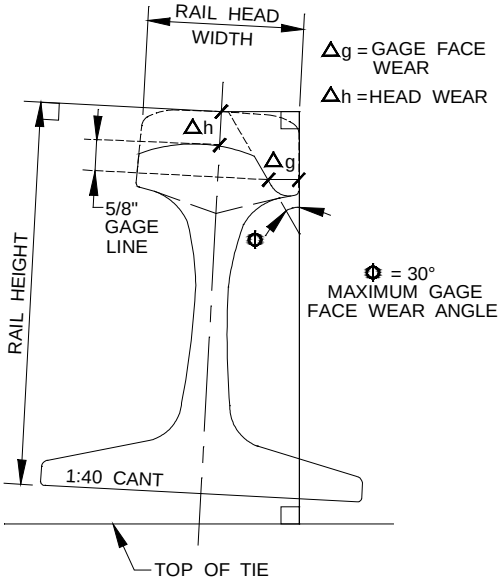
(c) In general, high side rails may be turned when horizontal wear does not exceed 1/2".

(d) 112 lb. and 131 lb. rail must not be turned or transposed without the permission of the MassDOT Rail and Transit Division.

§113.3.5(M) Gage Face Angle (Worn Rail)

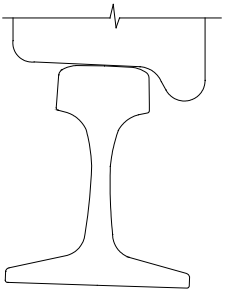
(a) When a rail is placed in track, under traffic, the gage face wears at an angle (ϕ). As this angle increases, the possibility for a wheel to climb the gage face of a rail and derail increases.

(b) As shown on the following diagram, rail replacement shall be accomplished when the gage face angle (ϕ) exceeds 30°. As the rail wear readings approach 30°, the Operating Railroad Company should make necessary plans to change out the rail.



RAIL WEAR CRITERIA

(c) For an example of new wheel and new rail interface, see the following diagram.



§113.4(M) Rail Classifications

§113.4.1(M) Defective Rails

(a) Rails removed from track on account of any defects listed in FRA §213.113(a), except end defects described in Paragraph (c) below, must be marked "NG" (no good) and a torch mark made in the head of the rail.

(b) Rails removed from track with end defects, such as bolt hole cracks or head-web separations where a portion of the rail end is not physically broken out, must have the top of the rail head noticeably damaged at the location of the defect, using a cutting torch or power saw to insure that a rail of this type is not returned to service without cropping off the defective end.

(c) "Reroller Rails/Rail Steel No. 1" are rail steel materials that are recycled as used to fabricate other steel products to include bars and shapes. Reroller rail generally has a higher value than rail scrap. Reroller rail includes:

- Standard section tee rails with a weight of 50 lbs/yard or greater which are free of all attachments;
- Rails that have no excessive pitting;
- Rails that are free of all debris (e.g., concrete, mud, asphalt, etc.);
- Rails that are not bent and twisted;
- Ferrous materials that do not contain frogs, switches and guard rails;
- Rails that do not have split heads and broken flanges;
- Pieces of CWR, provided no weld is over 9" from the end of the rail; or
- As specified by the Institute of Scrap Recycling Industries.

(d) Defective rails should be immediately removed from the right-of-way to the approved MassDOT secured scrap material storage area.

§113.4.2(M) New Rails

Class of Rail	Use
Medium-Hard Rail* Standard Rail (HB310)	In all tracks.
Head-Hardened Rail	For curves 3º and over, mainline turnouts, grade crossings, special trackwork, tunnels, and other locations as specified by the MassDOT Rail and Transit Division.

Notes:

* Standard Rail - standard rail that conforms to latest AREMA Specifications.
* Head-Hardened Rail - prime rail that is fully quenched and tempered in the head area only to increase hardness and strength. Head-hardened rail rolled by PST (Bethlehem Steel Company) will be marked "HH" to the right of the heat number. Head-hardened rail rolled by Rocky Mountain Steel Mill (CF&I Company) will be marked "DH" to the right of the heat number.
* Head-hardened markings furnished by any other manufacturers shall be approved by the MassDOT Rail and Transit Division.

§113.4.3(M) Cropped or Relay Rails

(a) Rails removed from track having only end defects, such as bolt hole cracks or head-web separations within joint bar areas, may be used without restrictions after defects have been eliminated by cropping (see §113.11(M)).

(b) Relay rail should be checked against the rail wear table given in §113.2.1(M) prior to installation.

(c) Any relay rail installed in main track that carries passenger trains, or is a hazardous material route, shall be inspected for internal rail defects if the operating speed is Class 3 or higher.

(d) If a valid search for internal defects cannot be conducted before expiration of time or tonnage limits given in FRA §213.237(a) or (c), reduce operating speed to a maximum 25 MPH until such time as the valid search can be made.

§113.5(M) Disposition and Shipment of Rails

(a) Rails released from renewals and retirements must be disposed of as authorized by MassDOT.

(b) Other track materials (OTM) must be removed from the individual rails before loading rail onto railcars or trucks (see §100.3(M)).

(c) For shipment, relay rails may be loaded head up with wood stripping between layers.

§113.6(M) Distributing Rail

(a) Rails and OTMs should be unloaded in a position as close as possible for laying to minimize further handling.

(b) Rails should be placed parallel with the track on their base to avoid excessive bending or damage. Care should be taken to avoid placing rails on manhole covers, on signal cables and conduits, or close to air lines.

(c) Rail is not to be stored between the running rails unless conditions do not allow rail placement outside the track off the ends of the ties. Rail heads should not be above the running rail.

(d) CWR ends must be offset and blocked to allow for thermal expansion.

(e) In yards and at locations where employees must walk close to the track, rail should be placed as near to the ends of ties as possible to avoid obstructing walkways.

(f) Any time rail and OTM is distributed along the right-of-way, the Transportation Department must be notified so as to include in a Division Notice.

§113.7(M) Preparation and Care

(a) As far as practicable, track should be placed in good line and surface prior to rail renewals. Programmed tie renewal shall be accomplished before laying rail. Track to be laid with CWR should be fully ballasted, and preferably, programmed tie renewals should be completed in advance of rail laying.

(b) Rails should be examined prior to laying in track to detect any sharp bends, damage, or surface conditions that will make them unserviceable.

(c) Care of rail should be taken the day on which it is laid, so that no damage to rail or fastenings will result from continued use under normal traffic. Loose ties should be tamped to a good bearing under the rail immediately behind rail laying operations.

§113.8(M) Laying Jointed Rails

(a) Jointed rails should be laid, one at a time, with space allowance for expansion being provided between rail ends in accordance with the following table:

Jointed Rail Expansion Tables	
39' Rails	
Rail Temperature (°F)	**Rail End Space (Inches)**
Below 6	5/16
6 to 25	1/4
26 to 45	3/16
46 to 65	1/8
66 to 85	1/16
Over 85	None

78' or 80' Rails	
Rail Temperature (°F)	**Rail End Space (Inches)**
Below 30	5/16
31 to 45	1/4
46 to 60	3/16
61 to 72	1/8
73 to 85	1/16
Over 85	None

(b) Rails greater than 80' and less than 400' in length, must be expanded and anchored as CWR.

(c) To insure the required space allowance, rail ends should be brought squarely together against approved expansion shims of proper thickness and the rail joints applied before spiking and anchoring.

(d) Space between rail ends for insulating joints (paper and poly types) should only be sufficient to permit insertion of standard end posts.

(e) An approved rail thermometer shall be used. The person in charge shall see that rail temperature is checked frequently and that proper rail expansion shims are used.

(f) Jointed rails should be laid, one at a time, with space allowance for expansion being provided between rail ends.

(g) To insure the space allowance required, rail ends should be brought squarely together against approved expansion shims of proper thickness and the rail joints bolted before spiking.

(h) An exception to the requirement of laying one rail at a time is to expedite rail installation no more than 180' of rail (5 @ 39' rails) may be bolted together prior to being installed in track, provided that the proper rail end spaces are maintained according to §113.9(a) above.

(i) Space between rail ends in insulated joints should only be sufficient to permit installation of standard end posts.

(j) An approved magnetic rail thermometer shall be used to determine the rail temperature. The thermometer is to be attached to the web of the rail that is shaded from the sun's rays for a minimum of 5 minutes until an accurate temperature reading can be achieved. Rail thermometer should be placed on the smooth surface of the web and not on any raised brand.

(k) Rail should be laid with joints staggered 13' to 15'. Permissible variations are as follows:

  (1) Through turnouts and at insulated joints;

  (2) Rails laid with the joints of one line of rail opposite the middle of rails in the other line in accordance with former standards need not be relocated until out-of-face rail renewals are made; and

  (3) At other locations as directed by the MassDOT Rail and Transit Division.

(l) Rails less than 18' in length should not be used in main tracks, except that rails not less than 14' may be used for:

  (1) Connections within turnouts and crossovers;

  (2) Temporary closures;

  (3) Temporary replacement of broken rails. Rails not less than 14' in length used in accordance with previous standard practice need not be removed until rails are changed or re-laid.

(m) Placing bolted joints in or closer than 30' from the edges of road crossings, within the limits of switch rails, frog guard rails, or the ends of open deck bridges, trestles, or viaducts is prohibited (unless approved by MassDOT Rail and Transit Division).

(n) Rails of the same section should be used on open deck bridges, through road crossings, through paved track areas of station platforms, through areas of direct fixation track, and to the greatest extent possible in turnouts and crossovers.

(o) Rails of unequal wear and different sections must be brought to an even surface at joints on the tread and gage side of the rail by welding. When shimming is required to run off the difference in height of rails, the requirements of §129.0(M) must be met.

(p) The use of shims or spring washers between the web and the joint bar to align the gage sides of rail heads, or the use of acetylene torches, or grinding to manufacture, or change the dimensions of compromise joints, is prohibited. Adjustments to the tread and gage side of the rail head must be accomplished by:

(1) Compromise joints of approved design.

(2) By welding the rail head.

(q) When necessary to make a temporary connection for the passage of a train at normal speed, the connection must be made with a piece of rail not less than 14' long. Use compromise or standard joints with the full number of bolts and with all rail holding spikes driven. Use of switch points to make temporary connections when laying rail is prohibited.

§113.9(M) Rail End Bolt Holes

(a) Holes must be drilled in accordance with AREMA recommended standard practice and the following:

(1) Bolt holes shall be drilled with the joint bars removed by marking the location of the center of the hole with a proper size template block or by drilling through an approved template.

(2) When bolt holes are drilled, a uniform feeding pressure should be maintained as per manufacturer's instructions.

(3) An environmentally sensitive lubricant should be used throughout the drilling process.

(4) Bolt hole sizes and drillings are found in the rail end drilling table given in §113.1(M).

(5) After drilling is completed, bolt holes should be brushed out and inspected. Any burrs or chipped edges should be removed by chamfering or filing to a smooth edge around the entire circumference of the bolt hole.

(6) If jointed rail is to be welded, rail ends should be drilled in such a manner as to provide for closure by field welding (no edge of hole closer than 6" to the joint).

(7) In those instances where the joint will not be welded, all holes in the joint bar will be drilled and fully bolted.

§113.10(M) Cutting and Electric Arc Welding of Rail

(a) For cutting of tight rails in CWR see Appendix A, "Continuous Welded Rail (CWR) Procedures."

(b) The tools which may be used for cutting rails are listed below:

(1) Power saws with approved guide attachments and proper PPE.

(2) Gas cutting torches, in emergency only in accordance with FRA §213.122.

(c) Electric arc welding is prohibited on any portion of the rail, except as listed below:

(1) Welding of engine burns. Engine burns deeper than 3/8" should not be welded. If there are more than four engine burns within a 39' rail, the rail should be changed out.

(2) Application of welded bonds.

(3) Top of rail within limits of joint bars (batter and rail ends).

(4) Gas welding of rail is prohibited.

(d) Any rail damaged by torches must be promptly removed from track.

(e) Except for the welding of engine burns in accordance with approved methods, and except for application of welded bonds, gas or electric arc welding is permitted only on the top of the rail within the limits of the joint bars.

§113.11(M) Bonding Rails for Track Circuits

(a) Except in an emergency where rails are bonded for track circuits, no rail bonds shall be broken or rails removed unless a Signal Maintainer is notified or present.

(b) Signal bonds shall not be applied to the rail web or base; only on the rail head.

(c) In an emergency, a broken rail, switch point, or frog may be renewed without waiting for the Signal Maintainer. In such cases, the joints shall be tightened to make as good contact as possible with the rails and the Signal Maintainer notified that the rail bonds have been broken.

(d) If a broken rail is replaced within the starting circuit of automatic highway crossing protection, the track shall not be restored to service until all trains approaching the crossing have been:

  (1) Instructed to be prepared to stop prior to passing over the crossing involved; or

  (2) Until a qualified person under FRA §213.7(d)(1) is provided to move train traffic at the crossing; or

  (3) The Signal Maintainer has applied all rail bonds and verified the continuity of the circuit.

§113.12(M) Maintenance of Rail by Grinding

(a) Rail grinding must be accomplished with profile grinders or production grinding units.

  (1) Hand grinding should be limited to small areas where the use of profile grinders is not practical.

  (2) Out-of-face grinding must be performed with production grinding units.

(b) Production grinding is required to remove surface anomalies such as scale, flakes, checks, shells, and corrugations on the rail head and to re-profile the rail head.

(c) In special trackwork a combination of production grinding and hand grinding may be required.

(d) Grinding of rail should be performed at regular intervals based on the condition of the rail, location (such as grades and curves), the number, and type of trains, and the accumulated tonnage at a particular location.

(e) All grinding on wooden open deck bridges shall be approved by MassDOT Rail and Transit Division before any work begins. Rail grinding on bridges (ballast deck) is permitted provided that proper precaution is taken against fire as given below:

  (1) Grinding shall only be performed when there is no highway or river traffic directly under the area to be ground.

  (2) The rail grinding crew has a supply of water and other fire suppressants to protect against fire.

  (3) After grinding, the entire structure is re-inspected for possible “hot spots” or fire.

  (4) Production grinding of rail on timber trestles is prohibited.

(f) High rail truck with water tank shall follow rail grinder to inspect for hot spots and slag.

(g) MassDOT Rail and Transit Division shall approve lubricants and/or friction modifiers to be used after grinding curves on:

  (1) Gage face on the high rail

  (2) Top of rail (TOR) on the low rail.

§113.13(M) Repair of Welds and Rail Head Depressions by Welding or Grinding

(a) Field and shop welds shall be inspected for batter. Maintenance welding and grinding shall be performed as required.

(b) The depth of low spots and depressions around welds shall be measured with a 36" straight edge and taper gauge. Maintenance welding and grinding shall be performed as required.

(c) The preferred method of removing low spots, low areas, and engine burns (but NOT engine burn fractures), in the rail head profile is by building up the rail head by welding.

(d) Any engine burn should be repaired as soon as practicable before rail and tie damage occur. Engine burns 3/8" or greater require removal and replacement of the rail.

§113.13.1(M) Cross Cutting (Slotting) of Bolted Joints

(a) Permanent bolted joints shall be inspected and rail ends slotted as required to remove metal flow and prevent end chipping.

(b) When rails are replaced at the location of a permanently bolted joint, the rail ends should be slotted.

(c) The frequency of grinding or slotting rail ends at permanently bolted joint locations may increase due to traffic and as other local conditions require.

§113.14(M) Passing Trains Over Broken Rails and/or Pull-Aparts

(a) When passing trains and/or locomotives over broken rails and/or pull-aparts, the Operating Railroad Company MOW personnel shall comply with the following information.

(b) Persons not fully qualified to supervise certain renewals and inspect track as required in Paragraph (a) of this section, but with at least one year of MOW or signal experience, may pass trains over broken rails and pull-aparts provided that:

  (1) The track owner determines the person to be qualified and, as part of doing so, trains, examines, and re-examines the person periodically within two years after each prior examination on the following topics as they relate to the safe passage of trains over broken rails or pull-aparts: rail defect identification, crosstie condition, track surface and alignment, gage restraint, rail end mismatch, joint bars, and maximum distance between rail ends over which trains may be allowed to pass. The sole purpose of the examination is to ascertain the person's ability to effectively apply these requirements and the examination may not be used to disqualify the person from other duties. A minimum of four hours training is required for initial training;

  (2) The person deems it safe and train speeds are limited to a maximum of 10 MPH over the broken rail or pull apart;

  (3) The person shall watch all movements over the broken rail or pull apart and be prepared to stop the train if necessary; and

  (4) Person(s) fully qualified under FRA §213.7 are notified and dispatched to the location promptly for the purpose of authorizing movements and effecting temporary or permanent repairs.

§115.0(M) RAIL END MISMATCH

Rail shall be maintained so that the mismatch of rails at joints may not be more than that prescribed in the following table:

Rail End Mismatch Maintenance Limits		
Class of Track	Any mismatch of rails at joints may not be more than the following:	
	On the head of the rail ends (Inches)	On the gage side of the rail ends (Inches)
1 – 5	1/8	1/8



Rail End Mismatch

§117.0(M) RAIL END BATTER/BEVELING OF RAIL ENDS

(a) Rail end batter is the depth of depression in the rail head near the end of the rail. It is measured by placing an 18" straight edge on the head of the rail at the rail end, without bridging the joint and measuring with a taper gauge the maximum distance between the bottom of the straight edge and the top of the rail head.

(b) When rail end batter is detected, it should be monitored and corrected when reaching the limits given below:

(1) See the following table:

Rail End Batter Maintenance Limits		
Class of Track	Rail End Batter May Not Be More Than (Inches):	Crop Bolt Holes and Rail Ends to Remove Batter if Batter Exceeds Values Below (Inches):
1 - 2	1/4	3/8
3 – 5	1/8	1/4

(2) Rail end batter should be repaired by a qualified welder using an electric arc welder.

(3) In Classes 3-5, rail ends that have 3/8" or more rail batter shall not be welded and shall be cut out and scrapped.

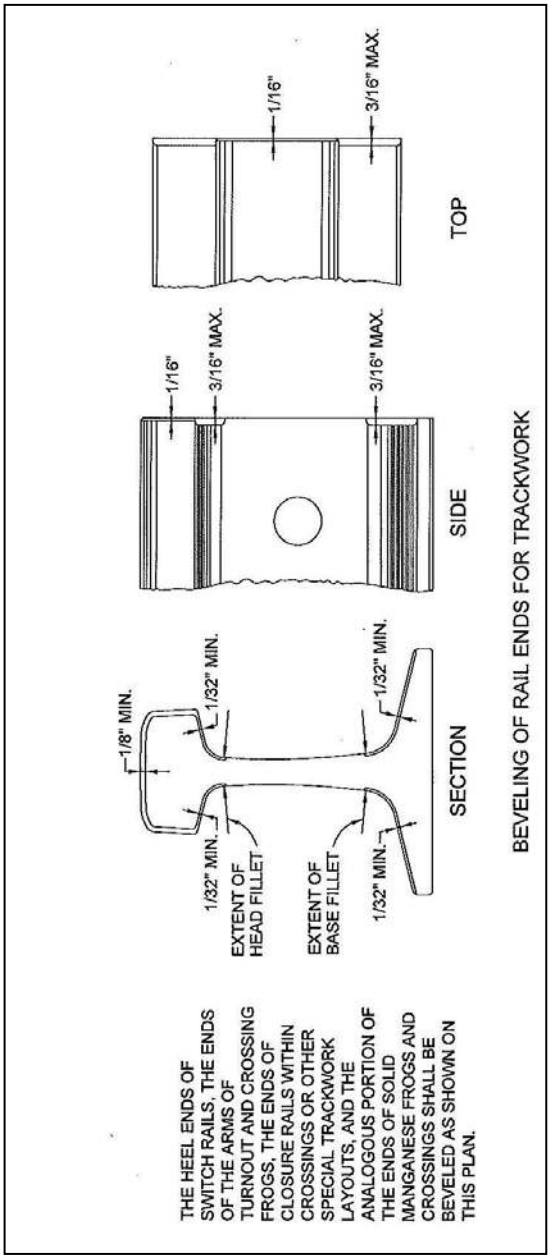
(4) After welding, rail ends shall be ground and slotted as shown in Paragraph (c).

(c) To reduce chipping or spalling due to overflow of steel under traffic, the rail end faces should be cross-cut by grinding with a 1/8" beveled slotting wheel to a depth of not less than 3/16" below the surface of the head.

(1) The maximum cut should not be wider than 1/8".

(2) If the rails are not in contact, the overflowed metal should be removed from both end faces by grinding 1/16" from the ends of both rails.

(3) See following figure as developed by AREMA.



BEVELING OF RAIL ENDS FOR TRACKWORK

§118.0(M) RAIL LUBRICATION

(a) The gage face of the running rail in track or in special trackwork must be lubricated as follows:

(1) Running rail in curve locations where there is significant gage face wear on the high rail, or significant flow on the low rail, shall be lubricated with a wayside lubricator or as specified by the MassDOT Rail and Transit Division.

(i) Lubricate high rail gage face

(ii) Lubricate low rail top of rail

(2) When changing switch points, stock rails, and frogs in heavily used routes in interlockings, regardless of turnout size or type, lubricate new components by hand.

(3) After grinding or welding repairs to switch points and/or frogs, lubricate components by hand.

(4) When production grinding, ensure that in curves both rails are lubricated on the last grinding pass.

(b) When lubricating rail, care should be taken to control the amount of lubricant being used to avoid migration to the running surface of the rail.

(c) At wayside lubricator locations, install geotech fabric to prevent fouling of ballast. Dispose of fabric in accordance with local, State, and Federal regulations.

(d) Locate lubricators no closer than 500' from grade crossings with active warning devices.

(e) When installing lubricators, care should be taken not to install steel-mesh hoses in signal territory.

(f) Both rails should be lubricated as excessive lubrication of the high rail and poor lubrication of the low rail can produce high lateral forces and low rail rollover resulting in derailment.

(g) Use only approved environmentally-friendly lubricants per manufacturer's recommendations.

§119.0(M) CONTINUOUS WELDED RAIL PROCEDURES

See Appendix A, "Continuous Welded Rail (CWR) Procedures."

§121.0(M) RAIL JOINTS

§121.1(M) Field Welding of Rail Joints

(a) When performing rail maintenance, reduce the quantity of joints in track by laying CWR and field welding joints wherever possible.

(b) Thermite and flash butt are acceptable methods for in-track field welding.

(c) Thermite and flash butt welding shall be performed in accordance with the supplier's recommended procedure.

(d) When it is necessary to install plug rails, the plug rails should be at least 13' in length.

(e) Bonded insulated joint rail assemblies shall be field welded.

(f) Whenever possible it is desirable to field weld all turnouts and special trackwork.

(g) If it becomes necessary to apply temporary joint bars in CWR, the end bolt hole in each rail must not be drilled, as this would prevent subsequent field welding. Additional rail anchors must be applied to this joint in accordance with §125.0(M).

(h) Field welding on open deck bridges is permitted provided that proper precaution against fire is taken and only allowed with the prior approval of MassDOT Rail and Transit Division.

§121.1.1(M) Thermite Field Welding

(a) When using the thermite field welding process:

(1) Ensure that rail ends are secured against movement from thermal expansion or contraction, or from other causes. Use a hydraulic expander to maintain the rail end gap and rail alignment.

(2) Saw cut rail ends to be welded. If a torch cut rail is to be welded at least 2" of rail behind the torch cut must be cut off with a saw before the weld is made.

(3) No thermite weld shall be made:

(i) If the air temperature is below 32°F.

(ii) In inclement weather (rain or snow).

(4) Required location of field welds:

(i) Within 14' of a field weld in the same rail.

(ii) Within 4' of a plant weld in the same rail.

(iii) Within 10' of the centerline of any joint (except bonded insulated joints where no weld shall be made within 7' of the centerline of the joint).

(iv) Within 6" of a bolt hole.

(v) Within 6" of a weld that has been cut out.

(vi) On or within 4-1/2" of a tie plate or concrete tie rail seat.

(vii) Within a grade crossing without the permission of MassDOT Rail and Transit Division.

(5) General welding procedures are as follows:

(i) Prior to installing the molds, make a visual inspection of the two rail ends to ensure there are no bent rails or other defects such as cracks, splits, pipes, etc., which could cause, or later be interpreted as a defective weld.

(ii) Check the gap to ensure that it meets the specification of the weld kit manufacturer.

(iii) Align the rail ends.

(iv) Remove foreign matter, luting compound, and/or moisture from the molds or crucible.

(v) If a hydraulic expander has been used, do not release it until the weld has cooled to 500°F or less. The expander shall be released gradually.

(vi) No train traffic shall be allowed to pass over the weld, nor shall there be any disturbance of the track or rail in the area of the weld, until the weld has cooled to 500°F or less.

(6) The grinding and finishing of the weldment are as follows:

(i) The top and sides of the head of the rail at the weld shall be ground flush with the parent metal.

(ii) The weld in the web and base should be ground ***only*** to remove notches created by offset conditions, sharp protrusions, and gouges. These should be blended into the contour of the weld collar to eliminate stress risers.

(iii) In the case of continuously supported rail, the bottom and sides of the base must be ground flush with the parent metal.

(iv) Overheating the rail when grinding must be avoided. If a weld has cooled to below 500°F it must be ground so as to not increase the temperature back above 500°F.

(v) Finish grinding shall be conducted when the weld temperature is less than 200°F.

(7) Welds shall be identified on the rail with a unique number and the date using a highly visible paint or paint stick to allow identification of a particular weld.

(8) Welds shall be inspected once completed and ground.

(i) A visual inspection shall be conducted immediately. This inspection shall look for voids, nicks, gouges, sharp protrusions, or other obvious surface defects.

(ii) An inspection of the alignment of the weld shall be conducted using a 36" straight edge centered on the weld. The weld will meet the following criteria:

1. There shall be no dip.
2. The crown shall not measure more than 3/50" at a point 18" from the weld.
3. The horizontal misalignment (measured by placing the straight edge on the running side of the head) shall not measure more than 3/50" at a point 18" from the weld or at the weld if the misalignment causes a gap at the weld.

(9) An ultrasonic inspection of the weld shall be conducted within 24 hours of the completion of the weld.

(b) Field welding on open deck bridges is permitted provided that all the following conditions are met:

(1) A qualified contractor and/or Operating Railroad Company individual using a 17 lb. dry chemical ABC extinguisher is available to protect against fires.

(2) A qualified contractor and/or Operating Railroad Company individual must be present for a period of at least one hour after the last field weld is finished and ground.

(3) An extra 17 lb. ABC extinguisher must also be readily accessible as a backup.

(4) While extinguishing any fires, the qualified contractor and/or Operating Railroad Company individual must stand upwind and aim the chemical at the base of the fire.

(5) A qualified contractor and/or Operating Railroad Company individual must be present during the entire welding operation from beginning of welding process to at least one hour after the last field is finished and ground.

(6) Flash butt welding, shearing and grinding shall only be performed when there is no highway or river traffic directly under the area of the welding.

(7) Bridge timber spacing may be more restrictive than that of ballasted track. Welding shall not be performed if the tie crib is less than 5-1/2" in width or as approved by MassDOT Rail and Transit Division.

(8) Welds on open deck bridges must be made as close to the center of the crib as possible. The minimum distance between center of weld and edge of tie shall be 2-3/4".

(9) After welding, the entire structure should be inspected for possible “hot spots” or fire.

§121.1.2(M) Electric Flash Butt Welding

(a) In general, thermite field requirements apply to this process along with the following additions:

(1) All electric flash butt welding consumes rail (1-1/4" – 1-1/2" at each weld location).

(2) The weld must be at least 400' from grade crossings, turnouts or other fixed objects in the track.

(3) Anchors or resilient fasteners must be removed from at least 200' of rail on both sides of the weld before the weld is made.

(4) Care must be taken to avoid skewing ties by binding the rail against the shoulder of the tie plates when the rails are pulled together.

(5) Care must be taken to avoid damaging elastomeric tie pads by sliding the rail through the tie seat area of concrete ties when the rails are pulled together.

(6) If new rail is to be welded by the electric flash butt welding method, this decision should be made before the rail is laid and distressed so that the right amount of expansion can be calculated.

(7) When CWR strings in track are laid in track and expanded to reach a preferred rail neutral temperature (PRNT), the actual required expansion shall be reduced if the CWR strings are to be electric flash butt field welded. The amount of expansion required for a particular CWR string shall be calculated using Appendix A, “Continuous Welded Rail (CWR) Procedures.” The amount of rail to be consumed when making the two electric flash butt field welds at each end of the string shall be subtracted from the amount calculated in Appendix A, “Continuous Welded Rail (CWR) Procedures.” The resulting “net” rail expansion shall be achieved in the field when distressing and/or laying the string before welding.

§121.2(M) Bolted Rail Joints

(a) Rail ends shall be fastened together by bolted standard, compromise, or insulated joints.

(b) The use of shims or spring washers between the web of the rail and the joint bar to align the gage sides of rail heads is prohibited.

(c) The use of acetylene torches or grinding to reconfigure or change the dimensions of standard and/or compromise joint bars is prohibited.

(d) Compromise joint bars of an approved design shall only be used to join rails of the respective sections.

(e) If rail end mismatch exists after applying approved joint bars, the rail head and gage face surfaces may be adjusted by electric arc welding the smaller rail and grinding to finish the weld. Do not grind the larger rail section.

(f) Each rail joint, insulated joint, and compromise joint must be of a structurally sound design and dimensions for the rail on which it is applied.

(g) If a joint bar is cracked, broken, or because of wear allows excessive vertical movement of either rail when all bolts are tight, the joint bar shall be changed.

(h) Each joint bar must be held in position by track bolts tightened sufficiently to provide firm support for abutting rail ends and to allow longitudinal movement of rails in the joint to accommodate expansion and contraction due to temperature variations.

(i) In track with conventional jointed rail, each rail shall be bolted with all joint bar bolt holes filled.

(j) If a permanent joint connection is made between CWR and bolted rail, all joint bar holes must be filled.

(k) No rail or joint bar having a torch cut or burned bolt hole may be used in track.

(l) When a bolt is changed in a joint in Track Classes 1-5, or a frog bolt is changed, then all bolts in the connections shall be checked and retightened as required.

(m) Whenever possible, new bolts, nuts, and spring washers should be used when new or relay joint bars are applied.

(n) Lubricate joint bars with environmentally-approved lubricate. Tighten all bolts, working from center of joint bars outward. During this final tightening, tap the toes of the bars inward with a sledgehammer.

(o) In locations of elastic fasteners, the appropriate clip will be used to properly fasten the ties through the joint area.

(p) Description of joint bars:

(1) Standard bolted rail joints consist of either head free or head contact standard bars or compromise joint bars held in position by track bolts having sufficient tension to firmly support abutting rail ends, but not too tight to prevent longitudinal movement in joints to accommodate expansion and contraction due to variation in rail temperature.

(2) Head free bars must have the inner surface of the head of the bar held tightly against the rail head fillet with the heel of the bar standing out the proper distance from the base fillet, where all of the “draw-in” for wear is concentrated.

(3) Head contact bars must have the top surface of the bar held tightly against the fishing surface under the rail head outside of the rail head fillet area. Bars must be secured in a vertical position without “cocking.”

(q) Application of standard bolted joint bars will be as follows:

(1) Joint bars shall be applied with their full number of bolts, nuts, and spring washers according to the standard plans and specifications.

(2) New bolts, nuts, and spring washers should be used when new or reformed joint bars are applied or renewed out-of-face.

(3) Grease shall be applied to the fishing area of the rails, for the full length of the joint bars.

(4) When initially applying joint bars, the bolt tension should be brought in the range of 20,000 to 25,000 lbs. and for subsequent retightening from 15,000 to 20,000 lbs. This may be approximated by an average individual with a 36" track wrench.

(r) Application of head free joint bars will be as follows:

(1) Set bars in position, insert all bolts, and apply spring washers and nuts by hand.

(2) Tighten up the two center nuts with a power track wrench in high gear without fully tightening to avoid locking bars in an improper position.

(3) Strike the bead of the heads of both inside and outside bars at both ends with a hammer to force the inside faces of the bars tightly against rail head fillets. Do not strike the toe of the bar, as this tends to force the toe of the bar outward.

(4) Tighten remainder of bolts from center of joint bars outward in high gear.

(5) Tighten all bolts in low gear, working from center of joint bars outward. During this final tightening drive the toes of the bars inward by tapping with a spike maul or sledge.

(6) By following the above procedure, proper contact will be obtained between the inner face of the bar and the rail head fillet. Also, the heel of the bar will stand out the proper distance from the rail base fillet.

(s) Application of head contact joint bars will be as follows:

(1) Set bars in position on rail; insert all the bolts, nuts, and spring washers by hand.

(2) See that the bars are in a vertical (uncocked) position as one of the center bolts is tightened by:

(i) Inserting a bar or drift pin in a bolt hole (necessary only when applying a 131 lb. bar).

(ii) Tapping toes of joint bars as bolt is tightened.

(3) Tighten all bolts, working from center of joint bars outward. During this final tightening drive the toes of the bars inward by tapping with a spike maul or sledge so that their vertical position is maintained.

(t) Maintenance of joints:

(1) Drilled ends of new rails are to be ground to remove burrs at the mills.

(2) To avoid chipping or spalling under service due to overflow of steel, the rail end faces should be cross-cut by grinding with 1/8" wheel to a depth of not less than 3/16" below the surface of the head. If the rails are not in contact, the overflowed metal should be removed from the end face of each rail. If the rails are in contact, only one pass should be made removing approximately 1/16" from each rail.

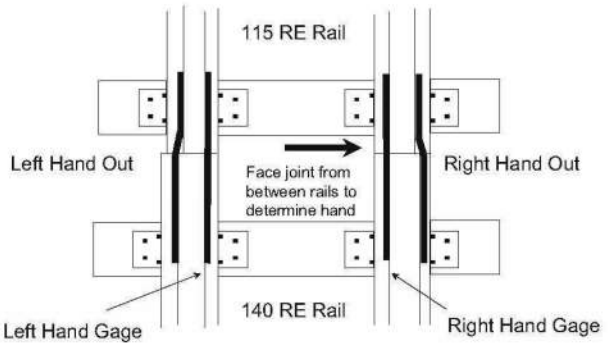
(3) When bolted joints are applied, other than insulated joints, the bolts should be tightened at the time they are applied, retightened within a week and again within a month after application.

(4) Bolts should be retightened periodically at intervals of not more than 1 year and in all cases following program track raising or surfacing.

(5) To prevent undue rail stress on account of expansion or contraction at the changes of seasons and wide temperature changes, sufficient joint bars should be loosened to permit the rail to adjust itself, immediately after which bolts should be retightened. Where necessary, a piece of rail should be cut out to avoid heat kinks or buckling of track.

(6) Wear in fishing spaces of rail should be compensated for by the application of oversized joint bars.

(u) Compromise joints are specified as left or right hand as shown in the following diagram. To determine where a left hand (“LH”) or right hand (“RH”) lays, stand in the center of the track and face the joint to be compromised.



Compromise Joint Example

§121.3(M) Insulated Rail Joints

(a) For new work or rail renewals in track circuit territory, insulated joints shall be located as follows:

(1) Insulated joints shall be staggered not more than 60" nor less than 24".

(2) Insulated rail joints at highway grade crossings shall be located in accordance with the material supplier's standard plans.

(b) For the application of Bonded Insulated Joints (Glued Insulated Joints), see the following:

(1) Glued plug insulated joints are required on all concrete tie tracks.

(2) When utilizing insulated plug rails, install the shortest plug rail available so as to minimize the number of joints and/or wells added.

(3) Conventional rail joints adjacent to bonded insulated joint rails should be field welded.

(4) All bonded insulated joints are to be installed as suspended joints. If it is absolutely necessary to install the insulated joint as a supported joint on a wood crosstie, an approved type rubber tie plate must be used under the joint. The end posts should not project above or beyond rail heads and should be trimmed with a hack saw.

(5) Double shoulder tie plates or elastic fastener tie plates should be used on the two wood crossties supporting suspended bonded insulating joints.

(6) Rail holding spike heads must be in reverse position and must be carefully driven to ensure that spike head is not in contact with the bar, which could result in the joint's being short circuited. All bonded insulating joints will have plate holding spikes installed.

(7) Joints installed with elastic fasteners shall have the correct clips (modified "e" clip) applied to prevent possible damage to the joint.

(8) No attempt should be made to tighten bolts in bonded insulated joints. In the event the bolts in the joint become loose, the joint should be replaced.

(9) Any rail head overflow at a bonded insulated joint is to be removed by grinding. Extreme care must be exercised to ensure that the end post is not damaged. The overflow should be ground only to the rail end, so that the joint gap will not be greater than the original gap. A cross grinder/slotter should not be used to remove the overflow.

(10) Bonded insulated joints will be considered as welded rail for purposes of compliance with the anchoring requirements of §125.1(M).

(11) Glued plug insulated joints shall be used in CWR (unless approved by MassDOT Rail and Transit Division).

(c) For the application of Polyurethane Coated Steel Insulated Joints (Poly Joints) see the following:

(1) Polyurethane coated (poly) steel insulated joints may be used permanently in track where the use of a bonded insulated jointed rail is not practical.

(2) Whenever possible, poly insulated joints are to be installed as suspended joints.

(3) The top of the poly joint must be set first into the fillet area of the rail. Bolts should be applied and tightened from the center out to the end of the bar.

(4) Rail holding spikes shall be reversed and not driven up against the poly joint.

§123.0(M) TIE PLATES

(a) Tie plates shall be installed and centered under running rails on all wood crossties, switch timber, and bridge timber.

(b) The preferred tie plate is a 14" double shoulder canted (1:40) plate (DSC).

(c) Tie plates with different cants and flat plates shall not be mixed.

(d) Canted tie plates shall be installed so that the rail cants towards the centerline of track.

(e) Tie plates must be placed square and tight to the base of the rail and no portion or part of the shoulder can be under the base of the rail.

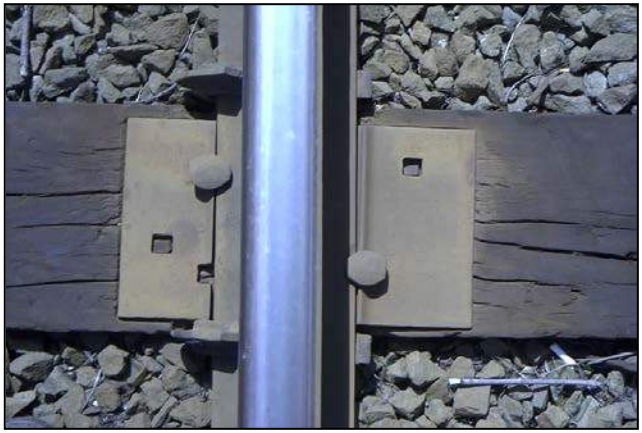
(f) No metal object that causes a concentrated load by solely supporting a rail shall be allowed between the base of the rail and the bearing surface of the tie plate (e.g., tie plate shoulders, spikes, ballast, etc.).



Tie Plate with Anchors Applied Correctly



Tie Plate with Anchors Overdriven



Box Anchored Ties with Anchors Applied Correctly

§124.0(M) TIE PADS

The use of tie pads, under the tie plates on open deck bridges, may be used only with the approval of the MassDOT Rail and Transit Division.

§125.0(M) RAIL ANCHORS/ELASTIC FASTENERS

§125.1(M) Anchor Placement

(a) Rail anchors shall be applied as follows:

(1) Anchors shall be applied on both rails and on the same side of the tie. Where special applications may be necessary, other arrangements may be used with permission of the MassDOT Rail and Transit Division.

(2) Wherever practicable, rail anchors shall be applied from the gage side of the rail.

(i) In turnouts, drive on type anchors shall be applied to switch stock rails from the field side of the track. Care must be taken in application of anchors so as not to foul switch rods.

(3) When adjusting or laying rail, the necessary anchor pattern shall be applied immediately as the rail is adjusted.

(4) Anchors should be fit tightly against sound ties.

(5) When ties at a joint cannot be anchored because of interference with a joint bar, there shall be no anchors applied to the affected joint.

§125.2(M) Fasteners Required

(a) Rail anchors should be driven just far enough so that the locking lip or groove of the anchor snaps into place on the base of the rail.

(b) A sufficient number of anchors must be applied in a pattern to effectively control longitudinal rail movement. See next pictures for typical fastening and anchoring systems.



Elastic Fastener: Pandrol Fast Clip



Elastic Fastener: Pandrol E-Clip

(c) Insufficient anchors may result in longitudinal rail movement and allow changes in rail neutral temperature (RNT) in CWR.

(d) The movement of rail can result in changes in line and surface, which may create a hazardous condition.

(e) Additional anchors must be applied if there is a standard anchor pattern and there is evidence that rails are still moving longitudinally under traffic.

(f) It should be recognized that when track is raised out-of-face, the resistance to longitudinal movement is reduced and additional anchors may be required to avoid undue rail and tie movement.

(g) Basic anchor requirements in CWR track:

(1) Every other tie shall be box anchored in all CWR tracks.

(2) Box anchor every tie in curves 3° and over.

(3) Additional anchors may be added at designated locations in anchored track or elastic fastener territory as required if longitudinal movement of the rail is detected.

(h) On main tracks the number of anchors to be applied when CWR is laid and maintained is as follows:

(1) When using rail anchors, box anchor every wood tie 200' in each direction from:

(i) Ends of CWR strings.

(ii) All joints to include glued plug insulated joints.

(iii) Turnouts, crossovers, and other special trackwork.

(iv) Rail track crossings.

(v) Public and private highway grade crossings.

(vi) Transitions to locations with elastic fasteners.

(vii) Transitions to locations of tie type change (e.g., wood to concrete or wood to steel).

(viii) Open decks on bridges, where the timbers are hooked and blocked in accordance with §119.1(M).

(2) To the extent practical, fully box anchor all ties in CWR within switch, turnout, and crossover areas.

(i) Rail anchoring systems shall be used on open deck bridges, trestles, and viaducts as determined by the MassDOT Rail and Transit Division.

(j) All jointed rail tracks require:

(1) A minimum of 40 anchors for a 78' rail and be boxed on 20 ties.

(2) A minimum of 16 anchors per 39' rail and be boxed on 8 ties.

(3) A minimum of 10 anchors per 33' rail and be boxed on 5 ties.

(4) No anchors will be placed in grade crossing panels (unless approved by MassDOT Rail and Transit Division).

(k) A fully clipped wood tie, bridge timber, or fully clipped and insulated concrete tie with an elastic fastener, is considered equivalent to a box anchored wood tie.

§125.3(M) Anchor Maintenance

(a) Ineffective anchors shall be removed and replaced when installing railing.

(b) Rail anchors must have full bearing against the tie, or tie plate, when applied.

(c) In order to avoid damage, only proper tools or machines should be used in applying and removing rail anchors.

(d) Anchors should never be applied with a spiking hammer.

(e) Anchors should not be driven along the base of the rail with a hammer.

(f) Care should be taken not to strike the rail.

(g) When the bearing of rail anchors against the tie is disturbed by renewing or re-spacing ties or replacing rail, or the anchor was not properly applied, the anchors must be taken off and then re-applied in proper position. All anchors removed must be re-applied, and defective or broken anchors must be replaced as necessary.

(h) Proper opening between rail ends in jointed rail is maintained by the use of rail anchors.

§125.4(M) Anchor Use

New or relay rail anchors may be used at any location on the MassDOT system as long as they are designed for the rail section to which they are applied and perform as intended.

§127.0(M) RAIL FASTENING SYSTEMS

§127.1(M) Number Required

(a) Track shall be fastened by a combination of components which effectively maintains gage to the prescribed limits.

(b) Additional fasteners may be used where they are needed to hold gage and/or restrain the movement of rail (both longitudinal and lateral).

§127.2(M) Installation of Fasteners

§127.2.1(M) Elastic Fasteners/Clips

(a) All elastic fasteners shall be inserted or removed from the specially designed tie plate with an approved device such as an 8 lb. sledgehammer. ***The use of a spike maul is prohibited.***

(b) Elastic fasteners shall not be overdriven as overdriving will cause premature relaxation of the fastener.



Overdriven Pandrol E-Clip



Correctly Driven Pandrol E-Clip as End of Clip Lines Up with Edge of Tie Plate

(c) If a fastener has been overdriven or is not performing its intended function of limiting the vertical and longitudinal movement of the rail, it shall be replaced.

(d) In the case of an “e” clip, a distance of 3/8" (approximate width of a wooden pencil) between the shoulder and the face of the clip should be maintained. This clearance will prevent overdriving.

(e) When applying clips with a sledgehammer, the clip must be gently tapped to ensure proper insertion before the clip is fully seated. When removing clips with a sledgehammer, secure clip with foot and gently tap clip to remove the toe load to ensure safe removal of the clip.

(f) When installing clips, the tie must be tamped up flush with the base of the rail before driving the clip so as not to damage the clip. The clip is not to be used to pull the tie up to the base of the rail.

§127.2.2(M) Screw Spikes

(a) A 15/16" diameter lag screw shall be used to secure elastic fastener plates with 1" diameter holes to wood ties and timber. Lag screws must be screwed into a 11/16" diameter pre-drilled hole that is 6" deep. Driving of lag screws with a sledgehammer or spike maul is prohibited.

(b) As shown in the MBTA Standard Plan Book 1225, in turnouts, gage, slide, heel, frog and standard tie plates, all round holes will be filled with a screw spike except:

(1) Self-aligning frog tie plates shall have one screw spike installed on each end of each plate.

(c) Holes for screw spikes shall be pre-drilled 11/16" in diameter and 6" deep.

§127.2.3(M) Cut Track Spikes

(a) All spikes (cut spikes) shall be driven with the head pointed toward the rail, except that spikes driven against the sides of insulated joints shall be driven with the head pointing away from the rail and not be in contact with the joint bars.

(b) Spikes should not be driven at ends of insulated joints as rail movement may cause the insulated joint bar to become electrically connected to the rail.

(c) Spikes must be started vertically and squarely and driven straight. The shank of rail holding spikes must have full bearing against the base of rail. Spikes should be driven

in accordance with the AREMA Manual, Chapter 5, leaving 1/8" clearance between the spike head and the base of the rail. Do not overdrive spikes.

(d) The use of lock spikes (hair pins) are prohibited. When existing lock spikes are removed they shall be replaced with cut spikes.

(e) Care must be taken not to strike the rail, its fastenings, or signal appliances when driving spikes.

(f) Spikes in main tracks, that have a cut throat, or are deteriorated due to rust, should be replaced.

(g) All old spikes, when pulled, shall be picked up and scrapped.

(h) Track spikes shall not be driven into round plate holes.

(i) When the head of the track spike is broken off, the replacement spike should be inserted in a new location, leaving the spike stub in the tie.

(j) All spike holes shall be plugged with cedar wood plugs, or with an approved plugging material, prior to re-spiking.

§127.3(M) Rail Fasteners Required

(a) Track shall be fastened by a system of components that effectively maintains gage within the limits prescribed.

(b) When spikes or elastic fasteners are used (unless otherwise ordered by the MassDOT Rail and Transit Division), each rail shall be fastened to every tie in the following manner:

Track	**Rail Holding Spikes**	**Plate Holding Spikes or Lag Screws**
Conventional Tie Plates		
Tangent and curves up to 1°	3 (1 field side rail holding; 2 gage side rail holding)	0
Curves between 1° and up to 4°	3 (1 field side rail holding; 2 gage side rail holding)	1 (1 field side)
Curves 4° and over and curved leads on all turnouts and crossovers	3 (1 field side rail holding; 2 gage side rail holding)	2 (1 field side; 1 gage side)[(1)]
Elastic Fastener Tie Plates	**Elastic Fasteners (Clips)**	**Lag Screws**
Tangent	2 clips	2 (1 field side; 1 gage side)[(1)] (2 cut spikes – 1 in each square hole field and gage)
All Curves	2 clips	4 (2 field side; 2 gage side) (2 cut spikes – 1 in each square hole field and gage)
All track with pre-plated ties	2 clips	4 (2 field side; 2 gage side)
Note: [(1)] Apply diagonally on opposite side of clip.		

§129.0(M) TRACK SHIMS

(a) If track does not meet the geometric limits (e.g., crosslevel or profile), track shims may be installed to temporarily correct the track surface.

(b) Shimmed track must be watched carefully to ensure that shims are in place and tight, and that proper gage and crosslevel is being maintained.

(c) If shims are used, they must be removed as soon as the weather, or other conditions, permit the track to be surfaced.

(d) Tie plates must not be removed from the ties as a means of adjusting the surface or crosslevel of track.

(e) Track shims must be at least the size of the tie plate and be spiked directly to the tie with spikes which penetrate the tie at least 4-1/2".

(f) Track shims must be bored where spikes are to be driven, and made of a material approved by MassDOT Rail and Transit Division.

(g) Track shims shall be braced if the shim is over 1" in thickness.

(h) Design and materials used in braces shall be approved by MassDOT Rail and Transit Division.

§145.0(M) BRIDGE GUARD RAILS

§145.1(M) Location

(a) A bridge guard rail is a continuous line of rails, connected by bolted joints or welds. The guard rail is fastened to the crossties or bridge ties adjacent to the gage side of the running rail.

  (1) One such rail is designated in these instructions as a “Single” bridge guard rail.

  (2) Two such continuous lines of rail, one adjacent to the gage side of each running rail is designated as a “Full” bridge guard rail.

(b) Guard rails are applied between the running rails of tracks at undergrade bridges which meet the below listed criteria. Full bridge guard rails shall be installed at the following locations:

  (1) Open deck bridges.

  (2) Ballast deck bridges.

  (3) Truss bridges (all).

  (4) Moveable bridges (all).

  (5) Other locations as directed by MassDOT Rail and Transit Division.

(c) Existing bridge guard rails applied in accordance to previous standards or practices need not be changed (unless instructed by MassDOT Rail and Transit Division).

(d) When it is necessary to remove bridge guard rail to perform work, bridge guard rail will be reinstalled only where required by the above instruction.

§145.2(M) Materials

(a) Suitable scrap or relay running rail may be used. The installed rail section will be approximately:

  (1) Level, but not more than 3/4" below the top of the adjacent running rails as per MBTA Standard Plan Nos. 3060 and 3062.

  (2) But in no case higher than the running rail.

(b) Install tie plates under guard rails on every other tie or timber. Tie plates should be installed with reverse cant.

(c) Joints shall be either four or six hole bars with a minimum of four bolts per joint. Joint bars shall not be used within the curved end section of the guard rail.

§145.3(M) Application

(a) Bridge guard rails shall extend a minimum distance of 39' (for speeds up to 60 MPH) and 78' (for speeds over 60 MPH), beyond each end of the bridge abutment, unless increased distances have been prescribed for specific territories or locations.

(b) The end of the bridge guard rails should be curved and brought to the center of the track.

(c) Guard rail ends shall have the rail ends beveled, bent down, or be fitted with a bridge guard rail nose. Each end shall be fastened to the center of the track so as to divert a derailed wheel and not catch dragging equipment.

(d) The guarding face of bridge guard rails on open deck bridges shall be parallel to and 12-5/8" from the gage of the running rail. If plates and clips are used on open deck bridges, see Paragraph (e) below.

(e) The distance of the guarding face will be changed in the following locations:

(1) On ballasted deck bridges the guarding face shall be at 18".

(2) On ballasted approaches to bridges the guarding face shall be at 18".

(f) Guard rail ends shall rest on a sound tie and be securely fastened.

§145.4(M) Inspection and Maintenance

Guard rails shall be inspected periodically to make certain that bolts and joints are tight, spikes are firmly against base of the rail, and castings fastened securely to rail ends, or ends properly beveled or bent down.

Subpart E - Tools

§150.0(M) TOOL REQUIREMENTS

(a) The person who is responsible for performing the track/switch inspection shall plan ahead and coordinate with the Operating Railroad Company to ensure that inspection tools are available when the inspection is made.

(b) The person who is responsible to perform track inspections shall notify the Operating Railroad Company when tools become in disrepair so that a tool can be fixed or replaced.

(c) Specified numerical limits given in this Part are to be confirmed during the track/switch inspection with the appropriate tool.

(1) Values are not to be estimated or approximated.

(2) Only values measured with approved tools are to be recorded on the Track Inspection Form.

(d) The person who is responsible for performing track inspections is encouraged to make periodic recommendations for improvements in existing tools or gauges and changes in tools that are needed to make the required inspection measurements.

§150.1(M) *Inspection Tools*

(a) Marking materials, as noted below, may be used to mark stations, tie lengths, dimensional data, and other information that will be made part of the inspection.

(1) Crayon (keel);

(2) Permanent metal marker.

(b) A mirror to be used to view difficult areas, especially the base or fillet of the rail, or connections to the moveable point frog and switch point area.

(c) A cloth measuring tape or folding wooden ruler may be used to measure track components and ties in the turnouts. The tape or ruler shall be non-conducting. The tape or folding wood ruler can also be used to measure switch point throw, frog guard face, and guard check, stations for alignment measurements, rail flow, tie spacings, offsets, and other key dimensional data.

(d) A standard combination track gauge with level shall be used so that gage, flangeway width, crosslevel, and superelevation measurements can be made.

(1) Level Board:

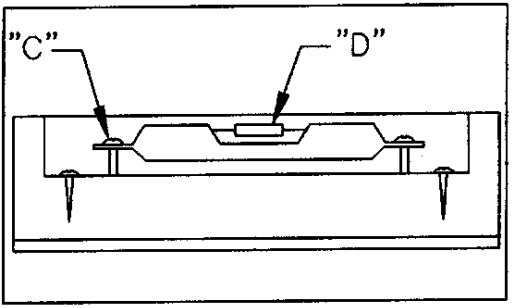
(i) The person who is responsible for performing the track inspection shall ensure that the level board is checked and maintained to measure correct crosslevel readings.

(2) Adjusting a Level Board:

(i) Set the level board on the tangent track where accuracy was checked and the difference in elevation between the two rails is known.

(ii) If required, turn the adjusting screw “C” to return the bubble “D” halfway between the readings for the known elevation. Center the bubble if possible.

- Turning the adjusting screw to the right moves the bubble away from the screw (Memory Aid: “Turn screw right away”).
- Turning the screw to the left moves the bubble toward the screw.



(iii) Turn the level board end for end and place it at the same point on the track.

(iv) See if the bubble is centered or the same. If the bubble rests at the same place, the board is adjusted.

(v) If the bubble readings are not the same, or not centered, continue steps (ii) through (iv). When the bubble is always at the same location (and centered), the level board is adjusted.

(3) Adjusting a level board by bubble positions:

(i) Place level board on the rails.

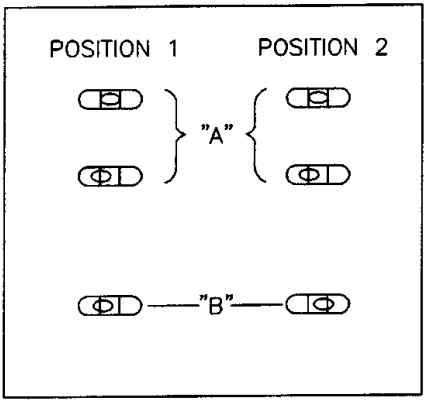
(ii) Note position of the bubble.

(iii) Turn level board end for end and place it at the same point on the track.

(iv) Note position of the bubble again.

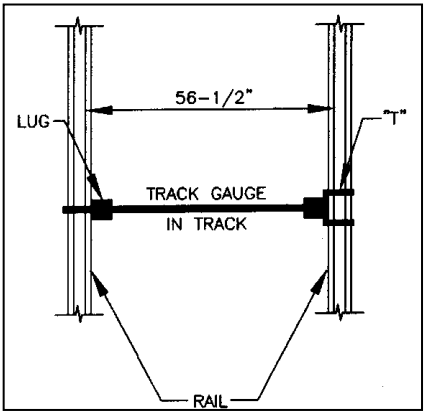
(v) If the bubble comes to rest in the same position both times “A”, the board is in adjustment.

(vi) If the bubble comes to rest in different positions “B”, adjustment of the board is necessary (see “Adjusting a Level Board” (d)(2)).



(4) The Track Inspector shall check and verify daily prior to use that standard track gauges are correctly measuring track gage.

(e) Checking a non-adjustable fixed track gauge.



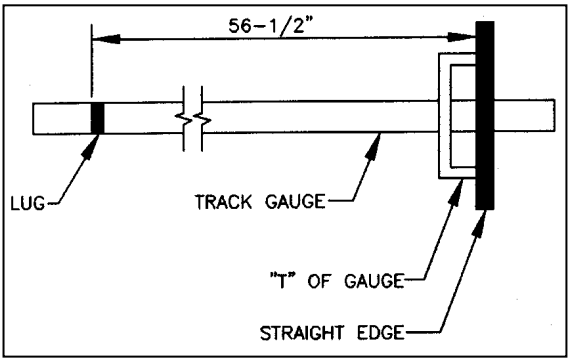
(1) Turn the gauge upside down.

(2) Place a straight edge along the “T” of gage.

(3) Measure the distance between the nearest face of straight edge and the lug.

(i) If the measurement is 56-1/2", the track gage is accurate.

(ii) If the measurement is not 56-1/2", the track gage is inaccurate. DESTROY AND DO NOT USE IT!



Track Gage Check

(f) A machined straight edge (minimum of 18" in length) shall be used to measure batter and chipping of rail ends, wear, flattened rails, mismatches (gage and tread) and engine burns on frogs and rail heads.

(g) A 36" machined straight edge with taper gauge shall be used to measure the straightness of field and plant welds.

(h) A taper gauge shall be used in conjunction with the straight edge to measure the depth of engine burns, flattened rails, and other anomalies in the rail head. In addition, the taper gauge shall be used to measure switch point/stock rail gap, and the gap at the moveable point frog.

(i) Stringline equipment capable of measuring 31' and 62' chords shall be used to check "alignment" spots. A discussion of stringlining curves is given in §55.2(M).

(j) Approved magnetic rail thermometer shall be:

(1) Calibrated in Fahrenheit, with a temperature range of 0°F - 150°F or as approved.

(2) Encased in housing with strong magnet(s) for attaching to web of rail.

(3) Meet AREMA Standard Rail Thermometer Plan 34-71, or approved equal.

(k) The following gauges may be used to check critical dimensions in and around frogs:

(1) Flangeway gauge: the gauge is designed to measure the flangeway in worn frogs so that grinding and welding repairs can be programmed. The gauge to be used by the Track Inspector shall conform to AREMA Plan No. 790-94.

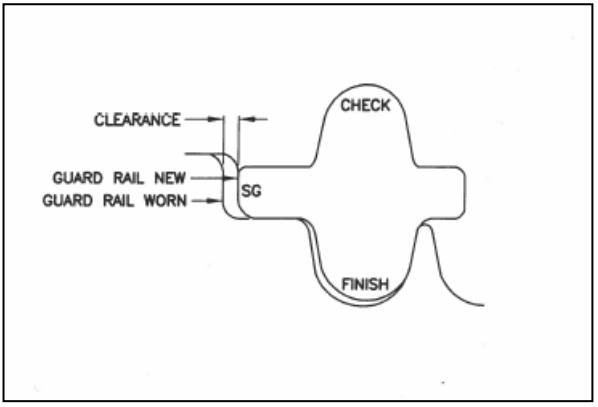
(2) Guard wear gauge: the gauge is designed to measure the wear on the guarding faces on a self-guarded frog.

(i) See AREMA plan for permissible variations in dimensions due to wear of frogs.

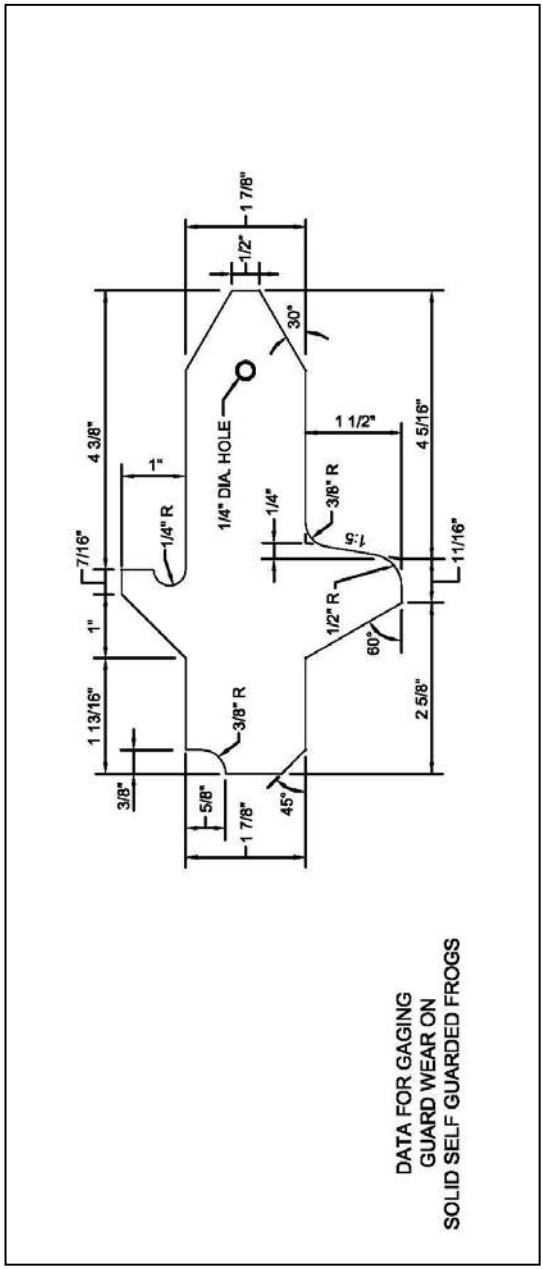
(3) The check gauge is used to test the flangeways in worn frogs and crossings for grinding or for welding repairs when necessary. It is designed for normal 1-7/8" flangeways and proper allowance should be made when used with wider flangeways. Standard contour gauge for self-guarded frogs is shown on the next page.

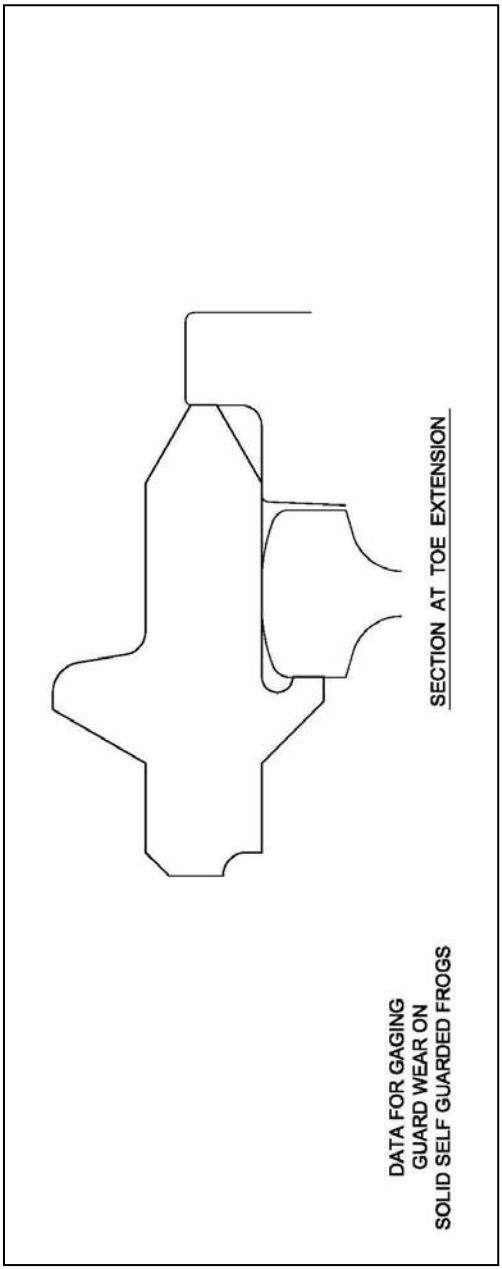
(4) The following check gauge graphic is used to measure flangeway widths in worn frogs and crossings to determine necessary welding and/or grinding repairs:

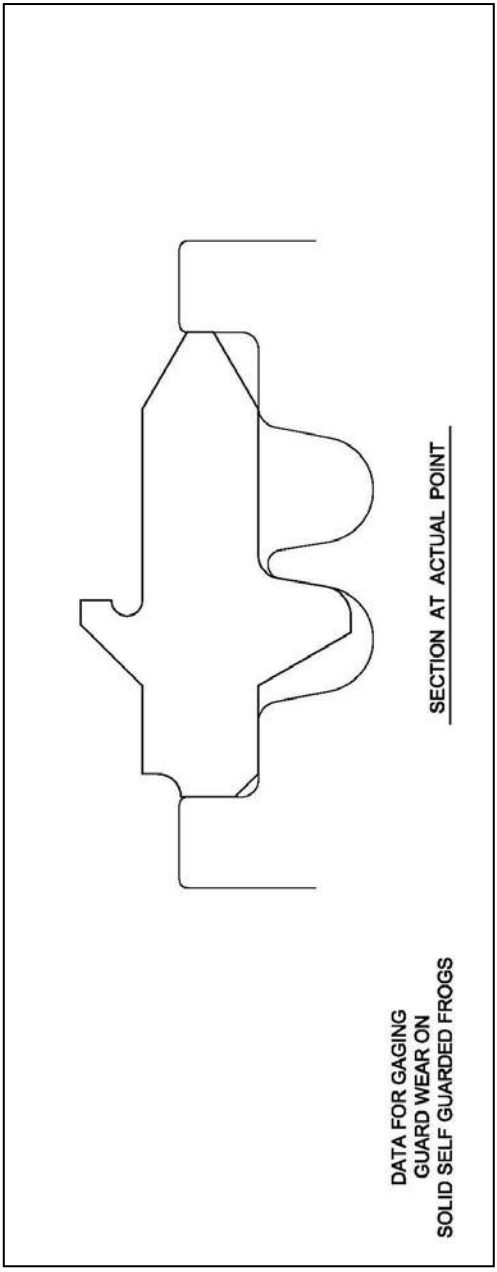
(i) The gage is designed for normal 1-7/8" flangeways.



(5) The gauge to be used by the Track Inspector shall conform to AREMA Plan No. 790-02 as shown on the following pages.


1 7/8"
1/2"
30°
1 1/2"
4 5/16"
11/16"
2 5/8"
60°
1/2" R
1:6
1/4"
3/8" R
1/4" DIA. HOLE
4 3/8"
1"
1/4" R
7/16"
1"
1 13/16"
3/8"
3/8" R
5/8"
1 7/8"
45°
DATA FOR GAGING
GUARD WEAR ON
SOLID SELF GUARDED FROGS


DATA FOR GAGING
GUARD WEAR ON
SOLID SELF GUARDED FROGS
SECTION AT TOE EXTENSION


DATA FOR GAGING
GUARD WEAR ON
SOLID SELF GUARDED FROGS
SECTION AT ACTUAL POINT

This page intentionally left blank

SUBPARTS A-H

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF SPECIAL TRACKWORK

This page intentionally left blank

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF SPECIAL TRACKWORK

TABLE OF CONTENTS

Page

SUBPART A GENERAL 81
1.0(STM) SCOPE 81
2.0(STM) MAINTENANCE RESPONSIBILITIES 81
3.0(STM) SCHEDULED MAINTENANCE ACTIVITIES 81
4.0(STM) UNSCHEDULED MAINTENANCE ACTIVITIES 83

SUBPART B MAINTENANCE PROGRAM 84
5.0(STM) MAINTENANCE 84
6.0(STM) PLANNING AND COORDINATION 84
7.0(STM) QUALITY CONTROL 84

SUBPART C SCHEDULED SITE MAINTENANCE ACTIVITIES 85
33.0(STM) DRAINAGE AND WATERWAYS 85
37.0(STM) VEGETATION MANAGEMENT 85

SUBPART D MAINTENANCE LIMITS 86
50.0(STM) SCOPE 86
53.0(STM) GAGE 86
55.0(STM) ALIGNMENT 86
63.0(STM) TRACK SURFACE 86

SUBPART E GENERAL MAINTENANCE REQUIREMENTS 87
133.0(STM) TURNOUTS AND CROSSOVERS 87
133.1(STM) Use of Turnouts and Crossovers 87
133.2(STM) Speeds Through Turnouts 87
135.0(STM) SWITCHES 88
137.0(STM) FROGS 89
139.0(STM) SPRING RAIL FROGS 90
141.0(STM) SELF-GUARDED FROGS 91
142.0(STM) GUARD RAILS 92
142.1(STM) Guard Rails – General 92
142.2(STM) Guard Rails – Use 92
143.0(STM) FROG GUARD RAIL AND GUARD FACES; GAGE 92
144.0(STM) INSTALLATION OF SPECIAL TRACKWORK GUIDELINES 93

SUBPART F SCHEDULED MAINTENANCE ACTIVITIES 95
150.0(STM) DESCRIPTION OF SCHEDULED MAINTENANCE ACTIVITIES TO BE PERFORMED 95
151.0(STM) RECORD OF TRACKWORK DISTURBANCE IN CWR TERRITORY 95
152.0(STM) LUBRICATION OF SWITCHES AND FROGS 95
152.1(STM) Lubrication of New Switch Points 95
156.0(STM) SURFACING (SPOT TAMPING) - GENERAL 95
157.0(STM) OUT-OF-FACE SURFACING AND ALIGNMENT 96
158.0(STM) SPOT REPLACEMENT OF MAJOR COMPONENTS 96
159.0(STM) SPOT RAIL REPLACEMENT 97
160.0(STM) BOLTS AND LOCK WASHERS 97

161.0(STM) FASTENING SYSTEMS 98

SUBPART G TURNOUTS IN SIGNALIZED TRACK 99
170.0(STM) GENERAL PROCEDURES FOR WORK ON TURNOUTS IN SIGNALED TERRITORY 99

SUBPART H MECHANISMS, APPLIANCES, AND DEVICES 100
200.0(STM) SWITCH OPERATING MECHANISMS 100
200.1(STM) Use of Mechanisms 100
200.2(STM) Installation of Switch Stands 100
205.0(STM) SWITCH POINT POSITION INDICATORS (TARGETS) 100
205.1(STM) General 100
205.2(STM) Installation of Position Indicators 100
205.3(STM) Maintenance 100
205.4(STM) Position Indication 100
205.5(STM) Distance From Rail For Switch Stands and Switch Point Targets 101
210.0(STM) SWITCH STAND MAINTENANCE 101
220.0(STM) SWITCH LOCKS 101
300.0(STM) DERAILS 102
300.1(STM) Position of Derails 102
300.2(STM) Use of Derails 102
300.3(STM) Types of Derails 102
300.4(STM) Installation of Derails 103
300.5(STM) Operation of Derails 103
300.6(STM) Maintenance of Derails 103

SUBPART I SCHEMATICS / PHOTOGRAPHS 104

Subpart A – General

§1.0(STM) SCOPE

(a) This subpart will provide guidance as to the types of maintenance and maintenance limits required for special trackwork**.**

(b) This subpart shall be used by the MassDOT' s Operating Railroad Companies to maintain a safe, reliable track structure in the most economical and efficient manner possible.

(c) Forces engaged in the repair of special trackwork and appliances shall be aware that their maintenance goal is to provide a safe and reliable track structure with a superior ride quality.

(d) Ensuring adequate spare material inventory for all trackwork is the responsibility of the Operating Railroad Companies.

§2.0(STM) MAINTENANCE RESPONSIBILITIES

(a) MOW personnel in charge of making repairs and performing maintenance of turnouts and other trackwork shall attend and successfully complete courses prescribed by the Operating Railroad Companies.

(b) For Track Classes 1-5, individuals designated to supervise the maintenance, restoration, and renewal of trackwork shall be designated in accordance with FRA §213.7.

§3.0(STM) SCHEDULED MAINTENANCE ACTIVITIES

(a) Turnouts and other special trackwork must be maintained on a regular basis to:

(1) Provide a safe and reliable track structure;

(2) Provide acceptable ride quality;

(3) Maximize the useful life of the special trackwork.

(b) The maintenance schedule for special trackwork is driven by:

(1) Location of the special trackwork;

(2) Frequency and accumulated tonnage over the special trackwork;

(3) Type and maintenance history of the special trackwork;

(4) Inspection reports of the Operating Railroad Companies.

(c) A summary of scheduled maintenance activities for special trackwork is given in the following table. This table is not intended to be all-inclusive and only identifies the major activities that are usually associated with special trackwork maintenance.

Scheduled Maintenance Activities for Special Trackwork

- Lubrication of switch and spring frog plates
- Maintenance grinding of frog, switch point, and stock rails
- Maintenance grinding of welds, forged areas, and slotting of mechanical joints
- Maintenance welding of worn frogs
- Maintenance welding of engine burns (≤3/8")
- Production grinding of special trackwork and approaches:*
  - 8-12 stone production switch grinder
- Inspection of gage, with attention to the spread of the rail due to defective fasteners, timber, and/or rail wear
  - Inspection of guard face gage, guard check gage and track gage
- Inspection of head block area (switch stand, timbers, and latches)*
  - Check the crank eye bolt under the switch stand to include cotter pin
  - Check the upright bolt and cotter pin at the connection between number 1 rod and the throw rod
  - Inspect all switch locks, circuit controller (CC) box, and unlock box for proper number and placement
  - Throw turnout to observe for loss of motion
  - Observe switch point and stock rail fit
- Maintenance, cleaning, and adjustment of switch targets
- Maintenance and replacement of gage plate and rod insulation*
- Spot tamping of trackwork*
- Out-of-face surfacing and alignment of trackwork*
- Spot replacement of major trackwork components (stock rails, switch points, frogs, etc.)*
- Spot rail replacement to include the replacement of insulated joints and curve worn rail*
- Bolt maintenance: tighten or replace loose and defective bolts and torque to specifications; inspect and install cotter pins as required
- Replacement or adjustment of defective fastener systems
- Maintenance of drainage and waterways
- Vegetation management
- Ballast maintenance
- Out-of-face ballast replacement (undercutting and shoulder ballast cleaning)*

***The Signal Department shall be notified prior to maintenance and inspection as noted above. In addition, the Signal Department must be notified when work is required on the following items:**

- Insulation on bridal plates
- Insulation on switch rods
- Repair/replacement of insulation joints
- Protection of track wires and bond wires

§4.0(STM) UNSCHEDULED MAINTENANCE ACTIVITIES

(a) Unscheduled maintenance activities are maintenance activities that cannot be planned or programmed.

(b) Unscheduled maintenance of special trackwork and components can be due to:

(1) Any signal failure.

(2) Natural events, such as fire, flood, severe storms, and extreme temperatures or extreme variations in temperature, and earthquakes.

(3) A sudden change in the type of traffic, speed of traffic, or frequency of traffic over special trackwork.

(4) A “run through” or derailment within the area of special trackwork or a component of special trackwork.

(5) Failure of a component or components.

Subpart B – Maintenance Program

§5.0(STM) MAINTENANCE

Refer to §5.0(M)

§6.0(STM) PLANNING AND COORDINATION

(a) Refer to §3.0(STM) for the list of maintenance activities that shall be planned and performed by track forces.

(b) Programmed maintenance shall provide for the safety of train operations and shall be carried out in a cost-effective manner to provide maximum life to the trackwork and maximum benefit to the Operating Railroad Company.

(c) The information contained in inspection reports shall be used to plan trackwork maintenance.

(d) Program maintenance and/or capital maintenance and production should be internally coordinated with the Operating, Signal, and Bridge & Building (B&B) Department of the Operating Railroad Company.

(e) Planned maintenance that involves work within private rights-of-way (i.e., grade crossings and utilities), shall be coordinated with fire, police, public safety, and appropriate utilities (call 811 for Dig Safe). Also coordinate with local Department of Public Utilities (DPU) and/or State District.

§7.0(STM) QUALITY CONTROL

(a) The person in charge of performing the maintenance activity or repair shall be responsible for the overall quality of the work performed.

(b) All maintenance work shall be performed in accordance with these practices.

(c) An Operating Railroad Company Official shall periodically review the work performed for quality, consistency, and adherence to (b).

(d) Trackwork repairs that are deficient:

  (1) May be cause for remedial action.

  (2) Shall be brought to the attention of an Operating Railroad Company Official.

(e) An Operating Railroad Company Official shall see that any additional work necessary is performed to bring the repair into compliance with MassDOT recommended practice and shall re-inspect for substandard or deficient work.

(f) Operating Railroad Company personnel are encouraged to make recommendations as to the required modifications to methods, procedures, and practice to improve the overall quality of work.

Subpart C – Scheduled Site Maintenance Activities

§33.0(STM) DRAINAGE AND WATERWAYS

Drainage in and around special trackwork shall be maintained in accordance with §33.0(M).

§37.0(STM) VEGETATION MANAGEMENT

Vegetation in and around special trackwork shall be maintained in accordance with §37.0(M).

Subpart D – Maintenance Limits

§50.0(STM) SCOPE

(a) Maintenance is the repair or replacement of a component of special trackwork which may include switch points, frogs, and fastenings.

(b) Maintenance limits are to be used as a triggering mechanism that prompts maintenance or reconstruction.

  (1) It is MassDOT's goal to have special trackwork that is maintained above FRA minimum standards.

  (2) As special trackwork components wear, maintenance should be programmed before the track reaches the maintenance limits.

  (3) Maintenance must be executed whenever the maintenance limits are exceeded and completed prior to reaching the FRA minimum standards.

  (4) Whenever possible, special trackwork should be repaired or reconstructed to as-new condition.

(c) The maintenance limits and recommended practice for special trackwork and other trackwork are found in this subpart or the applicable maintenance sections.

§53.0(STM) GAGE

Refer to §53.0(M), "Gage."

§55.0(STM) ALIGNMENT

(a) Maintenance shall be performed when alignment values reach the limits given in §55.0(M) Alignment.

(b) The straight stock rail (open point) in a turnout is the line rail. If stations fall within undercut portions of the stock rail, alignment measurements may be taken on the field side of the stock rail.

(c) In special trackwork, alignment deviation in curves is the difference in the mid-ordinate value between adjacent stations and not the average of multiple stations (uniformity) as given in FRA §213.55.

§63.0(STM) TRACK SURFACE

(a) The following criteria:

  (1) Will serve as a practical guide for the maintenance of smooth riding conditions in special trackwork; and

  (2) Will minimize the wear on special trackwork, special trackwork components, and rail vehicles.

(b) For Track Classes 1-5, surface may not deviate more than the amount prescribed in the table in §63.2(M).

Subpart E – General Maintenance Requirements

§133.0(STM) TURNOUTS AND CROSSOVERS

§133.1(STM) Use of Turnouts and Crossovers

(a) Turnouts and crossovers are designated by their frog numbers and should be used as follows:

(1) No. 20: At interlocking plants for crossing over of high speed trains from one main track to another main track (normally used in the same or reverse direction in locations where the normal speed is 50 MPH or more).

(2) No. 15: At interlocking plants for movements to another main track (normally used in the same or reverse direction, where conditions do not justify or afford the distance required for No. 20 frogs). For diverting trains to sidings or other tracks and returning trains to main tracks through power operated or spring switches.

(3) No. 10: For all other turnouts from main tracks and sidings, where practicable, and in yards and terminals.

(4) The use of other turnouts must have the approval of MassDOT Rail and Transit Division.

§133.2(STM) Speeds Through Turnouts

(a) The maximum permissible speeds through turnouts when located in tangent track will be as follows:

Frog No.	Switch Point/ Switch Rail Length (Ft.)	Maximum Authorized Speeds (MAS) (MPH)
20	59'-6"	60*
20	39'	45
20	39'	60*
15	38'	30
15	26'	30
10	27'	15
10	16'-6"	15
8	16'-6"	10
Note: * With equilateral turnouts only.		

(b) When turnouts or crossovers are located in curved tracks, speed must be adjusted in accordance with FRA §213.57.

(c) The maximum authorized speed (MAS) through turnouts shall be designated by the MassDOT Rail and Transit Division.

§135.0(STM) SWITCHES

(a) Switch points and moveable points should be kept in line and surface with all bolts tight and cotter pins in place.

(b) Switch points must fit the stock rails closely and accurately, with a full bearing against the head of the stock rail. If a wear pattern indicates bearing only along the top edge of point, the cause of wear shall be investigated and corrected.

(c) When an open switch point is found of more than 3/16", it must be immediately corrected and/or removed from service.

(d) Each switch stand in connecting rod must be securely fastened and operable without excessive loss of motion.

  (1) Connecting rod bolts must be of the proper size and installed with the bolt facing upwards and the nut on top.

  (2) The upright bolt and nut shall be drilled to accept and installed with a cotter pin.

(e) Switch points and stock rails should have the overflow ground off. Attention should be given to the overflow and fit of the back side of the switch point to the stock rail.

(f) When necessary to replace individual switch points or stock rails, use replacement material of similar kind (i.e., Samson points to Samson stock rails; plain points to plain stock rails).

(g) When replacing or changing a switch point, replace switch points and stock rails as a set:

  (1) Fastenings must be intact and maintained so as to keep the components securely in place.

  (2) Also, each switch, frog, and guard rail must be kept free of obstructions that may interfere with the passage of wheels.

  (3) Classes 3-5 track must be fully box anchored through and on each side of track crossings and turnouts to restrain rail movement affecting the position of switch points and frogs. Elastic fasteners designed to restrict longitudinal rail movement are considered the same as rail anchors.

(h) Adequately fasten switch points and stock rails to prevent lateral and longitudinal rail movement.

(i) Upright bolts used with horizontal switch rods must be placed with nut ends up and nuts secured with cotter pins so they can be visually inspected.

(j) Switch points shall be replaced when worn or chipped so that the top of the switch point, at any place, is more than 7/8" below the plane across the top of the stock rails.

(k) Unusually chipped or worn switch points that are found to have an unprotected flat, vertical service, 5/16" or more in width, at a depth of 3/4" below the top of the stock rail and switch point, must be removed from service and replaced immediately. This type of point wear may contribute to a wheel climb derailment.

(l) Switch points shall be replaced when the raised portion of the switch point (rise) is worn down to the level of the top of the stock rail. The purpose of the rise is to prevent the outer edge of the wheel tread from striking the stock rail and rolling the stock rail out of the switch plates and causing a derailment.

(m) Chipping or wear on any switch point should be investigated, its cause determined and corrective action taken. Wear or chipping produces a sloping surface on the face of the switch point which may tend to lift a wheel having an imperfect flange. The switch rail should be further examined to locate any point of hard contact by the wheel, which might contribute to wheel climb.

(n) Spot grinding of points is allowed to remove chips, minor burns, small imperfections, small cracks, etc., with care being taken to insure that proper profile is restored to the switch point to prevent wheel climb. Grinding is not to exceed 7/8" below top of stock rail.

(o) When changing switch points and curved closure rails, or when grinding switch points, lubricate as follows:

(1) The gage face of the curved point and the curved closure rail.

(2) Spot lubricate top of straight closure rail in vicinity of switch point.

(3) Lubricate gage face of all ground switch points.

(p) Switch points, components, and connections must be examined frequently.

(1) It is important that the stock rails are securely seated and have no movement in the switch plates.

(2) Care should be taken to avoid canting the rail by over-tightening the rail braces.

(3) Switch plates shall have no movement on the ties.

(q) Switch plates and moveable parts should be kept clean and lubricated with an approved graphite dry lubricant.

(r) The heel of each switch point must be secured and the bolts of each heel must be kept tight (e.g., fixed blocks).

(s) In yards when using No. 10 turnouts or smaller, and the maximum authorized speed does not exceed 15 MPH, a switch point guard may be applied to the outside of the stock rail.

(t) Switch point guards shall be used only in yards and installed so that the distance of the guarding face of the guard to the gage face of the switch point is set at 3-15/16". The gage face of the switch point guard shall be restored by welding once the wear exceeds 1/4" (4-3/16").

§137.0(STM) FROGS

(a) See AREMA Standard Track Plan No. 300 for guidance on the use of frogs.

(b) All metal flow from frogs must be ground promptly and the gage and guard edges of castings rounded. The radius shall be ground to match the original radius and contour of the frog. See AREMA Standard Track Plans or manufacturer's shop drawing.

(c) New frogs should be ground 30 days following installation. Subsequent grinding will be required monthly for the first several months depending on frog type and service.

(d) Frog points, frog castings, and wheel relief areas (false flange), should be built up by welding to maintain as-new cross section. Spring rail frogs also have false flange relief areas by design. See AREMA Standard Track Plans or manufacturer's shop drawing.

(e) Worn frogs should be repaired in track by an approved electric welding method and then ground to the correct contour.

(f) Each flangeway in special trackwork must be at least 1-1/2" wide with a 1/8" head radius.

(g) The flangeway depth, measured from a plane across the wheel-bearing area of the frog, may not be less than 1-3/8" in Track Class 1 or less than 1-1/2" in Track Classes 2-5.

(h) If a frog point is chipped, broken, or worn more than 1/2" down and 3" back, the frog should be repaired.

(i) If a frog point is chipped, broken, or worn more than 5/8" down and 6" back, operating speed over that frog may not be more than 10 MPH.

(j) If a riser or insert of a frog is broken out or worn down more than 3/8" below the original contour, operating speed over that frog may not be more than 10 MPH.

(k) Welding repairs on manganese (Mn) steel frogs shall be performed by a welder certified to weld manganese steel.

(l) All frog repairs should be ground to contour. Square corners lead to breakouts into the flangeway.

(m) Frog welding may be prolonged indefinitely by proper grinding practices.

(n) Missing or loose frog bolts shall be retightened or replaced with bolts of correct length and diameter.

(o) All frogs requiring repairs that cannot be made in track shall be removed from track and shipped to the designated repair point.

(p) Frogs shall be supported on effective timber that is fully tamped to minimize wear and damage from train traffic.

§139.0(STM) SPRING RAIL FROGS

(a) Spring frogs have a moveable wing rail that is normally held closed against the body of the frog except when pushed open by a diverging movement. This results in a smoother ride for main line moves.

(b) Spring frogs must be inspected to comply with FRA §213.139.

(c) Recommended practice for the proper installation, inspection, and maintenance:

  (1) Spring frogs must be inspected on foot at least once per week.

  (2) Good surface, line, drainage, and timber condition must be maintained.

  (3) The outer edge of a wheel tread must not be permitted to contact the gage side of the spring wing rail.

  (4) All bolts should be tight:

    (i) Some body bolts are special thin head bolts.

    (ii) Maintenance body bolts (studs) are available for locations where frog must be disassembled to install new bolt.

  (5) Ensure spring wing can move freely.

(d) Spring rail frogs are to be used on industrial tracks that are used infrequently (unless approved by the MassDOT Rail and Transit Division).

(e) The clearance between the hold-down housing and the horn may not be more than 1/8" at the top and 1/8" at the bottom. Other issues to be addressed:

  (1) Wing and point must fit properly. Grind overflow to prevent chipping. Grind gage corner radius to 5/8".

  (2) The spring wing to frog point is designed to have a 3/8" gap at the point. A gap of no more than 3/4" must be maintained.

  (3) Ensure there is sufficient tension on spring:

    (i) The spring nuts should be adjusted to compress the spring 1" (1/4" between spring follower and housing).

    (ii) This results in approximately 600 pounds of force from the spring.

(f) Typically, by design, there is a gap of up to 3/8" between the spring wing rail and frog point within the first 5" of the frog point. It is desirable to maintain contact between the spring wing rail and the remainder of the frog.

  (1) A gap less than 3/4" is to be maintained.

(2) If a gap of 3/4" exists, check the compression of the springs on the wing rail to see if the springs must be adjusted and/or replaced.

(g) Particular attention should be paid to the guard face gage in the point area on the straight side of the turnout. A guard rail protects the straight move through the length of the moveable wing.

(h) The outer edge of a wheel tread must not contact the gage side of a spring wing rail.

(i) When surfacing a spring frog:

(1) Do not jack the frog with production equipment between the toe and heel. This could bend the base plate.

(2) Use hydraulic hand jacks.

(j) Base plate and horns should be lubricated with switch plate lubricant.

(k) The toe of each wing rail must be solidly tamped and fully bolted, or preferably, field welded.

(l) Spring frogs should be ground 30 days after installation. Subsequent grinding may be required monthly for the first several months depending on frog type and service.

(m) Welding of a spring rail frog may only be performed with the permission of the MassDOT Rail and Transit Division.

(1) If a spring rail frog is welded in the field, the first train will operate at Class 1 speeds, freight trains at 10 MPH, and passenger trains at 15 MPH.

(2) The spring rail frog will be re-inspected after the first train before the track will be returned to MAS.

(n) Each spring must have sufficient compression force to hold the spring wing rail against the point rail.

(o) Lubricate spring frog plates with approved lubricant in the Spring, Summer and Fall and “Ice Free Switch” anti-icing agent in the winter (or approved equal).

(p) The opening between the spring wing rail and frog point of spring frog shall be kept free of any debris and snow and ice that may impede the operation of the spring wing rail.

§141.0(STM) SELF-GUARDED FROGS

(a) Self-guarded frogs shall be used in non-main tracks where the speed does not exceed 15 MPH.

(b) If, because of wear, repairs need to be made to the guarding face of a self-guarded frog:

(1) The raised guard face of a self-guarded frog may not be worn horizontally more than 3/8".

(2) Repairs require the use of a contour gauge (see §150.1(M), “Inspection Tools”).

(3) The track should be taken out of service.

(4) When repairing the guard face of a self-guarded frog, the build-up of weld material must be made from the top down to prevent wheel climb

(5) When repairs are made to a self-guarded frog, the guard face must be restored before rebuilding the point. This practice will ensure that the wheel does not strike the rebuilt frog point.

§142.0(STM) GUARD RAILS

§142.1(STM) Guard Rails - General

Guard rails shall be furnished in accordance with MBTA Standard Plan Book, AREMA Standard Plan Book, or as approved by the MassDOT Rail and Transit Division.

§142.2(STM) Guard Rails - Use

(a) Guard rails used with No. 15 spring frogs shall be a minimum of 16'-0" in length. Guard rails used with frogs of lesser number shall be a minimum of 13'-0" in length.

(b) Guard rails used with No. 10 spring frogs shall be a minimum of 16'-0" in length, or as approved by the MassDOT Rail and Transit Division.

(c) Guard rails installed in accordance with previous standard practice may be continued in general use until their replacement becomes necessary.

(d) Relay quality hook flange guard rails must only be reinstalled in other than main tracks.

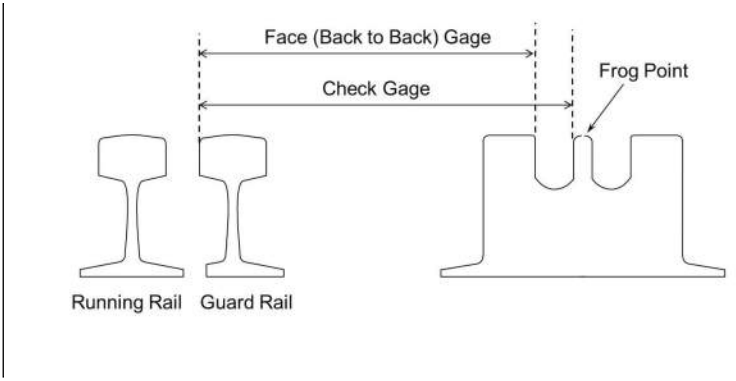
§143.0(STM) FROG GUARD RAIL AND GUARD FACES; GAGE

(a) If possible, when performing trackwork maintenance, repairs shall be made to restore the installation dimensions of guard rails:

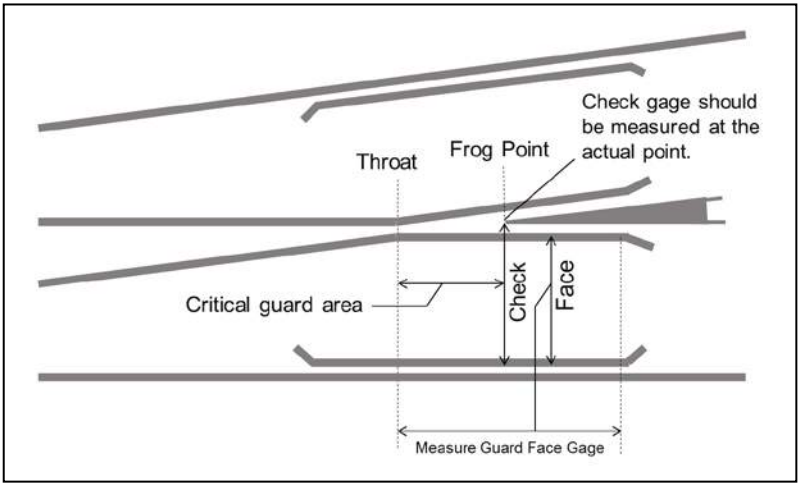
Track gage	56-1/2"
Guard check gage (may not be less than)	54-5/8"
Guard face gage (back to back) (may not be more than)	52-3/4"

(b) Maintenance limits contained in Paragraph (a) are more restrictive than those found in FRA §213.143.

(c) See the following diagrams showing guard check gage and guard face measurement locations.



Guard Check and Guard Face Gage



Guard Check and Guard Face Gage Measurement Locations

§144.0(STM) INSTALLATION OF SPECIAL TRACKWORK GUIDELINES

(a) Trackwork constructed in track, or at the site, shall be built to, and perform to the MBTA Standard Track Plans, AREMA Standard Track Plans, or as approved by the MassDOT Railroad Transit Division.

(b) Turnouts and crossovers shall not be placed in curves or spirals without the approval of the MassDOT Rail and Transit Division.

(c) Pre-plated, pre-assembled switch timber and pre-fabricated switch nose panels (if truckable), are preferred.

(d) Care must be used in unloading and handling all trackwork, timber, and turnouts. This includes handling and unloading from flatbed cars and trucks and assembling and loading onto transport cars.

(e) A minimum 12" bed of clean-bottom compacted ballast shall be provided with good drainage. See MBTA Standard Plan Nos. 1000 and 1002.

  (1) If roadbed materials (sub-ballast and sub-grade) are inadequate, an 8" layer of compacted sub-ballast shall be installed; or

  (2) A 5" layer of compacted hot-mix asphalt under-layment as per MBTA Standard Plan No. 1030; or

  (3) A Geo-Web (or approved equal) sized appropriately for the field conditions (4", 6", or 8") may be used as determined by the MassDOT Rail and Transit Division.

(f) When practicable, special trackwork should be completely installed with switches connected to their operating mechanisms and properly adjusted before trains are permitted to move over the trackwork.

(g) Care must be used when installing trackwork panels to prevent rail bending, tie splitting, or tie cracking, as well as bending and/or breaking fasteners and OTM.

(h) When installing special trackwork panels, bottom ballast should be furnished and installed and compacted level to within 2" to 4" of final bottom of tie grade. The final lift shall be nominal 1-1/2". (Ballast bagging or blocking can be used when undercutting or in emergencies.)

(i) Initial surfacing lifts for special trackwork shall be limited to 2" increments. This size lift helps prevent tie breakage, and the bending of rail and plates in spring and moveable point frogs. The final lift shall be a nominal 1-1/2".

(j) Where only one switch rail (closed point) has been installed in a main track turnout in existing main track, and it is necessary to move trains over the turnout, the following precautions must be taken:

  (1) All switch plates on the turnout side must be in the correct position and clipped and/or fully fastened.

  (2) The switch rail must be securely held against its stock rail by driving a spike in each of the first two ties back of the point and, where possible, spikes must pass through holes in the switch plates.

  (3) The switch point must be secured to the stock rail by standard clamping devices.

  (4) Unconnected ends of lead rails, or the toe of the frog, must be protected by a tapered wedge fastened to the tie to protect against dragging equipment.

  (5) The free end of stock rail must be fastened down to prevent movement and a tapered wedge fastened to prevent against dragging equipment.

  (6) Facing point train movements shall only be made under a 10 MPH temporary speed restriction unless point detection is provided.

(k) If both switch rails have been installed, but not properly connected to the switch operating mechanism, the following must be done before trains are permitted to move over the main track turnout:

  (1) Switch rods must be installed.

  (2) The main track switch rail must be secured against its stock rail, as required above.

  (3) The diverting switch rail (open point) must be blocked by driving a wooden wedge, not less than 18" long, between the switch rail and the stock rail.

  (4) On wood ties, a wedge must be secured in place by means of a lag screw or heavy nail through one clip bolt hole and a piece of wood placed against the end of the wedge and spiked to the first and second ties ahead of the point.

  (5) Unless the curved lead has been installed and spiked or clipped to prevent movement, a connecting rail shall be fastened to the heel of the open switch rail and moved away from the running rail so as to provide at least 5" clearance between rail heads.

  (6) Facing point train movements shall only be made under a 10 MPH temporary speed restriction unless point detection is provided.

(l) The main track guard rail must be correctly placed and clipped or spiked if the frog has been installed.

(m) Unconnected ends of lead rails or the toe of the frog must be protected by a riser wedge fastened to the tie to protect against dragging equipment.

(n) Where track is signaled, a switch circuit controller shall be installed, tested and functioning, by a signal employee of the Operating Railroad Company.

Subpart F – Scheduled Maintenance Activities

§150.0(STM) DESCRIPTION OF SCHEDULED MAINTENANCE ACTIVITIES TO BE PERFORMED

Refer to the table in §3.0(STM) for the list of major trackwork activities to be performed by the Operating Railroad Company.

§151.0(STM) RECORD OF TRACKWORK DISTURBANCE IN CWR TERRITORY

(a) Maintenance activities performed in trackwork installed in CWR track can cause a change in the rail neutral temperature (RNT) of the CWR and cause track instability in and around the special trackwork.

(b) MOW employees in charge of, or responsible for maintenance work performed in and around special trackwork in CWR track, shall be thoroughly familiar with and understand and comply with Appendix A, "Continuous Welded Rail (CWR) Procedures."

§152.0(STM) LUBRICATION OF SWITCHES AND FROGS

(a) Switch and spring frog plates shall be cleaned and lubricated as necessary.

(b) The Signal Maintainer has the overall responsibility to lubricate powered switches and derails in signaled track.

(c) The Track Department has the responsibility to lubricate all other switches, derails, and spring frogs with approved seasonal lubricants.

§152.1(STM) Lubrication of New Switch Points

(a) New switch points shall be greased after installation.

  (1) Special attention should be paid to lubricate the gage face of the diverging point from point of switch to point of frog.

(b) Existing switch points that show indication of wear should be carefully lubricated frequently on the gage face so as to prevent migration to the top of rail, as well as excessive ground and ballast contamination.

§156.0(STM) SURFACING (SPOT TAMPING) - GENERAL

(a) Spot tamping (less than 200') is required to restore the surface and line when deviations approach the alignment and surface maintenance limits given in §§55.0(M) and 63.0(M).

(b) Spot tamping is required to eliminate the excessive deflection and pumping of ties which:

  (1) Overstresses clips causing premature failure or backing out of clips.

  (2) Increases abrasion of the wood ties.

  (3) Fouls the ballast.

  (4) Increases ballast abrasion and wear.

  (5) Changes the load distribution over the length of the tie which, in some cases, may overstress the tie.

(c) Tamping should be performed in such a manner as to prevent the centerbinding of timber and ties.

(d) In wood tie turnouts, head block and movement ties may require tamping by hand to provide full support of the long timber.

(e) When spot surfacing in welded rail territory, see Appendix A, "Continuous Welded Rail (CWR) Procedures."

§157.0(STM) OUT-OF-FACE SURFACING AND ALIGNMENT

(a) Out-of-face surfacing (greater than 200') shall be accomplished by multiple tool switch tampers, ballast stabilizers, and ballast regulators.

(b) Out-of-face surfacing is usually required when there are multiple spots to be surfaced that are greater than 200' in length.

(c) Out-of-face surfacing is required to restore the overall surface and line when deviations approach the alignment and surface maintenance limits given in §§55.0(M) and 63.0(M).

(d) The Operating Railroad Company shall plan any out-of-face surfacing program for trackwork. The Operating Railroad Company MOW personnel shall make use of information on the Track Inspection Report, Special Track Inspection Report, Monthly Switch Inspection Report, track geometry car readings (if available) and train rides when planning the out-of-face surfacing program.

(e) Out-of-face surfacing and aligning of CWR track should be avoided:

(1) When the ambient air temperature is 80°F, or rail temperature is 100°F, or above;

(2) Anytime there is an ambient air temperature of 40°F, or below, for a 24-hour period. To surface and align track below the above temperature requires the approval of MassDOT Rail and Transit Division.

(3) Any other time when questionable track conditions exist that will not safely support surface and alignment of track.

(f) When out-of-face surfacing in welded rail territory, see Appendix A, "Continuous Welded Rail (CWR) Procedures."

§158.0(STM) SPOT REPLACEMENT OF MAJOR COMPONENTS

(a) During the useful life of special trackwork, it may be required to replace major components and systems as part of a programmed maintenance activity. The major components include, but are not limited to:

(1) Switch points, stock rails, and/or point protectors.

(2) Switch plates or tie plates and clips and fasteners.

(3) Frogs and guard rails.

(4) Bolt assemblies.

(5) Closure rails (associated joint and insulated joints).

(6) Switch timber and headblock ties.

(7) Switch stands, switch machines, and/or derails.

(8) Switch targets, handles, rods, and cotter pins.

(b) The replacement of major components is based on:

(1) The physical condition of the component.

(2) The amount of measured wear on the component compared to an established maximum "wear limit" as given in this Part.

(3) The ability of the component to sustain MAS and meet the operational requirements of the railroad.

(4) Lost motion of any moving switch parts.

(c) When changing major components, all work performed shall be reported on the daily Track Inspection Report and be available to the MassDOT Rail and Transit for review.

§159.0(STM) SPOT RAIL REPLACEMENT

(a) Rail replacement shall be performed on an as-needed basis as traffic and local conditions warrant.

(b) The replacement of rail is based on:
   (1) The age and physical condition of the rail.
   (2) The existence of a rail defect as defined in FRA §213.113.
   (3) The amount of measured wear on the rail compared to an established "wear limit" for that rail as given in §113.2(M).
   (4) Switch point to stock rail wear limits as given in this Part take precedence over the maintenance limits given in §113.2(M).

(c) A "Rail Failure in Main Track Report" must be filled out and available for MassDOT Rail and Transit Division to review every time a rail is changed.

§160.0(STM) BOLTS AND LOCK WASHERS

(a) During the useful life of trackwork there may be a requirement to replace broken or defective bolts and/or washers in frogs, heel blocks, and at permanently bolted joints.

(b) When evaluating the performance of bolts:
   (1) Verify that the bolt is of the correct diameter, length, and type.
   (2) Visually inspect the performance of the bolt and washer under load.
   (3) Visually inspect the joint or appliance and look for signs of vertical movement, batter, crushing, excessive flow, or excessive wear in the component affixed with the bolt and washer.
   (4) Visually inspect the condition of crib ballast and general line and surface at that location.
   (5) Visually inspect the condition of ties, plates, and clips at bolted locations.

(c) When changing a bolt in a joint, frog, or in a switch point, tighten all other bolts in the immediate vicinity.

(d) The preferred method of tightening new bolts is with a torque wrench and multiplier that applies the recommended level of torque (foot-pounds) to the bolt. See the following tables.

Recommended Torque Values in ft.-lb. to Produce the Minimum Specified Tension in Society for Automotive Engineers (SAE) Grade 5 Bolts

Bolt Diameter	Min Tension (lb.)	Lubricated Condition(1)	Non-Lubricated Condition(1)
1/2"	12,000	80	105
5/8"	18,000	155	210
3/4"	28,000	275	370
7/8"	39,000	450	600
1"	51,000	670	800
1-1/8"	56,000	825	1,100
1-1/4"	71,000	1,165	1,550
1-3/8"	85,000	1,535	2,040

Note:
(1) Lubricated torque valves shall be achieved by applying a metal-based lubricant to the bolt threads.

Recommended Torque Values in ft.-lb. to Produce the Minimum Specified Tension in SAE Grade 8 Bolts			
Bolt Diameter	**Min Tension (lb.)**	**Lubricated Condition(1)**	**Non-Lubricated Condition(1)**
1/2"	15,000	100	130
5/8"	24,000	195	265
3/4"	35,000	345	460
7/8"	49,000	565	750
1"	64,000	840	1,120
1-1/8"	80,000	1,180	1,575
1-1/4"	102,000	1,675	2,230
1-3/8"	121,000	2,185	2,910
Note: (1) Lubricated torque valves shall be achieved by applying a metal-based lubricant to the bolt threads.			

§161.0(STM) FASTENING SYSTEMS

(a) During the useful life of trackwork, it may be required to change rail fasteners (e.g., clips or spikes or screw spikes) as a normal maintenance activity.

(b) The replacement of fasteners is based on:

(1) The physical condition of the fastener (worn or corroded and/or broken or missing).

(2) The ability of the fastener and the fastening system to minimize the horizontal and vertical movement, as well as the longitudinal movement of the rail or components (e.g., switch points, frogs and guard rail), and to sustain maximum authorized speed.

(c) When evaluating the performance of fasteners, the Foreman shall:

(1) Verify that the correct type of fastener is being used.

(2) Visually inspect the fastener for cracks and breaks.

(3) Visually inspect the fastener to see if they are overdriven.

(4) Visually inspect the components being fastened and look for signs of vertical or horizontal movement or excessive wear.

(d) Clips that have repeatedly backed-out or fallen-out should be replaced with new clips and not reused.

Subpart G – Turnouts in Signalized Track

§170.0(STM) GENERAL PROCEDURES FOR WORK ON TURNOUTS IN SIGNALED TERRITORY

(a) When adjusting or working on a main track turnout in signaled territory:

(1) Notify the Signal Maintainer.

(2) Obtain foul time, track time or other form of Roadway Worker Protection (RWP) from the dispatcher.

(3) Hold a job briefing.

(4) Block the switch point.

(5) Perform the work.

(6) Remove blocking.

(7) Perform obstruction test (by Signal Maintainer).

(8) Make sure hand-thrown turnout is aligned and locked with an approved lock in the normal position before returning to service.

(9) Return track to service.

Subpart H – Mechanisms, Appliances, and Devices

§200.0(STM) SWITCH OPERATING MECHANISMS

§200.1(STM) Use of Mechanisms

(a) Switches shall be operated by approved types of mechanisms as follows:

(1) Power mechanisms as approved by the MassDOT Rail and Transit Division after recommendation by the Signal Department.

(2) Spring switches: Manually operated switch mechanisms, which are supplemented by slow-acting spring devices that permit wheels to trail through switches set for the opposite route, may be used with the approval of the MassDOT Rail and Transit Division.

(3) Approved type of new installation switch stands (unless approved by MassDOT Rail and Transit Division), are: Racor Model 36EH (High Mast) for mainlines and Racor Model 36E for yards.

(4) Manual operated mechanisms shall use the “back saver” and/or “triangular hand level” handles for new installations.

§200.2(STM) Installation of Switch Stands

(a) Manually operated switch stands shall be placed so that the operating rod is in tension when the switch is set in normal position.

(b) Whenever possible, the switch stand handle shall be positioned facing the frog when the switch is in the normal position.

(c) Where crossover switches are protected by signals, a switch locking arrangement shall be provided.

(d) Switch stands for all tracks shall be located to serve the safety and efficiency of employees.

§205.0(STM) SWITCH POINT POSITION INDICATORS (TARGETS)

§205.1(STM) General

(a) Where required, indicators shall be provided on all non-interlocked switches to give a clear and distinct indication of the position of the switch points

(b) Switch point targets shall be reflectorized. The height of the centerline of the target shall not exceed 20" above the track ties. Targets higher than this are called “high targets.”

(c) Generally, high targets with the EH36 high stand are used on all main track.

(d) Generally, low targets are used in yards and at locations on main tracks where clearance precludes the use of a high stand.

§205.2(STM) Installation of Position Indicators

Targets shall be set at right angles to the track and perpendicular to the headblock ties.

§205.3(STM) Maintenance

Switch targets should be kept clean to provide uniform brightness and visibility.

§205.4(STM) Position Indication

(a) In order to give a clear and distinct indication of the position of non-interlocked switch points, colored targets shall be provided, in addition to the switch stands.

(b) Target colors are given in the Northeast Operating Rule Advisory Committee (NORAC) Rule Book (Rule 104H).

(1) Where switch targets are used, a green or white banner indicates normal position of the switch, and a red or yellow banner indicates reverse position.

(2) Green and white banners are used on main tracks, and red and yellow banners are used on other than main tracks and yards.

§205.5(STM) Distance from Rail for Switch Stands and Switch Point Targets

(a) Switch stands, not between tracks, must be placed so that the distance from the gage of the nearest rail to the center of the spindle with a low mast is 4'-1" and with a high mast is 7'-0".

(b) Low target masts placed between tracks must be installed as follows:

Track Center Distance (at least)	**Minimum Distance From Gage of Nearest Rail to Center of Spindle**
12'-2" but less than 13'	3'-8-3/4"
13' or greater	4'-1

(c) All powered switch machines shall be installed as per Signal Department Instructions.

§210.0(STM) SWITCH STAND MAINTENANCE

(a) Switches, switch stands, and operating rods must be examined frequently. Broken, damaged, or missing parts shall be replaced immediately.

(b) Regular inspection shall be in accordance with FRA §213.233, and if necessary, corrective action must be taken immediately.

(c) Worn switch latches must be replaced before the wear is sufficient to permit the switch lever to be thrown without manually releasing the latch (keeper).

(d) Special attention should be taken to ensure that the cotter pin is maintained at the clevis location at the base of the switch stand and at the connection to the No. 1 rod (FRA §213.135).

§220.0(STM) SWITCH LOCKS

(a) At all main track switches, throw levers of switch stands, shall be secured by two latches (for normal and reverse positions), and locked by a standard switch lock. The lock is to be fastened by a chain to the switch stand, or tie, so that the switch can only be locked in the normal position.

(b) The throw levers of switch stands in other than main or secondary track, shall be provided with latches, but shall be provided with padlocks only when required.

(c) The standard switch lock used by the Operating Railroad Company is to be approved by MassDOT Rail and Transit Division.

(d) Recommended operating and cleaning procedures for switch locks are:

(1) Unlock the padlock and open the shackle to soak and wash the lock thoroughly in the recommended cleaner (LPS Instant Super Cleaner/Degreaser) or equivalent. This will remove any oil, grease, and their foreign matter from the

area of the locking balls. If feasible, use of an ultrasonic cleaning tank is advised. This type of device produces superior results.

(2) If cleaning by hand, use a squirt bottle to force the cleaning solution into the locking ball cavities. This will complete the cleaning and flushing of the locking ball area.

(3) Do not oil, grease, or graphite the lock. Lubricate only with a light, non-grease substance, such as LPS #1 Greaseless Lubricant.

§300.0(STM) DERAILS

§300.1(STM) Position of Derails

The "normal" position of a derail shall be to derail wheels of rolling equipment away from the main track or structure. The "reverse" position shall permit the unobstructed movement of equipment.

§300.2(STM) Use of Derails

(a) Derails shall be used on all tracks.

(b) Selection of derail type:

(1) A **double switch point derail** will be used at the following locations:

(i) Where the track on which the derail is to be placed descends towards the main track requiring protection.

(ii) On all tracks, even if descending away from the main track, if any portion of that track is higher in elevation than the track at the derail location.

(iii) Where the industry moves rail cars using on or off track equipment or by gravity or with a car puller.

(iv) On tracks used for loading, unloading, or storage of cars containing hazardous (hazmat) materials as defined in the U.S. Hazardous Material Instructions for Rail.

(v) Where operating conditions demand positive derailing protection.

(2) A **sliding rail** may be used where track on which the derail is to be placed is level or descends away from the main track requiring protection.

(3) A **hinge derail** may be used in yard areas where a derail operating stand would adversely impact the normal walking path.

(4) A **portable derail** is used to provide protection to personnel working on or about a track to make work limits inaccessible (see RWP Rules for Operating Railroad Company), or to protect equipment stored temporarily on a track not normally used for storage.

§300.3(STM) Types of Derails

(a) Derails are generally of three kinds: the "split switch," the "sliding block," and the "hinged block" type.

(b) Where derails are prescribed, the split switch type shall be used on side tracks or industrial tracks as follows:

(1) At all locations where the side track or industrial track is on a descending grade to the main track.

(2) Within interlocking limits, in main tracks, in secondary tracks, and as designated by the MassDOT Rail and Transit Division.

(3) In tracks where it is possible for the speed of rolling equipment to exceed 15 MPH.

(c) Approved sliding block type derails shall be used in other than main tracks with speeds less than 15 MPH at other locations than those given in Paragraph (b) above.

(d) Hinged block derails are usually used in yard limits or in conjunction with Roadway Worker Protection (RWP) practices.

§300.4(STM) Installation of Derails

(a) A derail shall be placed a sufficient distance back of the clearance point, not less than 12', to ensure that derailed rolling equipment will not foul the main or other protected track.

(b) When using single point split switch derails, a deflecting rail must be used.

(c) Where deflecting rails are used:

(1) The minimum length shall be 18'.

(2) The nearest end shall be 10' from the derail.

(3) The flangeway opening at the end nearest to the derail shall be 4".

(4) The end farthest from the derail shall be set to provide a 12" clear opening between running rail opposite the derail and the deflecting rail.

(5) The deflecting rail shall be of a section and weight that is not greater than that of the running rails, and, preferably less.

(6) The deflecting rail should be spiked to every tie with two rail holding spikes, one on each side of the rail base.

(7) Deflecting rails shall be fully anchored or otherwise secured to ensure that they do not move longitudinally.

(8) Derails are to be installed in accordance with manufacturer's recommendations.

(9) Existing installations of derails need not be changed to meet these provisions until renewals are necessary, or unless so ordered by the MassDOT Rail and Transit Division.

§300.5(STM) Operation of Derails

(a) Lever stands of approved types may be used for operating derails. Where practicable, the distance from the center line of the lever stand spindle to the gage of the nearest rail shall be at least 50".

(b) Derails shall be provided with standard switch padlocks fastened to the tie by a chain and staple, so that the lever or derail can be locked only in the normal position.

§300.6(STM) Maintenance of Derails

(a) Sliding block or hinged block derails shall be painted yellow.

(b) Dirt and weeds must be kept away from derails.

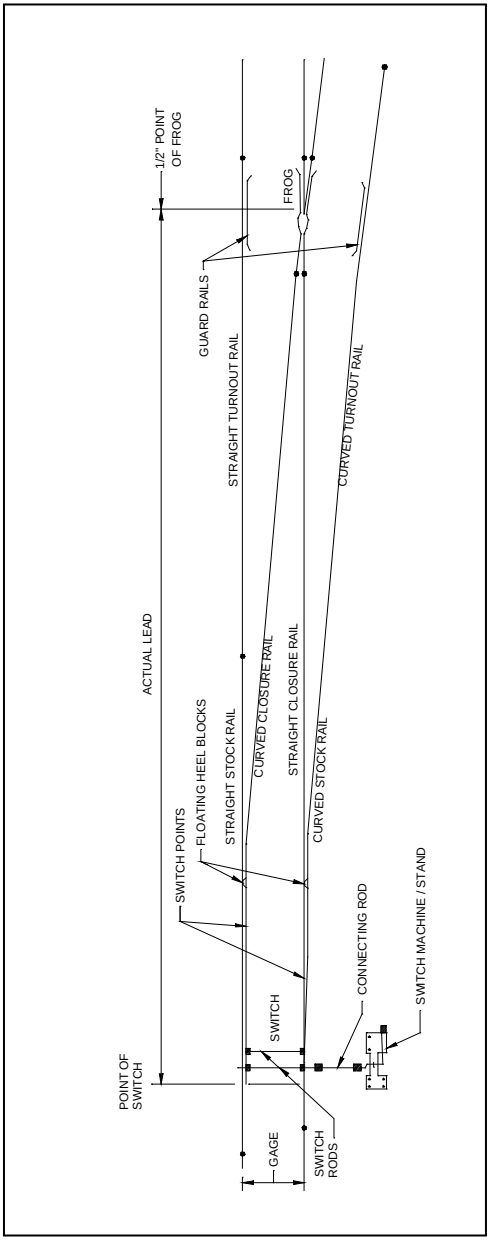
(c) Ballast, snow, and ice must be kept away from derails.

Subpart I – Schematics / Photographs

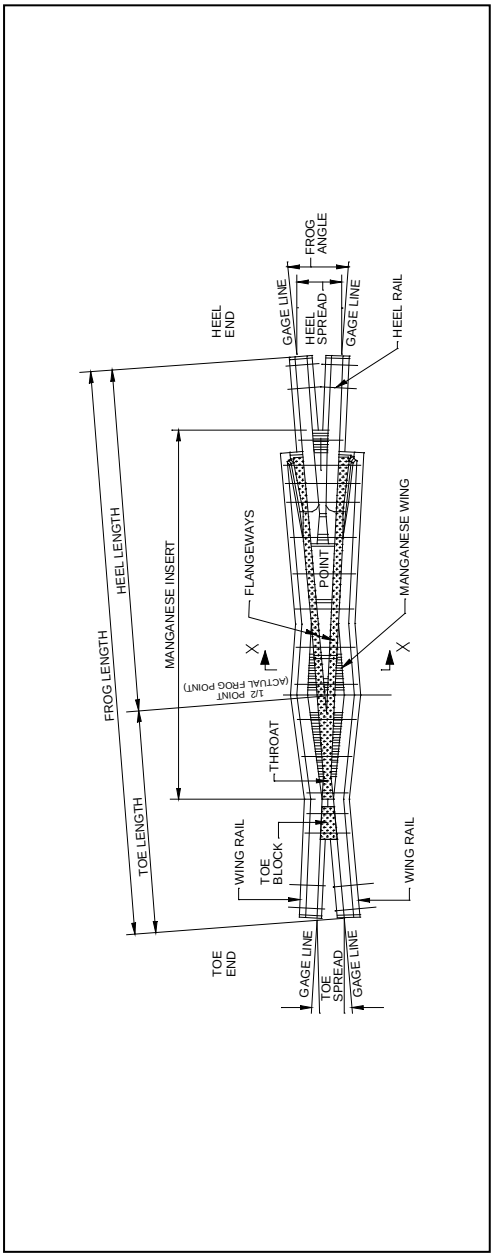
(a) Schematics and photos of trackwork are provided in the MW-1 to illustrate the name, location, and general arrangement of trackwork types and major components.

(b) Trackwork types and components are shown below in photos and drawings and include:

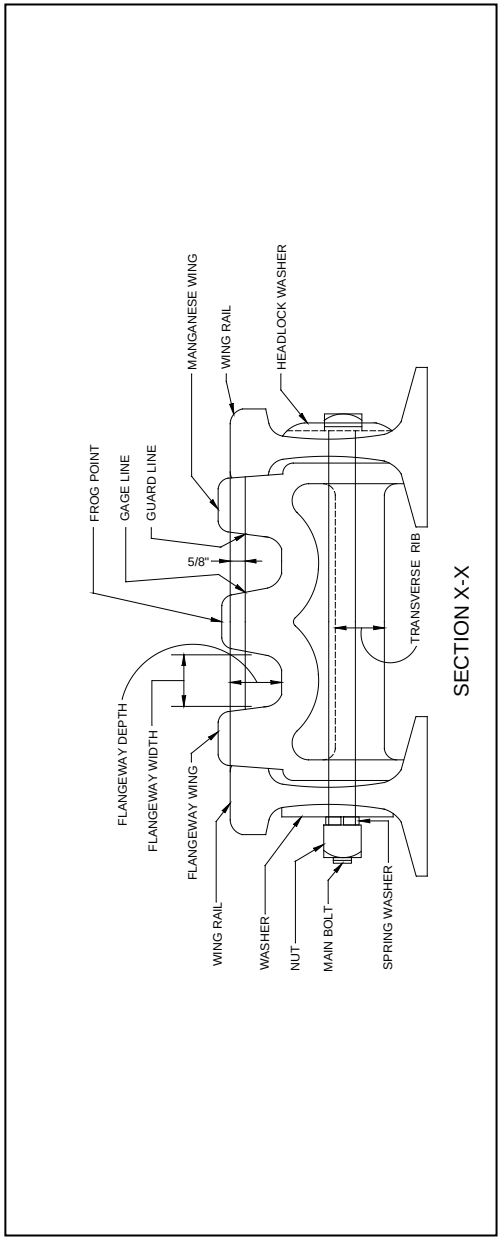
1. Conventional Turnouts
2a. Railbound Manganese Frog (RBM)
2b. Railbound Manganese Frog – Section X-X
3a. Self-Guarded Manganese Frog
3b Self-Guarded Frog – Section Y-Y
4a. Spring Frog Arrangement
4b. Spring Frog Details
5a. Guard Rail - Hook Flange Type
5b. Guard Rail - Hook Flange Type – Section A-A
6a. Hinged Derail
6b. Sliding Block Derail
6c. Double Switch Point Derail
7a. Switch Stand Type 36
7b. Switch Stand Type 36
8a. Western-Cullen Type Bumping Post
8b. High Energy Hydraulic Bumping Post



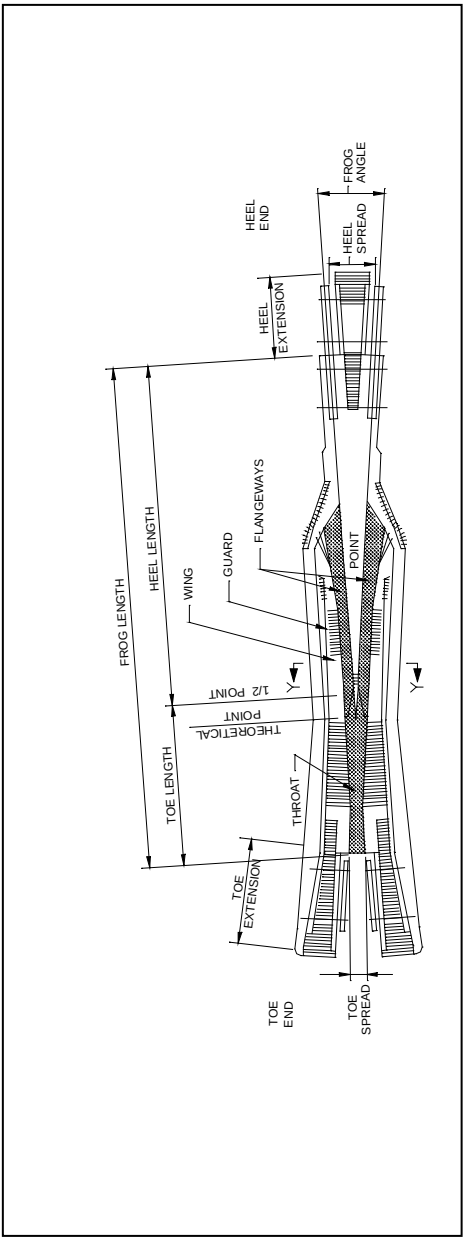
1. Conventional Turnout



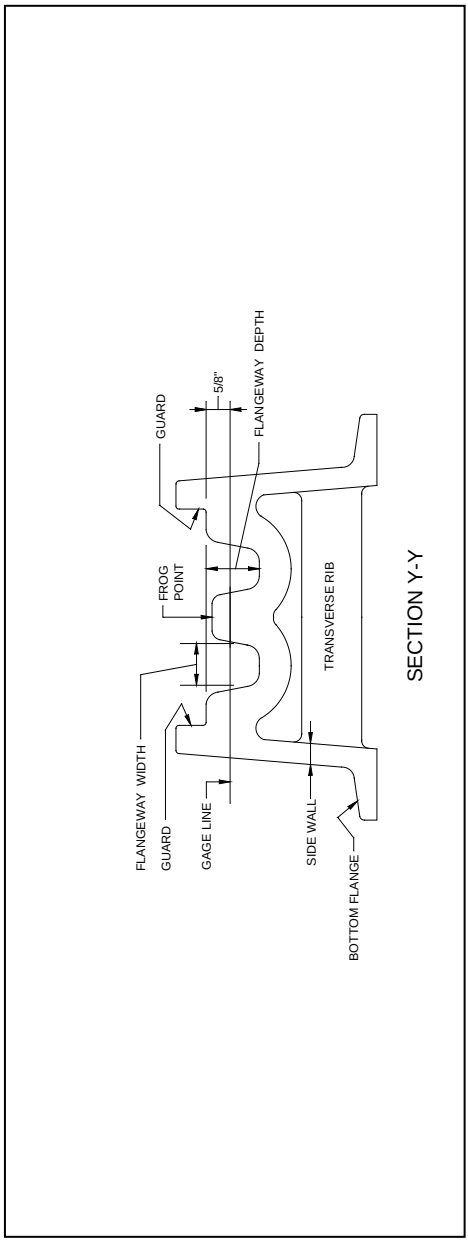
2a. Railbound Manganese Frog (RBM)



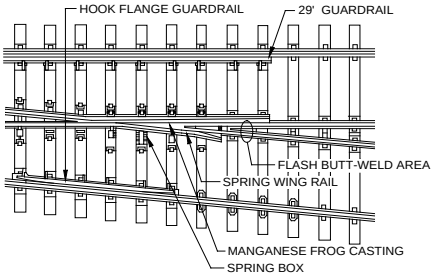
2b. Railbound Manganese Frog – Section X-X



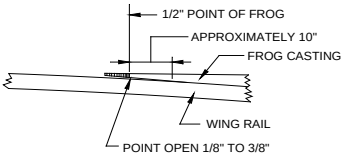
3a. Self-Guarded Manganese Frog



3b. Self-Guarded Frog – Section Y-Y



MANGANESE SPRING FR0G LAYOUT

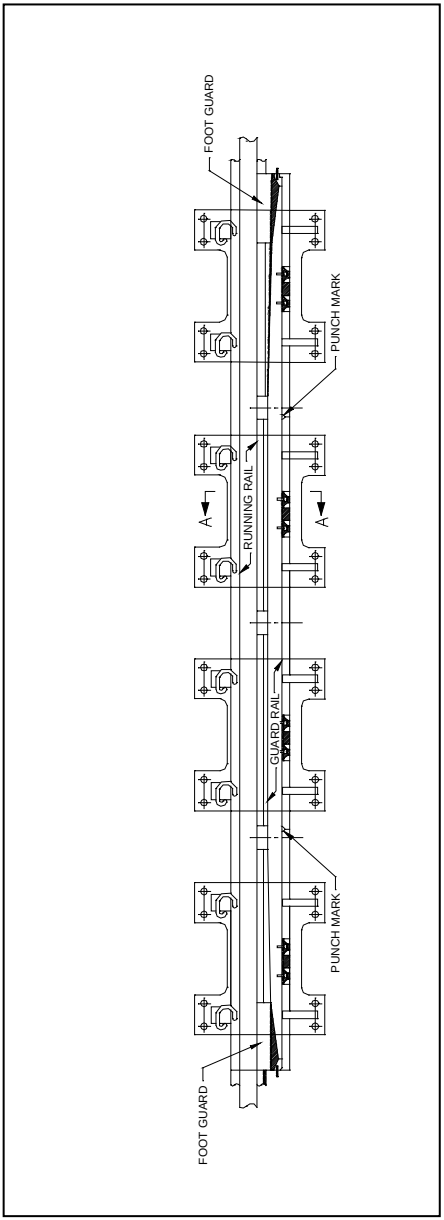


DETAIL OF SPRING FROG POINT AREA

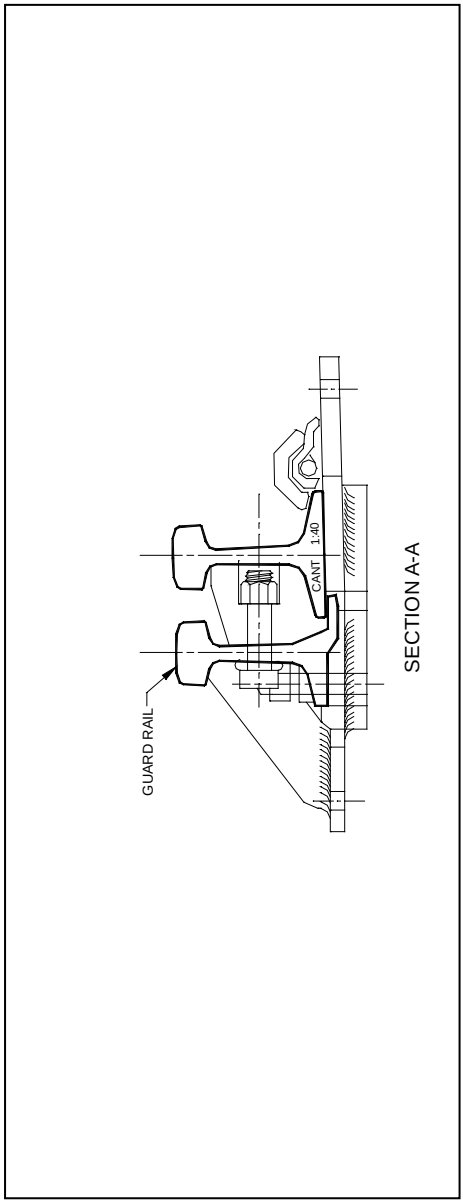
4a. Spring Frog Arrangement



4b. Spring Frog Details



5a. Guard Rail – Hook Flange Type



5b. Guard Rail – Hook Flange Type – Section A-A



6a. Hinged Derail



6b. Sliding Block Derail



6c. Double Switch Point Derail



7a. Switch Stand Type 36



7b. Switch Stand Type 36



8a. Western-Cullen Type Bumping Post



8b. High Energy Hydraulic Bumping Post



APPENDIX A

CONTINUOUS WELDED RAIL (CWR) PROCEDURES

This page intentionally left blank

Table of Contents

1.0 Applicability A-1
1.1 Introduction A-1
2.0 Fabrication and Distribution A-2
(a) Unloading A-2
(b) Use of CWR On MassDOT Rail and Transit Owned Lines A-2
3.0 Installation and Adjustment of CWR A-2
(a) Definitions A-2
(b) Installation of CWR A-3
(c) Adjustment/Distressing A-4
4.0 Anchoring of CWR A-7
5.0 Maintenance of the Desired Rail Neutral Temperature (RNT) in Previously Installed CWR A-9
(a) Maintaining Desired Neutral Temperature Range: Broken or Defective Rail, Pull-Apart (Service Failures) and/or Tight Rail or Track Buckle A-9
(b) Adjusting or Distressing Previously Installed CWR A-10
(c) Procedures for Making Repairs to Buckled Track A-11
(d) Installing Rail Plugs in Existing CWR Track A-12
(e) Field Welding of CWR A-12
6.0 Trackwork that Disturbs CWR Track and the Protection of Disturbed Track . A-13
6.1 General A-13
6.1.1. Trackwork that Disturbs CWR A-13
6.1.2 Trackwork that Does Not Disturb CWR A-13
6.2 Train Definition A-13
6.3 Work Activities that Disturbs CWR Track A-13
(a) Installation of Plugs in CWR that Disturbs CWR Track A-13
(b) Tie Renewal in Tangent Track that Disturbs CWR Track A-14
(c) Tie Renewal in Curves that Disturbs CWR Track A-15
(d) Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <3°) A-16
(e) Surfacing, Smoothing and/or Lining that Disturbs CWR Curved Track: Curves $\geq$3° A-18
(f) Cut and Throw of Track that Disturbs CWR Track A-19
(g) Switch or Track Panel Installation that Disturbs CWR Track A-20
(h) Undercutting that Disturbs CWR Track A-21
(i) Out-of-Face Shoulder Ballast Cleaning that Disturbs CWR Track A-21
(j) CWR Installation that is Unacceptable A-22
(k) Anchor or Clip Removal that Disturbs CWR Track A-22
(l) Cribbing that Disturbs CWR Track A-22

6.4 Suspension of Work Due to Heat Where Ambient Temperature >80°F or Rail Temperature >110°F A-23
6.5 Protection of Work Areas for Latent Heat Effects A-24
7.0 Special Inspections of CWR Track A-24
(a) Special Inspection in Hot Weather A-24
(b) Special Inspection in Cold Weather A-25
(c) Semi-Annual Inspection A-25
(d) Protection of CWR Track with Deficiencies A-26
8.0 Joints in CWR Track A-26
8.1 New Installations of CWR A-26
(a) Joints in CWR Track When Installing CWR A-26
8.2 Service Failures in Existing Previously Installed CWR A-26
(a) Bolted Joints in Exiting CWR that Experience a Service Failure A-26
8.3 Service Failure of Joint Bars and/or Track Bolts in a CWR Joint A-27
(a) Minimum Remedial Action Required A-27
(b) Number of Bolts in Rail Ends Required A-27
(c) Cracked or Broken Joint Bars A-27
(d) Opening (Gap) of Joints in CWR A-27
8.4 Inspection of Joints in CWR Track A-28
8.4.1 Embedded Joints A-28
8.4.2 Joint Inspection in CWR A-29
8.4.3 Record of Inspections A-29
9.0 Training A-29
10.0 Reporting Requirements for CWR Track A-30
(a) Report of Disturbance of CWR Track (Form “TD”) (Attachment E) A-30
(b) Report of Track Movement (Form “TM”) (Attachment E) A-30
(c) Report of Joint Elimination by Field Welding (Form “JE”) (Attachment E) A-31
(d) Report of Rail Clipping/Anchoring (Form “RC”) (Attachment E) A-31
(e) Report of Semi-Annual (Spring/Fall) Inspection of CWR Track (Form “CWR”) (Attachment E) A-31
(f) Special Instructions – Earthquakes A-31
11.0 Record Keeping A-33
(a) Report of CWR Installation A-33
(b) Report of Maintenance Work in CWR A-33

Attachments

Attachment A: Determination of Estimate of Pre-Break / Pre-Cut Neutral Temperature for a Service Failure in CWR A-35

Attachment B: Recommended Procedures for Distressing Continuous Welded Rail (CWR) Previously Laid in Track A-41

Attachment C: Recommended Procedures for Readjusting Continuous Welded Rail (CWR) After a Break, Pull-Apart (Service Failure) or Cut Below the Target Rail Laying Temperature (105°F) A-51

Attachment D: Joint Defect Guidelines / Maximum Allowable Temporary Speed Restrictions (TSRs) A-63

Attachment E: Preparation of Forms A-65

- Instructions for the Preparation of the Report of Disturbed Track (Form "TD") A-68
- Instructions for the Preparation of the Report of Track Movement Due to Surfacing or Out-of-Face Tie Renewal (Form "TM") A-70
- Instructions for the Preparation of the Report of Joint Elimination by Field Welding (Form "JE") A-72
- Instructions for the Preparation of the Report of Rail Clipping / Anchoring (Form "RC") A-74
- Instructions for the Preparation of the Report of Semi-Annual (Spring/Fall) Inspection of CWR Track (Form "CWR") A-76

Attachment F: Torch Cutting Rail (Figure/Remarks) A-77

This page intentionally left blank

APPENDIX A

MINIMUM RECOMMENDED REQUIREMENTS TO BE INCLUDED IN THE OPERATING RAILROAD'S CWR PLAN CONTENTS AS PER FRA 213.118 & 213.119

1.0 APPLICABILITY

The installation, adjustment, maintenance and inspection of continuous welded rail (CWR) shall be performed in accordance with FRA Part 213, Track Safety Standard's §213.118 and §213.119. As such, the requirements herein are based on the FRA/Rail Safety Advisory Committee (RSAC) Generic Policy document provided to the U.S. railroads as a part of the October 2009 enacted FRA safety rule and are based on current best practice guidelines on CWR in providing minimum requirements on CWR.

These MassDOT procedures are aimed to aid and assist the Railroad Operating Companies to maintain MassDOT-owned tracks in a safe and efficient manner. Performing CWR installation, maintenance, adjustment and inspection in accordance with the provisions and requirements stipulated herein will meet the expectations of the Commonwealth and provide uniform practice between the different properties of the Railroad Operating Companies.

This document details MassDOT's policy on installing, adjusting, maintaining, and inspecting CWR track. Each section details how the individual MassDOT rail operator applies its standards and procedures to comply with FRA standards.

1.1 INTRODUCTION

(a) Continuous Welded Rail (CWR) is defined as any rail that contains no joints in 400' or greater in length. This document will serve as the recommended practice for the installation, adjustment, maintenance, and inspection of CWR. Rail that is installed as CWR and subsequently has additional joints installed within the limits of the rail will still be considered as CWR, and subject to the requirements of this document. Track laid with CWR is referred to as "CWR Track." Any employee who installs, adjusts, maintains and inspects CWR must have a copy of their approved FRA Plan (§213.118 and 213.119).

(b) If the Operating Railroad cannot comply with the minimum recommended requirements found in Appendix A, they shall immediately notify MassDOT Rail and Transit Division.

(c) Preparation and care:

(1) **Programmed tie renewals shall be completed in advance of rail laying.**

(2) **Track shall be surfaced and aligned prior to CWR installation.**

(3) Track to be laid with CWR must have standard ballast section (shoulders and cribs) for welded rail before CWR is installed.

(4) Rails should be examined for defects and damage prior to laying in track.

(5) At the time of installation, care should be taken so that no damage to rail or fastenings will result.

(6) All ties, to include loose ties, should be tamped to full bearing under the rail, with a small tamper, during rail laying operations ahead of the spiker.

2.0 FABRICATION AND DISTRIBUTION

(a) Unloading:

(1) CWR should be unloaded as close as possible to the position where it is to be installed with a minimum of further handling, giving special attention to accurately locating the ends of CWR.

(2) CWR should be placed parallel with the track and base down, avoiding excessive bending or damage, making use of suitable mechanical equipment when available. Care should be taken to avoid placing rails on drainage facilities and other civil structures.

(3) CWR ends must be bypassed.

(b) Use of CWR on MassDOT Rail and Transit Division owned lines:

(1) CWR fabricated by an approved process may be laid without restriction in fully ballasted main and secondary tracks. When welded rail is laid on curves, particularly those sharper than 6 degrees, it must be closely monitored for any indication of movement up out of the plates.

(2) CWR may be laid across open deck bridges where bridge ties are spaced with timber blocks between ties provided that the following conditions are satisfied:

(i) The anchoring of open deck bridges shall be approved by the Operating Railroad's Bridge Engineer.

(ii) Per MBTA Standard Plan, all ties and blocks in a panel are tightly jacked and fastened together with guard timbers or spacing bars secured by lag screws in every tie. See latest MBTA Standard Plan.

(iii) Per MBTA Standard Plan, bridge ties are securely fastened to steel structure by means of a hook bolts, tie anchors, or other approved holding device. See latest MBTA Standard Plan.

(iv) The bridge structure is properly anchored to abutments and piers to prevent any movement other than normal expansion.

(v) CWR is anchored to the bridge ties in both directions in accordance with Section 4.0 of this document.

(3) After application of hook bolts, tie anchors or other approved holding devices, these devices must be checked and retightened weekly until ties have been fully seated on top flanges of built up members.

3.0 INSTALLATION AND ADJUSTMENT OF CWR

(a) Definitions:

(1) Neutral Temperature: The rail neutral temperature (RNT) is the temperature at which a rail is neither in tension or compression (i.e., when it has zero longitudinal force).

(2) The Rail Laying Temperature (RLT): The temperature at which the rail is installed that is sufficiently high so as to provide a high RNT to prevent possible track buckling.

(i) CWR on MassDOT Rail and Transit Division owned lines shall be installed at an RLT of 105°F with an allowable construction tolerance of -10°F to +10°F or 95°F to 115°F. **The target RLT shall be at least 105°F**.

(ii) When laying and/or distressing rail, the required minimum expansion shall be determined by using a target RLT of at least 105°F (see Section 3.0 and Attachment "B").

(iii) When repairing a service failure to include broken joint bars, pulled apart joints, a broken rail, a broken weld (shop or field), the replacement of a plug

rail or a rail cut in the field, the repair shall be made to ensure that the RNT after the repair is made is at or above RLT-10°F (95°F) (see Attachments A and C).

(3) Temperature Differential: The difference between the target rail laying temperature and the actual rail temperature taken at the time of installation is called the temperature differential (TD).

(i) CWR laying and adjusting procedures have been established to take into account these temperature differences.

(ii) If the rail temperature is below desired RNT of 105°F, the rail must be expanded to the target RLT of at least 105°F.

(iii) The rail expansion required is marked at the quarter points in the field on the string to be expanded.

(iv) RNT is achieved when the correct expansion amounts have been realized at the quarter points.

(v) RNT is not achieved when the required rail temperature of 105°F has been reached unless the required expansion has been realized.

(b) Installation of CWR:

(1) Programmed tie renewals shall be completed in advance of rail laying.

(2) Track shall be placed in good line and surface prior to rail renewals.

(3) Track to be laid with CWR must have standard ballast section for welded rail before installation of CWR.

(4) Rails should be examined for defects and damage prior to laying in track.

(5) At the time of installation, care should be taken so that no damage to rail or fastenings will result.

(6) All ties, to include loose ties, should be tamped with a small tamper to full bearing under the rail, during rail laying operations ahead of the spiker.

(7) Any alignment deviation reduces the temperature at which a track will buckle. As an example, an alinement deviation of about 1" may reduce the buckling temperature from 10 – 15 °F°**.** In addition, an alignment deviation from a Class 5 line defect to a Class 3 line defect (1" to 1 1/8") may reduce the buckling potential by 15 - 20°F, depending on track parameters and conditions."

(8) **The target RLT and RNT is at least 105°F unless approved by the MassDOT Rail and Transit Division.**

(9) CWR shall be anchored or have resilient fasteners applied ("clipped") at a rail temperature of between 95°F and 115°F, unless otherwise directed by MassDOT Rail and Transit Division. This is known as the "Desired Rail Installation Temperature Range."

(10) An approved rail thermometer (magnetic) shall be used to measure the rail temperature of all CWR before it is anchored or clipped. The thermometer should be placed on the web of rail just above the bottom fillet, on the side of the rail that is shielded from the direct rays of the sun and left there long enough (5 minutes) to determine the temperature accurately.

(11) When the rail temperature is lower than the target RNT of 105°F an approved rail heating device or a hydraulic rail stretcher must be used for expanding the CWR to make proper adjustment.

(12) A rail puller can be used to hold the required expansion, and/or to help get the required expansion. At least 20 ties on the next string to be distressed shall be

box anchored and/or clipped to provide sufficient holding power for the rail puller to hold or pull the string being expanded.

(13) Where CWR has been anchored and/or clipped at a rail temperature below 105°F- 10°F (RLT -10°F) and not expanded to the target RNT of 105°F during the rail laying operation, the rail shall be inspected by a person qualified on §213.7(a)(b)(c)(d). A TSR shall be placed, if necessary, and then removed when the rail is expanded to a target RNT of 105°F.

(14) If the CWR is anchored and/or clipped at a rail temperature greater than 115°F (RLT +10°F), up to and including 125°F, the rail may remain in track without restriction.

(15) The following information shall be recorded on the field side web of the individual string (with permanent metal marker) as the strings are being laid:

(i) String number

(ii) Date installed or adjusted or distressed

(iii) Length of string in feet

(iv) Existing rail temperature/preferred rail neutral temperature

(v) Total expansion required at end of string (if appropriate)

(16) The person in charge of installing the CWR shall be responsible for recording on the appropriate Form ("CWR Rail Expansion/Heat Record Report") the amount of required expansion and the rail temperature at each CWR string is anchored. Copies of these forms should be forwarded to MassDOT Rail and Transit Division. See Appendix "E", Form "RC".

(17) The "CWR Rail Expansion/Heat Record Report(s)" for any CWR laid in track and or distressed shall be retained by the Railroad Operating Companies until the CWR is readjusted and/or removed from service.

(c) Adjustment/Distressing:

(1) The target RNT is always 105° or greater. When the rail temperature is lower than the target RNT of 105°F an approved rail heating device, a hydraulic rail stretcher or heating by natural means or the ambient temperature shall be used to expand the CWR at its quarter points to achieve proper adjustment.

(2) Adjusting CWR strings to increase RNT by natural means or by using the ambient temperature is allowed only if the unadjusted rail temperature falls in the Desired Rail Installation Temperature Range of RLT -10°F to +10°F or 95°F to 115°F.

(3) All rail anchors and/or resilient fasteners must be removed from strings of CWR requiring adjustment to permit the desired expansion or contraction at the quarter points of the CWR string.

(4) The anchor and/or clip removal should start at the end of the string at the last quarter point to be expanded and move back towards the ¼ point or beginning of the string to be expanded. This is especially important if the rail to be expanded is in compression.

(5) .With conventional cut spikes and plates, an approved mechanical vibratory device may be used to free the rail. Additionally, rail holding spikes shall be pulled if restraining rail movement.

(6) With elastic fasteners and rolled plates, it may be necessary to pick the rail up out of the plates and set on spikes and/or rollers about every 20th tie so as to permit the unrestrained movement of the CWR when being expanded. Again, this process should start from the last quarter point to be expanded and proceed

back towards the ¼ point or beginning of the string to be expanded. This is especially important if the rail to be expanded is in compression.

(7) The rail head must not be struck with a hammer at any time; to include expanding the rail.

(8) CWR should be heated and vibrated so that expansion is introduced from one end of each string to the other end in the direction of rail laying.

(9) All rail anchors or resilient fasteners must be re-applied immediately after the CWR string has achieved proper expansion at the quarter points based upon the target RNT of at least 105°.

(10) The number of inches each CWR string should be expanded during the rail laying operation may be determined by calculation according to the following formula:

$$A = 0.000078 \times (T_D - T_E) \times L$$

where:

A = the amount (inches) of length a CWR string must be increased or decreased to reach the target rail laying or rail neutral temperature

T_E = the existing rail temperature of the CWR before the heating process has begun

T_D = the target neutral temperature or rail laying temperature (105°F) of the CWR at the end of the heating process

L = the length of the CWR in feet

Example: How much expansion is required to adjust the length of a 1,450 ft. CWR string, anchored at a rail temperature of 50°F to the target rail laying/rail neutral temperature of 105°F? Subtract 50°F from 105°F to obtain a difference of 55°F and then multiply as follows:

$$0.000078 \times 1{,}450 \times (105 - 50) = 0.000078 \times 1{,}450 \times 55 = 6.22 \text{ inches.}$$

Say 6.25 inches

Or use "Change In Rail Length Due To Change In Rail Temperature" Table on the back of Form "RC", "Report of Rail Clipping/Anchoring" found in Attachment E.

(11) A space equal to the amount of expansion required for each string of CWR should be provided between the far end of the string being expanded and the near end of the next adjacent string.

(12) The clipping or anchoring operation shall consist of sufficient personnel so that the work will progress closely enough behind the heating and/or pulling process so that the string is held in place, and no loss of expansion occurs.

(13) Quarter points should be marked on the rail and the tie plate, so that the amount of expansion can be accurately determined. The tie plate used for marking as a reference point must be one that is either doweled or has been spiked, or screw lagged; so that it will not move as the rail expands. Particular attention must be

paid to insure that the rail does not bind on tie plates, spikes or other obstructions.

(14) Heating should commence at the beginning of the first CWR string and steadily applied while moving forward until the required expansion has been obtained at the end of the string. Uniformity of expansion is to be controlled by marking each quarter of the string and introducing expansion as follows:

¼ point - ¼ of total expansion
½ point - ½ of total expansion
¾ point - ¾ of total expansion
End of the string – 100% of total expansion

(15) If when heating, the heated CWR string does not have the required expansion at each quarter point, the heater will back over the heated portion, without applying heat, and then reheat the rail until the necessary expansion is obtained.

(16) During and subsequent to heating, resilient fasteners or anchors shall be applied to the patterns specified in Section 4.0 to prevent the rail from losing expansion. If resilient fasteners fail to hold expansion, rail anchors in the pattern of the following paragraph shall be applied.

(17) Rail anchors and/or clips may be used to control and maintain the expansion realized in a string of CWR while the rail string is being anchored and/or clipped in its entirety. A minimum of 20 consecutive ties shall be solid box anchored and/or clipped at the fully expanded end of the string , to hold the expansion while applying all other anchors and or clips as required.

(18) A rail puller can be used to hold the required expansion and/or to help get the required expansion. At least 20 ties on the next string ahead of the string being distressed shall be box anchored and/or clipped to provide sufficient holding power for the rail puller to hold or pull the string being expanded.

(19) The entire CWR string is to be anchored and/or clipped in accordance with Section 4.0 “Anchoring of CWR” before the track is returned to service and trains are permitted to operate.

(20) An approved rail thermometer (magnetic) shall be used to measure the rail temperature of all CWR before it is anchored or clipped. The thermometer should be placed on the web of rail just above the bottom fillet, on the side of the rail that is shielded from the direct rays of the sun and left there long enough (5 minutes) to determine the temperature accurately.

(21) Where CWR has been anchored and/or clipped at a rail temperature below 95°F (RLT -10°F) and not expanded to the target RNT of 105°F during the rail laying operation, the rail shall be inspected by a person qualified on §213.7(a)(b)(c)(d). A TSR shall be placed, if necessary, and the removed when the rail is expanded to at least 95°F (RLT -10°F).

(22) If the CWR is anchored and/or clipped at a temperature greater than 115°F (RLT +10°F), up to and including 125°F, the rail may remain in track without restriction.

(23) If the CWR is anchored and/or clipped at a temperature greater than 125°F, the rail may remain in track without restriction with the permission of the MassDOT Rail and Transit Division.

(24) The following information shall be recorded on the field side web of the individual string (with permanent metal marker) as the strings are being laid:

(i) String number

(ii) Date installed or adjusted or distressed

(iii) Length of string in feet

(iv) Existing rail temperature/preferred RNT

(v) Total expansion required at end of string (if appropriate)

(25) The person in charge of installing the CWR shall be responsible for recording on the appropriate Form ("CWR Rail Expansion/Heat Record Report") the rail temperature for which each CWR string is anchored. Copies of these forms should be forwarded to MassDOT Rail and Transit Division. See Appendix "E", Form "RC".

(26) The "CWR Rail Expansion/Heat Record Report(s)" for any CWR laid in track and or distressed shall be retained by the Railroad Operating Companies until the CWR is readjusted and/or **removed from service.**

4.0 ANCHORING OF CWR

(a) CWR Rail Anchoring Requirements: The following anchoring requirements apply to all CWR tracks.

(1) Existing anchor patterns may remain in place until CWR is installed.

(2) Where the anchoring function is otherwise provided, such as with a resilient fastener, rail anchors may be omitted.

(3) Anchors may not be applied where they will interfere with signal or other track appliances or where they are inaccessible for adjustment or inspection.

(4) Anchoring must effectively restrain the longitudinal rail movement.

(5) Rail must be adjusted and/or anchors must be added to rail that is moving, or where the existing anchors do not have effective holding power to restrain longitudinal movement.

(6) Anchor pattern may be varied, if possible, to avoid placing anchors against deteriorated ties.

(7) When a crosstie has four properly installed resilient fasteners, or four properly installed rail anchors, it will be considered to be fully box anchored tie.

(b) When laying or distressing welded rail, rail anchors are used to maintain the desired expansion and length of CWR strings. Crossties shall be fully box anchored in accordance with the following:

(1) Every Tie:

(i) Curves 3° and over

(ii) Through all rails of turnouts and crossovers, where practicable

(iii) For 195' in each direction from:

a. Main track turnouts and crossovers
b. Track crossings (diamonds)
c. Highway grade crossings
d. On the fixed side of expansion joints
e. On the approaches to open deck bridges
f. On both sides of all insulated joints (bonded and/or non-bonded)
g. On both sides of hot box, dragging equipment and wheel impact load detectors
h. Before bumping posts

(2) Every Other Tie:

(i) Through the remainder of CWR strings where full boxing is not specified above.

(3) Bridge Anchor Patterns:

(i) Ballast deck bridges should be anchored with the same pattern as the rail on each approach to the bridge.

(ii) Open deck bridges should be anchored according to the following table or as approved by the MassDOT Rail and Transit Division:

Length of Continuous Open Deck Portion (ft.)**	**Individual Span Length (ft.)**	**Rail Anchor Requirements**	**Sliding Joint Requirements**
100 ft. or less	All spans	Every 3rd or 4th tie. See §111.0(M) Bridge Timbers*	None required
Greater than 100 ft.	100 ft. or less	Every 3rd or 4th tie. See §111.0(M) Bridge Timbers*	None required
	Greater than 100 ft.	Every 3rd or 4th tie. See §111.0(M) Bridge Timbers*	As per requirements of MassDOT Rail and Transit Division
* Box anchors are to be applied only to ties that are hook bolted to the span. **See MBTA Book of Standard Plans Drawing Nos. 1232 and 1236.			

(4) Other Anchor Patterns:

(a) Under pavement off the ends of grade crossing panels.

(b) Under grade crossing surfaces as per crossing surface manufacturer.

(c) In areas adjacent to the expansion side of expansion joints as authorized and approved by MassDOT Rail and Transit Division.

(c) Anchor Requirements After Making Rail Repairs in CWR and Adding Joints:

(1) When repairs are made to stripped joint or failed bar on CWR that already exists in track, the adjustment or addition of anchors will be as prescribed below:

Condition	Action
Bolted joint in CWR experiencing a service failure (pull-apart) or failed bar(s) with gap* present (FRA §213.119(c)(3)	Weld Joint, **OR** Remediate Joint conditions **and** replace four (4) bolts (new, in-kind or stronger) **and** weld joint within 30 days, **OR** Replace broken bar(s), install 2 additional bolts (6 total) and adjust anchors (ballast permitting), **OR** Replace bars, bolts (if broken or missing) and anchor every tie for 195' in both directions (ballast permitting) **OR** Add rail and make out Form "TD" and make future repairs
* Gap exists if it cannot be closed with a drift pin.	

5.0 MAINTENANCE OF THE DESIRED RAIL NEUTRAL TEMPERATURE IN PREVIOUSLY INSTALLED CWR

(a) **Maintaining Desired Neutral Temperature Range: Broken or Defective Rail, Pull-Apart (Service Failures) And/or Tight Rail or Track Buckle**

(1) This section addresses repairs for broken or defective rail, and corrections made for tight rail, track buckle or pull-apart.

(2) Also see Attachments A, B, and C.

(3) When performing this work, care shall be taken not to add rail to the track.

(4) In general, if a length of rail is installed in CWR, it should have a length less than the rail removed and/or not exceed the length of rail removed (DO NOT ADD RAIL).

(5) Before joint bars are removed and/or a rail is cut, reference marks shall be added at tie plates and on the base of the rail. Reference marks can be used to determine how much the joint opens, or how much rail is cut out (if rail is in compression) or how much rail is added.

(6) The use of reference marks includes:

- Marking the locations where the joint is to be removed or the rail is to be cut
- Marking the rail outside the limits of the joint bars
- Measuring the distance between the reference marks and mark it on the rail
- Installing the rail and re-measure the distance between reference marks
- Recording the difference and documenting the location

(7) If rail is added for any reason, such as repairing a pull-apart, making emergency repairs, fixing a service failure or any other interim repair, measure and record the amount of rail added on Form "TD" so that adjustments can be made before reaching the rail return temperature.

(8) Existing RNT shall be estimated where the rail has pulled apart, broken, or been cut for defect removal by using the appropriate charts in Attachment A.

(9) To determine the pre-break/cut RNT, record the length of the rail end gap, rail temperature, rail base size and existing rail anchorage and use tables in Attachment "A".

(10) The estimated pre-break/cut RNT shall be recorded on Form "TD" so that additional required repairs, if any, can be tracked and done before rail return temperatures are exceeded (see Attachment C).

(11) Work performed by Railroad Operating Companies, such as rail that has pulled apart, broken, or been cut for service failures to make repairs to CWR, shall be readjusted to a preferred RLT or RNT of 105°F +/- 10°F**. The minimum RNT is 95°F** (see Section 3.0).

(12) If rail has not been adjusted before rail return temperatures exceed the values in Attachment C, then a temporary speed restriction (TSR) of 25 MPH shall be placed. A TSR of 40 MPH may be placed if a required daily inspection is made during the heat of the day, every day, **until the adjustment and permanent repair is made.**

(13) For detailed procedures on adjusting pulled apart, broken, or cut rail, refer to Attachment C.

(b) **Adjusting or Distressing Previously Installed CWR**

(1) Rail can be distressed by heating rail and/or pulling rail that has a RNT below the target RLT of 105°F. In a curve, the CWR can be distressed or the curve can be lined out. When distressing or adjusting CWR with an RNT below the target RLT of 105°F, the following is a *general* procedure:

(2) Procedure:

(i) Determine amount of rail to be distressed on either side of a cut and/or joint (up to 800' on either side of the joint and/or cut for a total of 1,600' maximum).

(ii) Cut rail at the end or in center of rail to be distressed (see Attachment B).

(iii) Remove anchors or clips in both directions from either side of the cut back to the distressing limit or to a fixed object or an appliance in the track (turnout or grade crossing) or structure that prevents rail movement.

(iv) Wait until rails stop moving. The rail ends may need to be misaligned to allow for expansion and then trimmed one time (if possible) to fit.

(v) Take the rail temperature.

(vi) Compare the rail temperature to the target RLT=105°F to determine the temperature differential (TD).

(vii) If the actual rail temperature is lower than the RLT of 105°F, use the Rail Expansion Table in Attachment E (Form "RC") to determine the rail length to be removed based on the total distance the anchors or clips that have been removed.

(viii) Expand rail required amount by using ambient temperature, rail heater and/or rail puller.

(ix) Replace the rail anchors or clips.

(x) Weld the joint or apply joint bars:

- When making an orgothermite field weld, cut out required amount of rail plus the weld width allowance as specified by the weld manufacturer. **(**Typically **1"+/-)).**
- When making an electric flash butt field weld, the amount of rail to be cut is the amount determined from the rail expansion table minus the

amount of rail consumed when making the electric flash butt weld. (Typically 3/4" to 1-1/2")**.**

(3) All other provisions of Section 3.0 apply to this process.

(c) **Procedures for Making Repairs to Buckled Track**

(1) In the event of buckled track, the following conditions exist and procedures are to be used as a guideline:

(i) Since both rails are assumed to be in compression, cut both rails with a torch.

(ii) Make these torch cuts out of the displaced track zone where there may be significant compressive stress in the rails.

(iii) Torch cuts shall be at least one rail length (39'+) beyond the end of lateral track displacement.

(iv) If possible, before cutting the rail, line the track at the point of displacement in the direction of the displacement to further reduce the compressive stresses in the rail. If the displaced area is near a joint then the joint bars should be removed after lining the track.

(v) Misalign the cut and/or uncoupled rail ends, allowing the ends to bypass.

(vi) Bring the track back into correct alignment.

(vii) Both rails for some distance on either side of the point of maximum displacement and/or the point where rails were cut or the joint bars were removed are now considered to have lost their adjustment.

(viii) These rails must be readjusted and/or distressed according to this Section.

(ix) Also, see Attachment B: "Recommended Procedures for Distressing Continuous Welded Rail (CWR) Previously Laid In Track": "Reactive or Emergency Distressing".

(x) Track buckle at a fixed object:

- In those cases where the buckle occurs at a fixed object (grade crossing, turnout, etc.) the readjustment/distressing need only take place in the direction away from the fixed object,
- However, a close inspection of the track on the other side of the fixed object is required to determine if there is any evidence of rail or track movement, rail bunching, etc. which may indicate inadequate adjustment in that area and the need for additional distressing.

(xi) If the area cannot be readjusted or repaired before running a train, appropriate remedial action shall be taken:

- A Form "TD" shall be filled out so that necessary distressing work can be accomplished before return rail temperatures are exceeded (see Attachment C).
- Alignment measurements should be taken to ensure that the track meets minimum alignment requirements for the Class of Track at which the track is to be returned to service as is shown in the FRA Track Safety Standards §213.55**.**
- Rails that have been torch cut during the corrective procedure will be either cut back and/or removed from track promptly (see Attachment B).
- On MassDOT Rail and Transit Division owned rail lines, torch cut rails shall be protected by a maximum 10 MPH (F&P) temporary slow order (TSO) until the rail is cut back and/or removed from track.

(xii) New rail adjustment and rail clipping records shall be prepared on the Rail Clipping/Anchoring Form "RC" with the new adjusted temperatures when the rail in the affected area is distressed (see Attachment E).

(xiii) The original Form "TD" that was made out at the time of the incident shall be updated to indicate that all necessary repairs, to include distressing, have been made, when the permanent repairs are made.

(xiv) The Operating Railroad shall retain Form "RC" for the record for the duration of their Operating Contract and/or until the rail is removed from service. A copy of Form "RC" shall be sent to the MassDOT Rail and Transit Division.

(d) **Installing Rail Plugs in Existing CWR Track**

(1) When it is necessary to install rail plugs in existing CWR due to replacement of defective rails, defective field or plant welds, defective joints or insulated joint failures, etc., an approved heating device or hydraulic expander must be used to **assure the amount of rail installed is equal to or less than the length of rail removed. DO NOT ADD RAIL**

(2) If the work cannot be completed and a permanent repair cannot be made before running a train, appropriate remedial action shall be taken:

(i) A Form "TD" shall be filled out to document work done so that the necessary permanent repair can be accomplished before return rail temperatures are exceeded (see Attachment C).

(3) **Where necessary to install a plug rail in CWR, use at least a 14' long plug in tangent and at least a 21' plug in curves wherever possible.**

(4) See FRA §213.119(c)(3): If it becomes necessary to apply joint bars in CWR already laid in track, because of a service failure or a failed bar with a rail gap present:

(i) Weld the joint (The end bolt hole in each rail end must not be drilled to permit field welding);

(ii) Replace broken bar(s), replace broken bolts, adjust anchors and within 30 days, weld the joint;

(iii) Replace the broken bar(s), replace the broken bolts, install one additional bolt per rail end (six hole bar needs six bolts), and adjust anchors;

(iv) Replace the broken bar(s), replace the broken bolts, and anchor every tie 195 feet in both directions from the CWR joint.

(e) **Field Welding of CWR**

(1) When field welding joints with orgothermite welds between CWR strings that have been temperature adjusted, or field welding plugs previously installed in properly adjusted CWR track:

(i) **The necessary gap for welding will not be developed by allowing the rail gap to open up to the correct welding gap.**

(ii) The following welding practices shall be used:

- Remove the joint bar. Remove with an approved rail saw 1"+/- of rail, or as specified by weld manufacturer, to provide the required welding gap. If a "Wide Gap" field weld is to be used, the gap shall be as required by the weld manufacturer. Torch cutting of rail is prohibited. **DO NOT ADD RAIL**
- To maintain the proper weld gap apply a hydraulic expander to return the rail ends to the required gap and while holding this position,

proceed to make the weld in accordance with existing procedures. Let field weld cool to 500°F before removing expander.

- Upon completion of weld reapply anchors and/or clips before removal of the hydraulic expander.

(2) All other provisions contained in §121.1(M), "Field Welding of Rail Joints," of the MW-1 will be followed when field welding is conducted.

6.0 TRACKWORK THAT DISTURBS CWR TRACK AND THE PROTECTION OF DISTURBED TRACK

6.1 General

The following trackwork repairs are considered to disturb CWR track.

6.1.1 Trackwork that Disturbs CWR

(a) Trackwork activities discussed below are repairs and/or production work that are considered to have disturbed CWR track.

(b) **Trackwork activities that disturb CWR track** shall be inspected by a qualified person as designated in FRA §213.7(a)(b)(c).

(c) Before returning the track to service, the above designated person in (b) shall take appropriate remedial action and place a TSR as given in this Section 6.0.

(d) The designated qualified person as given in (b) shall place more restrictive TSRs and additional remedial action as conditions warrant.

6.1.2 Trackwork that Does Not Disturb CWR

(a) **Trackwork activities that do not disturb CWR track** shall be inspected by a qualified person as designated in FRA §213.7(a)(b)(c).

(b) Before returning the track to service, the above designated qualified person in (a) shall take any appropriate remedial action that that person sees fit to protect the safety of train operations.

6.2 Train Definition

(a) For the purposes of this part, a train is defined as:

(1) A locomotive and at least eight loaded ballast cars (80 ton cars each) (1,000 ton +/- consist), or

(2) A commuter train with at least five cars and a locomotive (750 ton +/- consist), or

(3) Some combination of railroad equipment that is 1,000 ton consist (including locomotive), or

(4) A ballast stabilizer that is equivalent to 50 tonnage trains (1,000 tons each) or 50,000 tons, or

(5) As approved by MassDOT Rail and Transit Division.

6.3 Work Activities that Disturbs CWR Track

(a) **Installation of Plugs in CWR that Disturbs CWR Track:**

(1) If, during the installation of a plug rail in CWR, rail has been added or RNT as determined by measurement of rail gap is less than 95°F or (RNT-10°F) see Attachments A and C and the following:

(i) Install the rail anchors reversed on field side of plug rail only until necessary permanent repairs are made; or

(ii) Spray the elastic fasteners on the gage side in orange paint until necessary permanent repairs are made.

(iii) Fill out Track Disturbance Report (Form "TD"). The amount of rail added, as well as the temperature and rail gaps of the rail at the time of the break or

saw cut, **shall** be reported on Form "TD", "Record of Disturbance of Main CWR Track."

(iv) Make temporary and/or permanent repairs as given in Attachment C using tables in Attachment A as required.

(v) The track shall be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(2) **Protective Slow Order**: See Table in Attachment C for maximum rail temperatures (°F) at which permanent repairs or readjustments shall be made and/or slow orders applied. **When these rail temperatures exceeded a TSR of no more than 25F and 25P MPH shall be placed on the track in question until repairs are made, unless inspected daily in the heat of the day, in which case the TSR can be no more than 40F and 40P MPH**

(3) Repairs shall be accomplished in accordance with Section 5.0 and Attachments C and A.

(4) Following steps (1) and (2), when permanent repairs have been made, the track will be returned to maximum authorized speed (MAS) unless additional deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(5) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work such as installing plug rails shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(b) **Tie Renewal In Tangent Track and in Curves <3° that Disturbs CWR Track:**

(1) Installing more than four ties in 39' of track with four undisturbed ties between renewed ties; or

(2) Installing four or less than four ties per 39' of track with fewer than four undisturbed ties between renewed ties.

(3) In any case no more than four ties per 39' of track (540 ties per mile) can be replaced in one pass.

(4) **When old ties are removed, and new ties and plates installed, do not lift the rail.**

(5) **When tamping ties installed, tamper should be set so that no lifting of the track occurs.**

(6) **MassDOT shall review means, methods, and equipment before ties are removed and installed.**

(7) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(8) Ties shall not be installed at ambient temperature of less than 40°F unless approved by the MassDOT Field Representative.

(9) Fill out Track Disturbance Report (Form "TD").

(10) The track shall be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(11) **Protective Slow Order (without stabilizer) (Ambient ≤80°F):** Not to exceed 25F and 30P MPH shall be applied for a period of 24 hours and a minimum of 12 trains over the affected track.

(12) **Protective Slow Order (with stabilizer) (Ambient ≤80°F):** Not to exceed 25F and 30P MPH shall be applied for the first train over the affected track.

(13) **Protective Slow Order (with or without stabilizer) (Ambient >80°F):** If ambient temperature >80°F and rail temperature is >110°F, a slow order of 10F and 15P shall be applied until the ambient temperature drops to 80°F. When the ambient temperature is ≤80°F, the Protective Slow Order applied is described as above in (11) or (12).

(14) Following steps (11) and/or (12), (13), track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(c) **Tie Renewal in Curves ≥3° that Disturbs CWR Track:**

(1) In addition to the protective action required when installing ties in tangent track in Paragraph (b) above, if 540 ties per mile or more are installed in curves ≥3° the following shall be done:

(i) The curve or curves ≥3° in question shall be staked as described in Attachment E, using Form "TM," Report of Track Movement.

(ii) Movement of the curve(s) when ties are installed shall be recorded on Form "TM"; and,

(iii) If a curve greater or equal to 3° moves inward and/or outward when installing ties, the curve shall be inspected by a person qualified under FRA §213.7(a)(b)(c), and appropriate remedial action taken as conditions warrant.

(iv) If movement limits to the inside of the curve are exceeded then the RNT shall be adjusted by distressing the rail in the curve and/or lining the curve out (see Attachment B).

(2) **When old ties are removed, and new ties and plates installed, do not lift the rail.**

(3) **When tamping ties installed, tamper should be set so that no lifting of the track occurs.**

(4) **MassDOT shall review means, methods, and equipment before ties are removed and installed.**

(5) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(6) Ties shall not be installed at ambient temperature of less than 40°F unless approved by the MassDOT Field Representative.

(7) Fill out Track Disturbance Report (Form "TD") and Report of Track Movement (Form "TM") as appropriate.

(8) **Protective Slow Order (with or without stabilizer) (Ambient ≤80°F)**: Same as for Tie Renewal in Tangent Track if curve movement for curves ≥3° is less than 3"as given on the table for Form "TM" (see Attachment E for table).

(9) **Protective Slow Order (without or with stabilizer) (Ambient >80°F):** If ambient temperature is >80°F and rail temperature is >110°F, a slow order of 10F and 15P MPH shall be applied until the ambient temperature drops below 80°F. When the temperature drops below 80°F, the Protective Slow Order is applied as described above in (8).

(10) **Protective Slow Order for Curve Movement (with or without stabilizer) (Ambient ≤80°F)**: If a curve ≥3° has movement ≥3" to the inside (see Form "TM," Attachment E), a protective slow order not to exceed 25F and 30P shall be applied. In addition:

(i) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(ii) The restriction shall remain in effect until the curve is lined out back to its original position and/or both rails are readjusted to the target neutral temperature of 105°F in accordance with Section 3.0 and Attachment B

(11) **Protective Slow Order for Curve Movement (with or without stabilizer) (Ambient >80°F)**: If a curve ≥3° has movement ≥3" to the inside (see Form "TM," Attachment E), a protective slow order not to exceed 10F and 15P shall be applied. In addition:

(i) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(ii) The slow order of 10F and 15P MPH shall be applied until the ambient temperature drops below 80°F. When the temperature drops below 80°F, the protective slow order is applied as described above in (10); and

(iii) The restriction of 25F and 30P shall remain in effect until the curve is lined out back to its original position and/or both rails are readjusted to the target neutral temperature of 105°F in accordance with Section 3.0 and Attachment B.

(12) Following steps (7) through (11), track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(d) **Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <3°):**

(1) **The normal balancing of throws done during high speed surfacing operations does not constitute out-of-face curve realignment.**

(2) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(3) If the ambient temperature and/or rail temperature is less than 40°F, all work will be suspended unless it is an emergency or directed by the MassDOT Field Representative.

(4) **Protective Slow Order: T**he protection of CWR Track which has been surfaced is shown in the following table, "Protection Required for CWR Track Surfaced Based on Air and Rail Temperatures."

(5) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(6) When operating speeds change during the time a restriction (TSR) is in effect, the worked track must be re-inspected by a qualified Operating Railroad Employee each time the speed is to be raised.

(7) Whenever a dynamic stabilizer is to be used as part of a surfacing operation, it will be:

(i) Operated after each pass of the tamper; and

(ii) Both vibration units must be fully operable and the frequency of oscillation shall be in the range of 30-35 Hz, with a minimum vertical loading pressure of 870-1,000 psi and working speed shall be in the range of 1-2 MPH.

(iii) A ballast compactor may be used if approved by MassDOT Rail and Transit Division.

Protective Slow Order Required for CWR Track Surfaced Based on Air and Rail Temperatures

Air Temperature	Distance	Wood Tie Track Protection	Concrete Tie Track Protection
Applies to ALL Surfacing: STOP Work			
Ambient Does Exceed 80° or the and Rail Temperature Exceeds 110°F***	All Distances	STOP Work	STOP Work
Protections to be applied for Surfacing with NO Dynamic Stabilizer			
Ambient Does Not Exceed 80° (Rail Temp ≤110°F)	0 ft. to 19'-6"	None*	None*
	Over 19'-6"	25F-30P MPH for 24 hours **and** the passage of 12 trains	25F-30P MPH for 24 hours **and** the passage of 12 trains**
In an Emergency, Ambient Does Exceed 80° (Rail Temp >110°F)	All Distances Ambient >80°F	10F-15P MPH until ambient temperature ≤80°F	10F-15P MPH until ambient temperature ≤80°
	All Distances Ambient ≤80°F	25F-30P MPH for 24 hours **and** the passage of 12 trains	25F-30P MPH for 24 hours **and** the passage of 12 trains**
Protections to be applied for Surfacing USING a Dynamic Stabilizer			
Ambient Does Not Exceed 80° (Rail Temp ≤110°F)	All Distances	10F-15P MPH for the first train 25F-30P MPH for the second train,	10F-15P MPH for the first train 25F-30P MPH for the second train,
	WITH the use of a Dynamic Stabilizer	Then Normal Speed	Then Normal Speed
In an Emergency, Ambient Does Exceed 80° (Rail Temp >110°F)	All Distances	10F-15P MPH first train 25F-30P MPH for the second train,	10F-15P MPH first train 25F-30P MPH for the second train,
	WITH the use of a Dynamic Stabilizer	Then not more than 40F-60P MPH for the passage for 24 hours and 12 additional trains	Then not more than 40F-60P MPH for the passage for 24 hours and 12 additional trains

* If the air temperature does exceed 80°F (rail temperature exceeds 110°F) during the 24 hours following the work then a 25F-30P MPH restriction must be placed on the worked area for 24 hours and the passage of 12 trains.

** A restriction with a speed no greater than 40F-60P MPH may be applied only if a Shoulder and Crib Compactor is used immediately after surfacing. If a restriction greater than 25F and 30P MPH is applied, the first train over the affected area must be limited to 25F and 30P MPH.

***If the air temperature exceeds 80°F and the rail temperature exceeds 110°F, there is no work permitted except in an emergency or as directed by MassDOT Rail and Transit Division.

(e) **Surfacing, Smoothing and/or Lining that Disturbs CWR Curved Track: Curves ≥3°**:

(1) **The normal balancing of throws done during high speed surfacing operations does not constitute out-of-face curve realignment.**

(2) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(3) If the ambient temperature and/or rail temperature is less than 40°F, all work will be suspended unless it is an emergency or directed by the MassDOT Field Representative.

(4) Curves 3° or over being surfaced and aligned shall be staked to monitor movement.

(i) To stake a curve, place reference points uniformly around the curve in the track along the gage side of the high rail, starting at the tangent to spiral point (TS). As a minimum, tag and stake the following points:

- Tangent to Spiral Point (TS)
- Spiral to Curve Point (CS)
- Full Body of Curve: at least every 200'
- Curve to Spiral Point (CS)
- Spiral to Tangent Point (TS)

(ii) The reference points shall be 200' or less apart. Each reference point around the curve shall be staked on the field side of the high rail (where possible). Stakes should be set a minimum of 15' from the gage corner side of the high rail out of the way of ballast unloading and the ballast regulator wings.

(iii) The reference points are to be recorded on Form "TM," "Report of Track Movement" (see Attachment E).

(iv) Measure from the reference points to the stakes on the field side of the high rail to obtain initial values of distance between reference points and stakes before any work is conducted and record on Form "TM".

(v) The reference point to stake distances shall be re-measured immediately after the final surfacing pass by the surfacing gang. These measurements are made to determine track movement, if any, at the reference points. The measurements shall be measured and recorded on Form "TM" before track is returned to normal speed.

(vi) In addition, the track movement at the reference points should also be re-measured seven days after the work is completed.

(vii) Track movements shall be calculated and compared to the values given on Form "TM" (see Attachment E).

(5) **Protective Slow Order (any temperature):** If in surfacing and aligning a curve ≥3°, the limits of out-of-face curve realignment given in Attachment E, Form "TM", are NOT EXCEEDED:

(i) If the curve is moving outward and/or inward, inspect the curve with a person qualified under FRA §213.7(a)(b)(c), and provide protection and/or TSRs as given in Section 6(d), "Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <3°)"; or

(ii) If the curve is moving outward and/or inward, inspect the curve with a person qualified under FRA §213.7(a)(b)(c), and, if conditions warrant, take

remedial action ad provide more restrictive protection than required in Section (6)(d), "Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <°3)."

(6) **Protective Slow Order (when curve movements in Attachment E, Form "TM", are exceeded):** If in surfacing and aligning a curve ≥3°, the limits of out-of-face curve realignment (≥3") given in Attachment E, Form "TM" are exceeded (≥3"), proceed as follows.

(i) Fill out Form "TD" Track Disturbance Report and Form "TM" Report of Track Movement.

(ii) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(iii) The curve will have been considered to have lost its neutral temperature and will have to be adjusted in accordance with Section 3.0, "Installation and Adjustment of CWR" and/or realigned out to original position as determined by staking.

(iv) **Protective Slow Order (Ambient ≤80°F):** Not to exceed 25F and 30P MPH until rail has been cut and RNT adjusted to 105°F and/or curve has been lined out to original position.

(v) **Protective Slow Order (Ambient >80°F):** Not to exceed 10F and 15P until:

- The ambient temperature drops below 80°F. When the temperature drops below 80°F, the protective slow order is applied as described above in (iv) above; and.
- The restriction of 25F and 30P shall remain in effect until the curve is lined out back to its original position and/or both rails are readjusted to the target neutral temperature of 105°F in accordance with Section 3.0 and Attachment B

(7) Following steps (4) through (6), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(f) **Cut and Throw of Track that Disturbs CWR Track:**

(1) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(2) When existing CWR track is cut and thrown, it will be considered to have lost its neutral temperature and will have to be adjusted in accordance with Section 3(b). **DO NOT ADD RAIL.**

(3) Fill out Track Disturbance Report (Form "TD").

(4) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(5) **Protective Slow Order (Ambient ≤80°F):** Not to exceed 25F and 30P MPH shall be applied until RNT is readjusted to 105°F.

(6) **Protective Slow order (Ambient >80°F):** Not to exceed 10F and 15P MPH until RNT is readjusted to 105°F.

(7) The area of cut and throw will have been considered to have lost its neutral temperature and the RNT shall be adjusted in accordance with Section 3.0, "Installation and Adjustment of CWR."

(8) RNT adjustments shall be made before the ambient and rail temperatures reach those given in (1).

(9) Following steps (3) through (8), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(g) **Switch or Track Panel Installation that Disturbs CWR Track:** When performing panel installation, the following requirements apply:

(1) Fill out Track Disturbance Report (Form "TD").

(2) Switch and track panel installation shall only be performed at ambient temperatures greater than 30°F unless it is an emergency or as directed by MassDOT Rail and Transit Division; and,

(3) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(4) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(5) The area of switch or track panel installation will have been considered to have lost its RNT if:

(i) Rail has been added when the switch and track panel has been installed.

(ii) This can be determined by placing match mark on the rail before the track is cut to install the switch and/or track panel and by measuring the rail gap.

(6) If RNT has been lost, the rail shall be adjusted to a target RNT of 105°F in accordance with Section 3.0, "Installation and Adjustment of CWR."

(7) If rail has been added, a protective slow order shall be placed until the adjacent CWR and RNT is adjusted. These RNT adjustments shall be made before the ambient and rail return temperatures are exceeded as given in Attachment C. These temperatures are related to the rail temperature at which the rail was cut to install the track or switch panel.

(8) **Protective Slow Order (Ambient ≤80°F) (until rail neutral temperature adjustment):** Not to exceed 25F and 30P shall be applied until the RNT adjustment work is accomplished.

(9) Protective Slow Order (Ambient >80°F) (until rail neutral adjustment): Not to exceed 10F and 15P MPH shall be applied until the RNT adjustment work is accomplished.

(10) In addition, the track panel has lost all its lateral stability and the CWR is considered disturbed until the ballast section is restored and recompacted/stabilized by machine action and/or by train traffic.

(11) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast without stabilizer):** Place a protective slow order not to exceed 25F and 30P MPH will be applied after surfacing, for a period of 24 hours ***and*** a minimum of 12 trains over the affected track.

(12) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast with stabilizer):** Not to exceed 25F and 30P MPH shall be placed for a period of 24 hours and a minimum of three trains over the affected track if a stabilizer has been used.

(13) Following steps (4) through (12), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(h) **Undercutting that disturbs CWR track:** When performing this work, the following requirements apply:

(1) Fill out Track Disturbance Report (Form "TD").

(2) Undercutting shall not be done at an ambient temperature below 30°F and above 80°F (rail temperature greater than a temperature of 110°F) except in an emergency and as approved by MassDOT Rail and Transit Division.

(3) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(4) When undercutting track, the neutral temperature shall be considered lost and the rail will have to be adjusted to a target RNT of 105°F in accordance with Section 3.0, "Installation and Adjustment of CWR."

(5) These RNT adjustments shall be made before the ambient and rail return temperatures are reached as given in Attachment C. These temperatures are related to the rail temperature at which the rail was undercut and the existing RNT was substantially altered.

(6) **Protective Slow Order (Ambient ≤80°F) (until rail neutral temperature adjustment):** Not to exceed 25F and 30P shall be applied until the RNT adjustment work is accomplished.

(7) **Protective Slow Order (Ambient >80°F) (until rail neutral adjustment):** Not to exceed 10F and 15P MPH shall be applied until the RNT adjustment work is accomplished.

(8) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast without stabilizer):** Place a protective slow order not to exceed 25F and 30P MPH will be applied after surfacing, for a period of 24 hours ***and*** a minimum of 12 trains over the affected track.

(9) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast with stabilizer):** Not to exceed 25F and 30P MPH shall be placed for a period of 24 hours and a minimum of three trains over the affected track if a stabilizer has been used.

(10) Following steps (3) through (9), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(i) **Out-of-Face Shoulder Ballast Cleaning that Disturbs CWR Track:**

(1) Fill out Track Disturbance Report (Form "TD").

(2) Out-of-Face shoulder ballast cleaning shall not be done at an ambient temperature below 30°F and above 80°F (rail temperature greater than a temperature of 110°F) except in an emergency and as approved by MassDOT Rail and Transit Division.

(3) After shoulder ballast cleaning is performed, there shall be a full restoration of the standard ballast section to include cribs and shoulders.

(4) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(5) **Protective Slow Order (with compactor and/or stabilizer) (Ambient Temperature ≤80°F):** The track may be put back at MAS provided that:

(i) The first train shall operate after out-of-face shoulder ballast cleaning at no more than 25F and 30P MPH.

(ii) The Operating Railroad person qualified under FRA §213.7 shall re-inspect the track and if no deficiencies are found; and

(iii) The track has a fully restored standard ballast section that has been treated with:

- A standard ballast compactor and/or;

- A dynamic stabilizer.

(iv) The track shall be returned to MAS.

(6) **Protective Slow Order (without compactor and/or stabilizer) (Ambient Temperature ≤80°F):** If ballast compaction is not performed with a standard ballast compactor and/or a dynamic stabilizer:

(i) The track shall have a protective slow order of no more than 25F and 30P MPH for 24 hours. for a period of 24 hours ***and*** a minimum of 12 trains over the affected track.

(ii) The Operating Railroad person qualified under FRA §213.7 shall re-inspect the track and if no deficiencies are found;

(iii) The track speed shall be returned to MAS.

(7) **Protective Slow Order (with compactor and/or stabilizer) (Ambient >80°F):** In an emergency, if the ambient temperature exceeds 80°F (rail temperature >110°F), out-of-face shoulder ballast cleaning shall continue only if a shoulder compactor and/or dynamic stabilizer is used. A protective slow order shall be placed as follows:

(i) Wood or concrete tie track: not to exceed 25F and 30P MPH during the period the air temperature exceeds 80°F and/or until 24 hours elapses then re-inspect and return to MAS, if appropriate.

(j) **CWR Installation that is Unacceptable:**

(1) Fill out Track Disturbance Report (Form "TD")

(2) CWR not installed in compliance with Section 3.0.

(3) A protective slow order not to exceed 25F and 30P MPH until the CWR is installed and adjusted to the target neutral temperature of 105°F as per Section 3.0.

(k) **Anchor or Clip Removal that Disturbs CWR Track:**

(1) When more than eight ties per 39' of track have anchors or clips removed and/or missing; or,

(2) The required standard anchor pattern as in Section 4.0 does not exist, CWR track is disturbed; and

(3) Fill out Track Disturbance Report (Form "TD")

(4) **Protective Slow Order (Ambient >80°F):** If anchor/clip replacement is not accomplished before the ambient temperature exceeds 80°F (rail temperature >110°F), a slow order not to exceed 25F and 30P MPH and shall be in effect until the proper number of anchors or clips are applied and/or re-applied in the pattern as described in Section 4.0.

(5) Install all missing anchors and/or clips.

(6) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(7) Following steps (3) through ((6), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(l) **Cribbing that Disturbs CWR Track:**

(1) Cribbing more than three ties in a row in 39'; or

(2) Cribbing four or more ties with less than four undisturbed ties between ties cribbed.

(3) In all cases no more than three successive ties or more than four ties per 39' of track can be cribbed in one pass.

(4) Track with the cribs reduced in the rail seat area for the mechanical installation of rail anchors on properly adjusted CWR does not require a slow order for improper ballast section, if this is the only ballast section deficiency and the track has not had lateral resistance reduced.

(5) If the ambient temperature is greater than 80°F (rail temperature greater than a neutral temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(6) Fill out Form "TD" Track Disturbance Report.

(7) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(8) Wood or concrete tie track will be returned to service:

(i) When all the cribs are filled with new ballast and dressed and mechanically tamped.

(9) **Protective Slow Order (at any ambient temperature):** Not to exceed 25F and 30P MPH for a period of 24 hours and the passage of 12 trains over the affected track, re-inspect and return track to MAS, as appropriate.

(10) Following steps (6) through (9), track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

6.4 Suspension of Work Due to Heat Where Ambient Temperature >80°F or Rail Temperature >110°F

(a) The following work which can reduce the stability of CWR at higher temperatures will be suspended (except under a continuous track outage) or unless there is an emergency, when air temperatures are expected to be above 80ºF (rail temperature greater than a rail temperature of 110°F):

(1) Tie Renewal

(2) Tie Renewal in Curves

(3) Surfacing, Smoothing and/or Lining

(4) Out-of-face Curve Re-aligning

(5) Cut and Throw of Track

(6) Installation of Track or Switch Panels

(7) Undercutting

(8) Out-of-Face Shoulder Ballast Cleaning

(9) Cribbing

6.5 Protection of Work Areas for Latent Heat Effects

(a) **This requirement applies for work that has been done that disturbs CWR track until seven days of traffic has been accumulated over the work area, or the period of high heat ends.**

(b) The speed restriction shall be placed by a person qualified on FRA §213.7(a)(b)(c), if appropriate, on a case-by-case basis if the air temperature is at 80ºF or above (rail temperature >110°F).

(c) Each Operating Railroad qualified employee in a work block is responsible for the protection and inspection requirements of this Section, as they relate to the work conducted under the railroad's control.

(d) In the case where a Foreman is working in an out-of-service block of track under the control of another Foreman, but at a separate location from the Foreman providing protection:

(1) This Foreman will inspect and report the findings, if any, to the Foreman in charge of the track before reporting clear of the track.

(2) This report must include any required speed restrictions and any other information that would affect the safe movement of trains.

7.0 SPECIAL INSPECTIONS OF CWR TRACK

(a) **Special Inspection in Hot Weather**

(1) When the air temperature is ≥95ºF or the rail temperature is ≥125°F, all main tracks with CWR shall be inspected by qualified Operating Railroad personnel qualified on Track Safety Standards, Part 213, §213.7(a)(b)(c) and in accordance with currently established inspection procedures, outlined in this Appendix.

(2) During periods of extreme heat, when air temperatures exceed 95ºF or the rail temperature is ≥125°F, the Operating Railroad qualified employee should make Special Inspections and place appropriate speed restrictions (TSR) and take remedial action, as required.

(3) Determination of Temperature: The rail temperature is the preferred temperature and is taken with an approved rail thermometer. The air temperature is as reported by the National Weather Service.

(4) Operating Railroad personnel shall make out a “Special Track Inspection Report” (see Appendix F, “Forms”) for this inspection and retain a copy for the duration of the Operating Contract that can be reviewed by the MassDOT Rail and Transit Division.

(5) During this inspection, the track inspector must be particularly alert for wavy track, longitudinal rail movement, kinked joints in compression and evidence of lateral track movement. The track inspector must also be aware that the following conditions increase the possibility of buckling:

(i) Recently worked track

(ii) Fouled ballast and mud spots

(iii) Gaps in the ballast at the ends of the ties indicating tie movement

(iv) Existing deformations in line and surface

(v) Rail canting and/or lifting out of the tie plates

(vi) Shiny marks on the base of the rail indicating that the rail is sliding through the anchors and/or clips

(vii) Kinky or wavy rail

(viii) Bottom of sag curves

(ix) In areas of heavy braking and acceleration

(x) Higher degree curves

(xi) Fixed facilities (i.e., turnouts, road crossings, bridges, etc.)

(xii) Sub-standard ballast section

(xiii) Sub-standard anchor/clip pattern

(xiv) Sub-standard tie conditions

(6) If track is identified as having any conditions which indicate the possibility of buckling, remedial action must be taken immediately by Operating Railroad personnel qualified in FRA §213.7(a)(b)(c).

(b) **Special Inspection in Cold Weather**

(1) When the air temperature or the rail temperature is ≤10°F, all main CWR and jointed tracks will be inspected by qualified Operating Railroad personnel in accordance with currently established inspection procedures, outlined in this Appendix.

(2) Determination of Temperature: The rail temperature is the preferred temperature and is taken with an approved rail thermometer. The air temperature is as reported by the National Weather Service.

(3) Operating Railroad personnel shall make out a "Special Track Inspection Report" (see Appendix F, "Forms") for this inspection and retain a copy for the duration of the Operating Contract that can be reviewed by the MassDOT Rail and Transit Division.

(4) Inspectors will inspect, at a minimum, for:

(i) Broken rails

(ii) Canted rails out of the plates on curves

(iii) Bent bolts

(iv) Pull-aparts

(v) Broken welds

(vi) Wide gap between rail ends

(vii) Cracked or broken joint bars (conventional and insulated)

(viii) Curve movement to the inside

(c) **Semi-Annual Inspections**

(1) A Spring inspection, between April 1 and May 30 (before air temperature of 80°F or a rail temperature of 110°F), and a Fall inspection between October 15 and November 15, shall be made by walking or by a hy-rail on all CWR main track. This inspection shall made using the "Report of Semi-Annual Inspection of CWR Track" found in Attachment E. The Inspection shall be made by a Manager of the Operating Railroad qualified under FRA §213.7(a)(b)(c).

(2) The inspection will concentrate on compliance with standards in the following areas:

(i) Anchor pattern

(ii) Anchor position

(iii) Resilient fasteners

(iv) Tie condition

(v) Ballast condition

(vi) Ballast section

(vii) Joint condition

(viii) Evidence of longitudinal rail movement, particularly at fixed locations, such as turnouts and grade crossings and open deck bridges.

(ix) Drainage condition

(x) Overall roadbed stability

(xi) Curve movement

(xii) Alinement deviations

(3) The Operating Railroad Manager will, within 30 days from the completion of the inspection, submit inspection information to the MassDOT Rail and Transit Division. Some of the information to be included is:

(i) A report of the special inspection that identifies track inspected by number and milepost limits;

(ii) The name of the individuals inspecting;

(iii) Date inspected;

(iv) Any exceptions found; and

(v) Protective and corrective action identified.

(d) **Protection of CWR Track with Deficiencies**

(1) When making Special Inspections (Hot and Cold Weather), Bi-Annual Inspections (Spring and Fall) and/or regular scheduled inspections in CWR track, if any of the above conditions described above in this paragraph are found to exist:

(i) Remedial action shall be taken, if required, as per FRA §213.5 by an individual qualified as per FRA §213.7(a)(b)(c).

(2) It is extremely important that noted deficiencies be corrected before the air temperature is expected to be above 80°F or the rail temperature expected to be above 110°F.

(3) If deficiencies are not corrected before the air temperature is expected to be above 80°F or the rail temperature above 110°F, appropriate remedial action shall be taken as per FRA§213.5, by an individual qualified as per FRA §215.7(a)(b)(c), if warranted.

(4) Determination of Temperature: The rail temperature is the preferred temperature and is taken with an approved rail thermometer. The air temperature is as reported by the National Weather Service.

8.0 JOINTS IN CWR TRACK

8.1 New Installations of CWR

(a) Joints in CWR track when installing CWR:

(1) When a joint or joints are installed in CWR during installation of CWR, one of the following actions per FRA 213.119(c)(2) shall be undertaken within 60 days:

(i) Weld the joint;

(ii) Install additional bolts in the joint bar so that all holes (6 holes) in the bar contain a bolt; or

(iii) Fully box anchor every tie for 195' in both directions from the joint.

8.2 Service Failures in Existing Previously Installed CWR

(a) Bolted joints in existing CWR that experience a service failure:

(1) In the case of a bolted joint in CWR experiencing service failure or a failed bar with a rail gap present, within 30 days either of the following actions per FRA 213.119(c)(3) shall be taken:

(i) Weld the joint;

(ii) Replace the broken bar(s), replace the broken bolts, adjust the anchors and, within 30 days, weld the joint;

(iii) Replace the broken bar(s), replace the broken bolts, install one additional bolt per rail end, and adjust anchors.

(iv) Replace the broken bar(s), replace the broken bolts, and anchor every tie 195' in both directions from the CWR joint; or

(v) Replace the broken bar(s), replace the broken bolts, add rail with provisions for later adjustment pursuant to FRA §213.119(d)(2) and reapply anchors.

8.3 Service Failure of Joint Bars and/or Track Bolts in a CWR Joint

(a) Minimum remedial action required:

(1) In the event of:

(i) Cracked or broken joint bar or bars, and

(ii) Bent and/or broken joint bolt or bolts,

(iii) Take the appropriate minimum remedial action given below and as shown in Attachment D, "Joint Defect Guidelines/Maximum Allowable Temporary Speed Restrictions (TSRs)".

(b) Number of bolts in rail ends required:

(1) In CWR track each rail end shall be bolted with at least two bolts at each bolted joint used to connect CWR strings, or CWR strings to conventional rail.

(2) Where either of the following conditions are found to exist, the track must be protected by the appropriate remedial action until the condition is corrected:

(i) Less than two bolts, but at least one bolt in a rail end: fix or place a TSR of no more than 10F/15P MPH until repaired.

(ii) One rail end unbolted (see Attachment D).

(3) Each joint bar must be held in position by track bolts or fasteners, and tightened sufficiently to provide support for abutting rail ends.

(4) When no-slip, or joint-to-joint rail contact exists by design; these locations are considered to be CWR track, and must meet all the requirements for CWR in this Appendix.

(c) Cracked or broken joint bars (see Attachment D):

(1) If a joint bar is cracked, broken or because of wear allows vertical movement of either rail when all bolts are tight, it shall be replaced.

(2) If a joint bar is cracked between the middle two bolt holes it shall be replaced.

(3) If between the middle two bolt holes, both joint bars are found to be cracked or one joint bar is found to be broken entirely through, trains may not be operated and the track taken out of service (see Attachment D) until the joint bars are replaced.

(4) If both joint bars are found to be broken entirely through between the middle two bolt holes, trains may not be operated and the track taken out of service (see Attachment D) until the joint bars are replaced.

(d) Opening (gap) of joints in CWR (see Attachment D):

(1) Bolted Rail Ends (Both Ends): The gap between rail ends shall be less than 1-1/2". If a joint is found to be open 1-1/2", a maximum 25F and 30P MPH temporary speed restriction shall be applied if there are two effective bolts in each rail end.

(2) Bolted Rail Ends (One End): If the gap between the rail ends is 1-1/2" but less than 2", a person designated under FRA §213.7(a)(b)(c)(d), shall visually supervise each train move. Repair the joint within 24 hours.

(3) Bolted Rail Ends (One End): If the gap between the rail ends is greater than 2" but 4" or less, a person designated under FRA §213.7(a)(b)(c)(d) shall visually supervise each train move. Repair the joint within 24 hours.

(4) Bolted Rail Ends (One End): If the gap between the rail ends is 4" or greater, the track shall be taken out of service until the joint is repaired.

8.4 Inspection of Joints In CWR Track

(a) Joints in CWR track must be inspected on foot according to §213.119. Rail joints in CWR track within turnouts, track crossings, expansion joints or lift rail assemblies need not be inspected during the walking inspection as they shall be inspected monthly in accordance with §213.235.

(b) The limits of the turnout for the purpose of this part are defined as a point 50 feet in advance of the points to the last long timber, or the heel of the frog if weave timbers are found at the heel.

(c) The limits of a track crossing, expansion joint, or lift rail assembly will be any joint within 20 ft. of the device.

(d) This inspection results shall be recorded on the Operating Railroad's Turnout Inspection Form.

(e) During walking inspections of joints in CWR particular attention must be paid to the following conditions of the joint and the track surrounding the joint:

(1) Cracks in the joint bar

(2) Evidence of movement of the bars in relation to the rail ends in the fishing areas ("loose" joints)

(3) Loose, bent or missing joint bolts

(4) Rail end batter

(5) Rail end mismatch

(6) Track surface, particularly hanging ties at the joint

(7) Evidence of excessive longitudinal movement of rail noted by the displacement of rail anchors, or "polished" areas at the ends of the bars or at rail anchors or clips

(f) All requirements per FRA Part 213 applying to Gage, Track Surface, Crossties, Defective Rails, Rail End Mismatch, Rail Joints, Rail End Batter, Tie Plates, and Rail Fasteners still apply. If there is a combination of conditions that substantially increases the chance of a broken joint bar an appropriate speed restriction should be applied.

8.4.1 Embedded Joints

(a) Permanently Embedded Joints:

(1) Where embedded joints exist, it is not necessary to disassemble or remove the track structure (e.g., remove pavement or crossing pads), to conduct an inspection of CWR joints unless there a deficiency or defect is suspected. Every effort must be made to inspect the visible portions of the joint bar and/or joint in embedded track construction.

(2) In new construction there shall be no embedded joints without the permission of the MassDOT Rail and Transit Division.

(b) Temporarily Embedded Joints:

(1) Joints may be embedded in a temporary crossing.

(2) Every effort should be made to keep the joint bar visible for inspection through the use of flangeway protection such as timbers, etc.

8.4.2 Joint Inspection in CWR

(a) Each joint in CWR shall be identified by using:
   (1) Route;
   (2) Track designation;
   (3) Milepost;
   (4) Joint type;
   (5) Rail designation; or
   (6) Other information so that the joint can be identified in the field.

(b) The Operating Railroad Company will maintain a computer-based inventory of each joint and furnish a copy to MassDOT Rail and Transit Division annually. The annual report shall also include the past five years of data as developed by the Operating Railroad Company.

(c) Each time a joint is removed from track by welding and/or is removed by the installation of rail that eliminates the joint, a Report of Joint Elimination by Field Welding shall be filled out (see Attachment E). The disposition of joints in track removed shall be noted on the next report when inspecting joints in CWR. By doing this, joints in CWR are reported from the time they are introduced until the time they are removed from track.

(d) The joint inventory will not contain those joints considered part of a turnout, track crossing, expansion joint, or lift rail assembly as the inspection of these joints is contained on the Monthly Switch Inspection Form as per §213.235.

8.4.3 Record of Inspections

(a) Each walking inspection of a joint in CWR track shall be recorded on the Operating Railroad Company's Special Track Inspection Report.

(b) The information on the Form shall include at a minimum, the Joint Identification Number, the route, the track, the milepost, the rail type, and any defects that require a remedial action and/or a permanent repair.

9.0 TRAINING

(a) To be considered qualified under §213.7 to supervise or conduct the installation, maintenance, adjustment and inspection of CWR track; individuals will receive instruction in, and be tested on, the **Operating Railroad's Approved CWR Plan.**

(b) All Operating Railroad MW employees responsible for the inspection, installation, adjustment, or maintenance of CWR track must successfully complete training on the Operating Railroad's Approved CWR Plan every calendar year.

(c) In addition, Operating Railroad MW employees shall be provided with a copy of these procedures which they shall make available at any CWR job site, if requested.

(d) The Operating Railroad shall maintain a list of those employees qualified to supervise restorations and inspect track in CWR territory. The Operating Railroad shall make this list available upon request.

(e) Annual CWR training programs will address the following:
   (i) The Operating Railroad's Approved CWR Plan and the application of written CWR procedures issued by the Operating Railroad.
   (ii) The qualification and designation of the Operating Railroad's MW personnel to:
      - Know and understand the requirements of the Operating Railroad's CWR Plan; and
      - Have the ability to detect deviations from the Operating Railroad's CWR Plan; and

- Can prescribe appropriate remedial action when deviations are discovered from the Operating Railroad's CWR Plan; and
- Have written authorization from the Operating Railroad to prescribe remedial action and/or make necessary repairs.

(iii) Subjects to be discussed during the annual training on the Operating Railroad's CWR Plan include, but are not limited to, the following:

- Installation and Adjustment of CWR
- Anchoring of CWR
- Maintenance of Desired Rail Neutral Temperature in Previously Installed CWR
- Trackwork That Disturbs CWR Track and Protection of Disturbed Track
- Special Inspections of CWR Track
- Joint Inspections in CWR Track
- Training
- Record Keeping

10.0 REPORTING REQUIREMENTS FOR CWR TRACK

(a) **Report of Disturbance of CWR Track (Form "TD") (Attachment E)**

(1) When any maintenance operations are considered to have disturbed CWR track as per Section 6.0, or if any rail is cut in CWR track or a service failure occurs in CWR track, a "Report of Track Disturbance", Form "TD", will be filled out by the Operating Railroad.

(i) Part A of this Form shall be completed for any work listed in Section 6.0 above which causes the CWR track to be considered disturbed.

(ii) Part B shall be completed whenever there is a Service Failure or CWR in main track is cut or broken for any reason.

(iii) The "Report of Track Disturbance Form" with instructions is found in Attachment E.

(iv) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the MassDOT Rail and Transit Division.

(b) **Report of Track Movement (Form "TM") (Attachment E)**

(1) During out-of-face surfacing operations and/or the out-of-face installation of ties, the neutral temperature can be adversely affected on curved track. The track may be line in and/or the track may pull in due to reduced longitudinal and lateral resistance of the track structure.

(i) For curves of 3° and greater, a "Report of Track Movement, Form "TM" shall be made out when the curve is surfaced out-of-face or when more than 540 ties per mile are installed.

(ii) This report shall be required in addition to the Report of Track Disturbance of CWR Track (Form "TD").

(iii) The curve shall be stationed at key geometric locations. Reference stakes shall be added to the field side of the high side of the curve so that curve movement during and/or after maintenance work is performed can be obtained.

(iv) This report shall be completed by the Contractor or Operating Railroad Company on whose territory the work is being performed. The "Report of Track Movement" Form with instructions is found in Attachment E.

(v) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Operating Railroad Company.

(c) **Report of Joint Elimination by Field Welding (Form "JE") (Attachment E)**

(1) Any time a field weld is made to eliminate a joint, either by the thermite or flash butt method, Form "JE" must be completed by the Contractor/Operating Railroad Company in charge of the work.

(i) The "Report of Joint Elimination by Field Welding" is found in Attachment E.

(ii) This report shall be required in addition to the Report of Track Disturbance of CWR Track (Form "TD").

(iii) This report shall be completed by the Contractor/Operating Railroad Company on whose territory the work is being performed.

(iv) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Mass DOT Rail and Transit Division.

(d) **Report of Rail Clipping/Anchoring (Form "RC") (Attachment E)**

(1) Any time CWR is adjusted according to the requirements of Section 3.0 of this document the Form, "Record of Rail Clipping/Anchoring," Form "RC," must be completed by the Contractor/Operating Railroad Company in charge of the work.

(i) The "Record of Rail Clipping/Anchoring", Form "RC" with instructions, is found in Attachment E.

(ii) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Operating Railroad Company.

(e) **Report of Semi-Annual (Spring/Fall) Inspection of CWR Track (Form "CWR") (Attachment E)**

(1) Any time CWR is inspected annually either in the Spring and/or the Fall according to the requirements of Section 7.0 of this document the Form, **"**Report of Semi-Annual (Spring/Fall) Inspection of CWR Track," Form "CWR" must be completed by the Contractor/Operating Railroad Company in charge of the work.

(i) The **"**Report of Semi-Annual (Spring/Fall) Inspection of CWR Track," Form "CWR", is found in Attachment E.

(ii) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Operating Railroad Company.

(f) **Special Inspections – Earthquakes**

(1) When an earthquake occurs, each quake's magnitude – or inherent strength is measured and reported by the National Earthquake Information Service operated by the U.S. Geological Survey in Golden, Colorado.

(2) The Richter scale gages the energy released by an earthquake, as measured by the ground motion recorded on a seismograph. The magnitude of an earthquake is the same no matter where one is located. Its intensity – or the degree to which it is felt in a specific location – varies depending on one's distance from the earthquake's epicenter, or center of energy.

(3) When an earthquake is reported, the Operating Railroad notifies Maintenance-of-Way to begin a Special Track Inspection.

(4) Use the criteria in the Table below to determine whether a special inspection is warranted.

Magnitude (Richter Scale)	Initiate Special Track Inspection	Criteria/Action
Unknown	Yes	Reports of ground shaking in a geographic area. Trains stop within 50-mile radius of reported shaking until inspection is complete.
0.1 to 4.9	No	No action required.
5.0 to 5.4	Yes	When track is within a 30-mile radius of the epicenter, trains in affected areas slow to restricted speed until inspection is complete.
5.5 to 5.9	Yes	When track is within a 50-mile radius of the epicenter, trains stop in the affected area until inspection is complete.
6.0 to 6.9	Yes	When track is within a 100-mile radius of the epicenter, trains stop in the affected area until inspection is complete.
7.0 and above	Yes	When track is within a 150-mile radius of the epicenter, trains stop in the affected area until inspection is complete.

(5) Special inspections shall identify hazards and identify necessary remedial action(s) to protect the safety of trains operating in the affected areas.

(6) When conducting a special inspection, check the following:

- Materials fouling the track, such as trees, pole lines, wires, etc.
- Alignment, cross level, and profile of the track.
- Bridge piers, abutments, and bulkheads for signs of structural damage.
- Substructure and superstructure for damage from large objects falling into structures.
- Piers, bents, and bridge members for missing components.
- Signal outages and malfunctions.
- Landslides in cuts and slope failures in fills.

(7) Fill out "Special Track Inspection Report" and retain for duration of Operating Contract.

11.0 RECORD KEEPING

(a) **Report of CWR Installations**

(1) Rail temperature, neutral temperature, location, and date of CWR installations must be recorded in system logs or data management system and must be retained by the Operating Railroad for the duration of the Contract with the MassDOT Rail and Transit Division.

(b) **Report of Maintenance Work in CWR**

(1) Because track maintenance can substantially impact CWR stability and safety, the following records of work done must be recorded on Form "TD" and must be kept by the Operating Railroad for the duration of the Contract with the MassDOT Rail and Transit Division.

(i) Rail that is added for any reason.

(ii) Repair of broken or defective rails, pull-aparts and welding of rail joints, and changing glued plug insulated joints.

(iii) A record of pre-break/cut RNT when rail has pulled apart, broken, or been cut for defect removal (see Attachment C).

(iv) A record of the readjusted RNT after a rail has pulled apart, broken, or been cut for defect removal (see Attachment C).

(v) Where a curve has been staked and the curve has chorded as a result of surfacing and lining track (Form "TM", Attachment E).

(vi) CWR installation or maintenance work that does not conform to Appendix "A" procedures.

(2) Any time work is performed in CWR territory by a Contractor and/or the Operating Railroad, an Operating Railroad qualified person under FRA §213.7(c) shall make out a Track Disturbance Form (Form "TD", Attachment E).

(3) The Contractor and/or the Operating Railroad shall review the Form "TD" to ensure necessary corrections and adjustments and permanent repairs are made so as to maintain the overall stability of CWR track.

This page intentionally left blank

ATTACHMENT A

DETERMINATION OF ESTIMATE OF PRE-BREAK / PRE-CUT NEUTRAL TEMPERATURE FOR A SERVICE FAILURE IN CWR

(a) General

(1) In line with Section 5.0's requirements, the RNT will be estimated and recorded on Form "TD" where a weld has broken or a rail has pulled apart, broken or been cut for defect removal (service failure).

(2) This attachment addresses how to calculate the rail's neutral temperature before the break or before the cut for defect removal.

(3) Attachment A provides an estimate of neutral temperature based on the measured field gap size, rail size and fastener type.

(4) The rail size is given in terms of a 6" base rail (i.e., for rail sizes above 115# rails) and for 5-1/2" rail (i.e., for 115# and below).

(5) The fastener types are given as EOTA (every other tie anchored) and ETA (every tie anchored).

(6) Concrete tie elastic fasteners, CTEF, and elastic fasteners on wood ties (such as Pandrol type) fall into the ETA category.

(7) The pre-break/pre-cut estimated RNT must be recorded on Form "TD" when making field repairs and kept in a data base by the Operating Railroad for managing subsequent readjustments.

(b) Use of the following tables: **NOTE**

(1) For wood tie tracks 200' from a fixed point (switches, turnouts, crossings, bridges, tunnels, etc.) they **DO NOT apply**. For such the data entry on the Form "TD" should be: ***NA**.

(2) For wood tie tracks between 200' - 400' of a fixed point apply EOTA tables, but data entry Form "TD" should be: ***AP** (for approximate)

(3) Tables for concrete ties and for wood ties with elastic fasteners, apply 200' beyond a fixed point, but **DO NOT apply within 200'**. For the latter, data entry on Form "TD" should be: ***NA**.

(4) For wood or concrete tie tracks where breaks/cuts on the same rail are clustered in close proximity (i.e., within 800' of each other). The data entry on Form "TD" should be: ***NA**.

(5) For iced rail/frozen ballast, tables **DO NOT apply**. For such, data entry on Form "TD" should indicate: ***FB**.

This page intentionally left blank

Table 1a. 6" Base Rail
Wood Tie Track / Every Other Tie Anchored (EOTA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5**	**7**	**7.5**	**8**	**8.5**	**9**
60	84	94	102	109	114	119	124	129	133	137	140	144	147	151	154			
55	79	89	97	104	109	114	119	124	128	132	135	139	142	146	149	152		
50	74	84	92	99	104	109	114	119	123	127	130	134	137	141	144	147	150	153
45	69	79	87	94	99	104	109	114	118	122	125	129	132	136	139	142	145	148
40	64	74	82	89	94	99	104	109	113	117	120	124	127	131	134	137	140	143
35	59	69	77	84	89	94	99	104	108	112	115	119	122	126	129	132	135	138
30	54	64	72	79	84	89	94	99	103	107	110	114	117	121	124	127	130	133
25	49	59	67	74	79	84	89	94	98	102	105	109	112	116	119	122	125	128
20	44	54	62	69	74	79	84	89	93	97	100	104	107	111	114	117	120	123
15	39	49	57	6	69	74	79	84	88	92	95	99	102	106	109	112	115	118
10	34	44	52	59	64	69	74	79	83	87	90	94	97	101	104	107	110	113
5	29	39	47	54	59	64	69	74	78	82	85	89	92	96	99	102	105	108
0	24	34	42	49	54	59	64	69	73	77	80	84	87	91	94	97	100	103
-5	19	29	37	44	49	54	59	64	68	72	75	79	82	86	89	92	95	98
-10	14	24	32	39	44	49	54	59	63	67	70	74	77	81	84	87	90	93
-15	9	19	27	34	39	44	49	54	58	62	65	69	72	76	79	82	85	88
-20	4	14	22	29	34	39	44	49	53	57	60	64	67	71	74	77	80	83
-25	-1	9	17	24	29	34	39	44	48	52	55	59	62	66	69	72	75	78
-30	-6	4	12	19	24	29	34	39	43	47	50	54	57	61	64	67	70	73
-35	-11	-1	7	14	19	24	29	34	38	42	45	49	52	56	59	62	65	68
-40	-15	-6	2	9	14	19	24	29	33	37	40	44	47	51	54	57	60	63
-45	-21	-11	-3	4	9	14	19	24	28	32	35	39	42	46	49	52	55	58
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

Table 1b. 5-1/2" Base Rail
Wood Tie Track / Every Other Tie Anchored (EOTA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5**	**7**	**7.5**	**8**	**8.5**	**9**
60	86	97	106	113	119	125	130	135	139	144	148	152	155					
55	81	92	101	108	114	120	125	130	134	139	143	147	150	154				
50	76	87	96	103	109	115	120	125	129	134	138	142	145	149	153			
45	71	82	91	98	104	110	115	120	124	129	133	137	140	144	148	151		
40	66	77	86	93	99	105	110	115	119	124	128	132	135	139	143	146	149	152
35	61	72	81	88	94	100	105	110	114	119	123	127	130	134	138	141	144	147
30	56	67	76	83	89	95	100	105	109	114	118	122	125	129	133	136	139	142
25	51	62	71	78	84	90	95	100	104	109	113	117	120	124	128	131	134	137
20	46	57	66	73	79	85	90	95	99	104	108	112	115	119	123	126	129	132
15	41	52	61	68	74	80	85	90	94	99	103	107	110	114	118	121	124	127
10	36	47	56	63	69	75	80	85	89	94	98	102	105	109	113	116	119	122
5	31	42	51	58	64	70	75	80	84	89	93	97	100	104	108	111	114	117
0	26	37	46	53	59	65	70	75	79	84	88	92	95	99	103	106	109	112
-5	21	32	41	48	54	60	65	70	74	79	83	87	90	94	98	101	104	107
-10	16	27	36	43	49	55	60	65	69	74	78	82	85	89	93	96	99	102
-15	11	22	31	38	44	50	55	60	64	69	73	77	80	84	88	91	94	97
-20	6	17	26	33	39	45	50	55	59	64	68	72	75	79	83	86	89	92
-25	1	12	21	28	34	40	45	50	54	59	63	67	70	74	78	81	84	87
-30	-4	7	16	23	29	35	40	45	49	54	58	62	65	69	73	76	79	82
-35	-9	2	11	18	24	30	35	40	44	49	53	57	60	64	68	71	74	77
-40	-14	-3	6	13	19	25	30	35	39	44	48	52	55	59	63	66	69	72
-45	-19	-8	1	8	14	20	25	30	34	39	43	47	50	54	58	61	64	67
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

Table 2a. 6" Base Rail
Wood or Concrete Tie Track / Every Tie Anchored (ETA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
60	90	102	111	119	126	133	139	144	149	154	159							
55	85	97	106	114	121	128	134	139	144	149	154	158						
50	80	92	101	109	116	123	129	134	139	144	149	153	157					
45	75	87	96	104	111	118	124	129	134	139	144	148	152	156				
40	70	82	91	99	106	113	119	124	129	134	139	143	147	151	155			
35	65	77	86	94	101	108	114	119	124	129	134	138	142	146	150	154		
30	60	72	81	89	96	103	109	114	119	124	129	133	137	141	145	149	153	
25	55	67	76	84	91	98	104	109	114	119	124	128	132	136	140	144	148	151
20	50	62	71	79	86	93	99	104	109	114	119	123	127	131	135	139	143	146
15	45	57	66	74	81	88	94	99	104	109	114	118	122	126	130	134	138	141
10	40	52	61	69	76	83	89	94	99	104	109	113	117	121	125	129	133	136
5	35	47	56	64	71	78	84	89	94	99	104	108	112	116	120	124	128	131
0	30	42	51	59	66	73	79	84	89	94	99	103	107	111	115	119	123	126
-5	25	37	46	54	61	68	74	79	84	89	94	98	102	106	110	114	118	121
-10	20	32	41	49	56	63	69	74	79	84	89	93	97	101	105	109	113	116
-15	15	27	36	44	51	58	64	69	74	79	84	88	92	96	100	104	108	111
-20	10	22	31	39	46	53	59	64	69	74	79	83	87	91	95	99	103	106
-25	5	17	26	34	41	48	54	59	64	69	74	78	82	86	90	94	98	101
-30	0	12	21	29	36	43	49	54	59	64	69	73	77	81	85	89	93	96
-35	-5	7	16	24	31	38	44	49	54	59	64	68	72	76	80	84	88	91
-40	-10	2	11	19	26	33	39	44	49	54	59	63	67	71	75	79	83	86
-45	-15	-3	6	14	21	28	34	39	44	49	54	58	62	66	70	74	78	81
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

Table 2b. 5-1/2" Base Rail
Wood or Concrete Tie Track / Every Tie Anchored (ETA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
60	92	106	116	125	133	139	146	152										
55	87	101	111	120	128	134	141	147	152									
50	82	96	106	115	123	129	136	142	147	153								
45	77	91	101	110	118	124	131	137	142	148	153							
40	72	86	96	105	113	119	126	132	137	143	148	152						
35	67	81	91	100	108	114	121	127	132	138	143	147	152					
30	62	76	86	95	103	109	116	122	127	133	138	142	147	151				
25	57	71	81	90	98	104	111	117	122	128	133	137	142	146	151			
20	52	66	76	85	93	99	106	112	117	123	128	132	137	141	146	150		
15	47	61	71	80	88	94	101	107	112	118	123	127	132	136	141	145	149	153
10	42	56	66	75	83	89	96	102	107	113	118	122	127	131	136	140	144	148
5	37	51	61	70	78	84	91	97	102	108	113	117	122	126	131	135	139	143
0	32	46	56	65	73	79	86	92	97	103	108	112	117	121	126	130	134	138
-5	27	41	51	60	68	74	81	87	92	98	103	107	112	116	121	125	129	133
-10	22	36	46	55	63	69	76	82	87	93	98	102	107	111	116	120	124	128
-15	17	31	41	50	58	64	71	77	82	88	93	97	102	106	111	115	119	123
-20	12	26	36	45	53	59	66	72	77	83	88	92	97	101	106	110	114	118
-25	7	21	31	40	48	54	61	67	72	78	83	87	92	96	101	105	109	113
-30	2	16	26	35	43	49	56	62	67	73	78	82	87	91	96	100	104	108
-35	-3	11	21	30	38	44	51	57	62	68	73	77	82	86	91	95	99	103
-40	-8	6	16	25	33	39	46	52	57	63	68	72	77	81	86	90	94	98
-45	-13	1	11	20	28	34	41	47	52	58	63	67	72	76	81	85	89	93
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

ATTACHMENT B

RECOMMENDED PROCEDURES FOR DISTRESSING CONTINUOUS WELDED RAIL (CWR) PREVIOUSLY LAID IN TRACK (IN CONFORMANCE WITH SECTION 5.0 REQUIREMENTS)

(a) MassDOT's CWR Policy prescribes distressing requirements for newly installed CWR as per Section 3.0, including a general procedure for distressing rail.

(1) **Attachment B provides more detailed Recommended Procedures for distressing CWR previously laid in track based on current industry best practice guidelines.**

(b) **Definition**: Distressing is the operation of removing (or sometimes adding) rail in CWR to make the longitudinal thermal stress (force) to be zero at a prescribed temperature.

(1) MassDOT's preferred Rail Laying Temperature (RLT) is 105°F.

(c) **Common Distressing Types for Existing CWR in Track:**

(1) There are typically three types, or categories, of distressing which are driven by specific maintenance needs:

(i) **programmed distressing**,

(ii) **reactive or emergency distressing**, and

(iii) **curve distressing**. (Note: although curve distressing can be both programmed and reactive, a separate category is given here due to its general complexity).

(2) **Programmed distressing** is when one or more strings of rail are deemed to be sufficiently below (or above) RLT to warrant rail neutral temperature (RNT) adjustment. When several strings require distressing on MassDOT-owned rail lines, often the out-of-face distressing shall be accomplished by a Contractor working directly for MassDOT Rail and Transit.

(3) **Reactive or emergency distressing** is an imminent action that addresses tight, wavy, kinky rail, and other buckling prone conditions. This type of work on MassDOT-owned rail lines is usually accomplished by the Operating Railroad Personnel.

(4) **Curve distressing** applies to stress adjustments of curves due to cold temperature chording-in or to excessive curve movements resulting from maintenance actions performed when rail is in tension. This type of work on MassDOT-owned rail lines is usually accomplished by Operating Railroad Personnel or by a Contractor working directly for MassDOT Rail and Transit.

(d) **General Guidelines for Programmed Distressing of CWR Strings In Track Up to 1600' In Length.**

(1) **Programmed Distressing may be used for:**

(i) Rail that was laid at colder temperatures sufficiently below a target RNT of 105°F; or

(ii) Rail laid at "hot" temperatures, which exhibits excessive rail movement (running rail); or

(iii) Locations where recent track maintenance (lining, surfacing, lifting, etc.) has lowered RNT below RLT -10°F or 95°F; or

(iv) Locations where the Operating Railroad and/or MassDOT Rail and Transit Division deems it necessary.

(2) The following applies when distressing:

(i) The means, methods, and equipment used when distressing rail shall be approved by MassDOT Rail and Transit or its representative.

(ii) The range of rail temperature at which rail is distressed shall be approved by MassDOT Rail and Transit or its representative.

(iii) Distressing should be scheduled and completed when the ambient temperature provides sufficient heat so that the rail temperature is as near as possible to the target RLT of 105°F; unless approved by MassDOT Rail and Transit.

(iv) **No more than 1,600' of rail may be distressed at any given time (1,600' strings).** This is a continuous 1600' string and/or a 1600' string with a cut or joint in the middle (800'+/- each side of cut and/or joint).

(3) The following preparatory work shall be performed:

(i) Make reference match marks around the existing joint or rail cut location:

- On the base of rail and tie plates on unanchored ties within 10'+/- of the joint and/or cut in the rail; or
- On the left side of the elastic fastener tie plate or the side opposite the drive on elastic fastener or clip within 10'+/- of the joint and/or cut in the rail; and

(ii) When distressing one or more strings, mark the quarter points of the string to be distressed.

(iii) When out-of-face distressing, set offset stakes at the far end of the rail to be distressed to measure any rail panel “pull” back at the end of the CWR string where the rail is cut and/or a joint is located.

(iv) Rail panel “pull back” is often associated with wood tie track anchored on every tie with elastic fasteners or in areas with weak crib ballast.

(v) Rail panel “pull back” movements (inches) shall be measured after:

- The rail has been correctly expanded at the quarter points and at the end by using the ambient temperature, a rail heater and/or a. hydraulic rail puller, and;
- The CWR string has been anchored and/or clipped.

(vi) Rail panel “pull back” measured is the same as ADDING RAIL and the CWR shall have to be unclipped and expanded again to eliminate any pull back when it is finally anchored and clipped before it is finally jointed and/or welded.

(vii) Measured rail end movements away from the joint or cut at the end of the CWR string at the match marks is the same as ADDING RAIL. The CWR shall have to be unclipped and expanded again to eliminate any rail end movement away from the joint and/or cut before the CWR is finally jointed and/or welded.

(viii) The total expansion length required, using the temperature differential, shall be calculated so as to achieve a target RLT of at least 105°F.

(ix) The amount of rail to be expanded when using the temperature differential moved can be determined by using the Report of Rail Clipping/Anchoring, Form “RC” found in Attachment E.

(x) To improve RNT, the total required expansion for any string, shall consist of the following:

- The calculated expansion required from the temperature "differential", and;
- Any measured "rail panel pull back", and;
- Any measured rail end movements away from the joint and/or cut.

(xi) If in compression, the rail shall be cut with a torch (see Paragraph (g) below) and placed in a position that will permit the rail ends to bypass each other, so as to permit the rail to expand freely.

(xii) If in compression, the rail shall be unanchored or unclipped from the cut or joint at the end of the string to be expanded back to the beginning of the string.

(xiii) If the base of rail is caught in the elastic rail fastener plates, the rail shall be raised from the tie plates or tie pads. Place base of rail on risers (spikes and/or rollers) to allow the rail to expand freely; risers shall be placed every 12^{th} to 15^{th} tie (especially in areas of elastic fastener plates). There may be a need to add additional risers at closer intervals on curves.

(xiv) If risers are required, all rail anchors, clips and insulators must be removed and risers placed to ensure the base of the rail is free to move relative to the tie plate and/or tie seat (i.e., stress free).

(xv) If power vibrators are used, it may not be necessary to place the rail on risers in areas of cut spikes and conventional tie plates.

(xvi) Ensure that vibrated rail is totally free to expand/contract longitudinally (i.e., stress free).

(e) **Programmed Distressing: Adjusting Short CWR Lengths (Spot Distressing) Already in Track in Wood and Concrete Tie Territory)**

(1) This method is generally used by the Operating Railroad MW forces to repair a service failure such as a pull-apart, broken rail, or broken weld and to remove a defective rail and/or add a plug rail or by making a cut in CWR.

(2) When distressing short lengths Operating Railroad MW forces generally use the ambient temperature and/or a rail puller to obtain the expansion required.

(3) In this case, the rail to be distressed should be centered, if possible, on an existing joint that can be removed and/or a cut made in the CWR string. Approximately 50% of the area to be distressed should be on either side of the joint and/or cut.

(4) In this case, the rail on either side of the joint and/or cut is expanded towards the rail cut and/or joint location.

(5) The base of the rail and plate should be marked at or within 10' of either side of the joint or cut and then at 50' stations or the quarter points for the full length of the rail to be expanded.

(6) Generally the amount of rail to be expanded on either side of the joint and/or cut is from 195' (380' total) to 390' (780' total). However, longer lengths of CWR, up to 800' (1600' total) may be distressed by this method.

(7) The movement at these stations should be recorded when the joint is removed and/or the rail is cut and recorded on Form "TD."

(8) A rail puller can be used, along with the ambient temperature and/or a heater, to increase the RNT, to at least **RLT -10°F**, when making repairs.

(9) Because of the need to expand rail in two directions, it may be somewhat easier to achieve the required expansion by using the ambient temperature in warmer periods of the year and/or by using a rail puller. A rail heater is more problematic because of the need to have the heater working on both sides of the joint and/or cut and having to move the heater over the joint or cut to expand rail in two directions.

(10) See Attachment C "Recommended Procedures for Adjusting CWR After a Break (Service Failure) or Cut Below the Target RLT (105°F)."

(f) **Programmed Distressing: Adjusting Numerous CWR Strings Out-of-Face Already in Track in Wood and Concrete Tie Territory (Preferred Method)**

(1) This procedure applies to distressing CWR in track as part of programmed maintenance when a length of rail(s) is deemed to be sufficiently below (or above) the target RLT of105°F to warrant RNT readjustment.

(2) The preferred way to expand rail is to heat the rail naturally or with a rail heater. A rail puller may be used when expanding rail to help achieve the required expansion and/or hold the expanded rail in place while installing anchors and/or clips.

(3) The rail to be distressed is usually expanded from the starting point to the end of the string being distressed in one continuous direction.

(4) The maximum length of rail to be distressed at any time in 1600'.

(i) Once a string to be distressed is identified, the end of the string at an existing joint, or a location where the rail is cut, shall have the rail ends mismatched to allow unobstructed movement of the rail string. Then, as the rail is heated naturally by sunlight and/or with a rail heater, the rail is expanded in the direction towards the joint and/or cut.

(ii) Before expanding the rail string, anchors, and/or clips shall be removed starting at the far end of the string at the joint and/or rail cut back to the beginning of the rail string.

(iii) Measure the existing rail temperature and subtract from the target RLT of at least 105°F to determine the temperature differential to be used. See the Report of Rail Clipping/Anchoring (Form "RC") in Attachment E to calculate the total expansion required. The expansion required depends upon the rail temperature differential and total length of the CWR string. The required amount of expansion shall be marked at the one-quarter points on the base of the rail and plates.

(iv) Mark the quarter points on the base of the rail and tie plates of rail strings to be expanded.

(v) Expanding rail continuously in one direction allows MW crews to mark and expand rail at the quarter points and then re-clip rail in a continuous motion from the point of beginning to the end of the string at the joint and/or cut in the CWR.

(vi) Heat (natural or with a rail heater) should be uniformly applied along the string to be distressed until the required expansion has been obtained at the quarter points to include the end of the string at the joint and/or cut rail.

(vii) When using a rail heater, if any quarter point does not have the required expansion, either before or after anchoring/clipping, the string shall have to be reheated. The rail heater will back over the portion that needs to be reheated without applying heat.

(viii) Then the heater shall work towards the end of the string at the joint or rail cut applying heat until the required expansion is obtained.

(ix) Re-clip and/or re-anchor the rail as soon as expansion at the quarter points has been achieved. Clip and/or anchor using the standard anchor patterns given in Section 4.0 "Anchoring of Rail."

(x) The CWR shall not be considered to be distressed until the required expansion at all the quarter points have been realized. When distressing strings of CWR, rail expansion, and not rail temperature, determines if a string of CWR has been distressed.

(xi) A rail puller can be used to hold the required expansion and/or to help get the required expansion. At least 20 ties on the next string to be distressed should be solid box anchored and/or clipped to provide sufficient holing power for the rail puller to hold or pull the string being expanded.

(g) **Torch Cutting CWR in Track**

(1) The preferred method of cutting CWR in compression is with a torch.

(2) Rail shall only be torch cut in an emergency to relieve thermal stress in the rail prior to expanding and then cutting with a rail saw.

(3) Operating Railroad personnel and/or Contractors shall be trained to cut rail with a torch in accordance with their in-house Safety Procedures.

(4) Operating Railroad personnel and/or Contractors shall not cut rail with a torch on MassDOT property unless trained to do so by their respective companies.

(5) A recommended procedure for torch cutting rail in compression is illustrated in Attachment F "Torch Cutting Rail."

(6) Person making torch cut:

(i) Shall stand on opposite side of rail from which it is expected to move when making torch cut.

(ii) In curve if buckle/alignment is on high side of curve; stand on low side of curve.

(iii) In tangent track, stand on side opposite from misalignment or buckle.

(7) Initially, remove anchors only in an area large enough to facilitate the torch cut. Do not remove any additional anchors until the torch cut is made.

(8) Clear personnel from misalignment area when rail is cut as rail/track may move suddenly when compressive stress is relieved by torch cutting.

(9) Additional anchors shall be removed after the rail is torch cut to facilitate the necessary rail expansion movement, the misalignment of rail ends and repair.

(10) If a torch cut rail is to be welded within 15 minutes of cutting, it shall be trimmed back at least 3/8" on each rail end with a saw before welding. **This practice requires the approval of the local MassDOT Rail and Transit Field Representative.**

(11) All torch cut rail ends shall be trimmed back:

(i) At least 2" (AREMA Chapter 4.7.3) and/or;

(ii) Beyond the heat affected zone on either side of the torch cut which will appear as a different color on the web of the rail; or whichever is greater;

(iii) With a rail saw before a field weld is made and/or a joint is applied.

(12) If necessary, in an emergency, to pass a train over a torch cut rail end, before the torch cut ends are trimmed back:

(i) Joint bars may be installed with at least two bolts in each rail end, if possible.

(ii) Each train may be passed over the joint at a maximum of 10F/15P provided the move is under the supervision of a qualified person under FRA §213.217(a)(b)(c)(d).

(h) **Reactive or Emergency Distressing: Cutting Tight Track/CWR in Compression**

(1) If a misalignment (wavy, kinky or nervous rail) is found in track that exceeds values for any class of track found in FRA §213.55, Alinement, take appropriate remedial action per FRA §213.9.

(2) Locate point of maximum misalignment.

(3) Fill out Form "TD" and include rail temperature and alinement deviation/defect as per FRA §213.55.

(4) Select a point to make a torch cut. It may be advisable to cut at a point near, but not exactly at the center of the misalignment where compressive stresses may be the highest.

(5) A recommended procedure for torch cutting rail in compression is illustrated in Attachment F "Torch Cutting Rail." See additional torch cutting information found in (g).

(6) Make repairs in accordance with, "Reactive or Emergency Distressing" (see Example 3).

(i) **Reactive Distressing: Adjusting Tight, Wavy Nervous Rail: Procedures**

(1) Reactive distressing consists of actions taken to address tight, wavy, kinky rail conditions seen in CWR track. Usually tight, wavy, or nervous rail is discovered when the rail temperatures are warm.

(2) Such conditions typically are associated with large reductions in rail temperatures and indicate a possible imminent track buckle.

(3) First establish the length of rail exhibiting the tight, wavy condition (i.e., the length of rail requiring neutral temperature adjustment through distressing).

(4) **The total length for distressing is a recommended minimum of 1.5 times the estimated tight, wavy length (although 2 times is the MassDOT preferred).**

(5) **Note: 400' of unfastening (200' either side of torch cut) is a *minimum* distance.** More length is required if the estimated $L_{distress}$ is longer than **260'**, in which case the unfastening length rule of thumb is:

Unfastening Length = 1.5 x $L_{distress}$

(6) Generally *both* rails should be distressed unless otherwise dictated.

(7) The procedure to follow is as described below.

(i) Estimate the length of the tight, kink, wavy rail segment; locate the midpoint where rail is to be cut.

(ii) Record the length of rail to be distressed (i.e., $L_{distress}$ = _____ ft.).

(iii) Cut rail. (**Note: typically torch cutting is required)** and misalign rail ends.

(iv) Keep cutting rail with rail saw until it stops moving; this may require several cuts.

(v) **After rail stops moving, unfasten rail for minimum required distance on both sides of the cut starting at the cut and working away from the cut.**

(vi) After unfastening CWR, continue cutting rail out until there is no more movement; at this point the rail ends should just be touching.

(vii) Measure and record the rail temperature.

(viii) Refer to MassDOT's preferred RLT (105°F) and compare it with the measured rail temperature to determine the distress *temperature differential*. If the measured rail temperature is *lower* than the RLT, proceed to Form "RC," "Report of Rail Clipping/Anchoring" in Attachment E to determine the additional rail to be removed.

(ix) If the measured rail temperature is *above* RLT, no additional rail needs to be removed, and proceed to next step.

(8) Rail shall be expanded by ambient temperature and/or pulled with a rail puller.

(9) f CWR is cut with a torch, both rails on either side of the torch cut shall have to be cut back at least 2" with a rail saw (see Paragraph (g) above).

(10) A plug rail **shall** have to be added. A minimum 18' plug in tangent track shall be installed.

(11) Rail to be cut out when an 18' plug rail is installed includes:

(i) The length of the plug rail.

(ii) The amount that the rails on either side of the torch cut are to be expanded from Form "RC," "Report of Rail Clipping/Anchoring." See Attachment E.

(iii) An additional 1" allowance for each end of the plug if it is to be field welded (2x1" = 2").

(iv) If installed plug rail is to be jointed and not welded, no additional rail for welding needs to be removed. Comply with FRA §213.119(c).

(v) DO NOT ADD RAIL.

(12) If field welding, add the weld allowance (usually 1") to the CWR rail expansion value and cut out the indicated amount of rail.

(13) Make the weld or install joint bars and reapply rail fasteners or anchors. (Note: some pulling of the rail may be required to close rail to welding gap.)

(14) Record distress temperature differential, distress length, unfastening length, the readjusted RNT, and the amount of rail removed on Form "TD."

(15) Proceed to distress the other rail.

(j) Distressing Curves Procedures:

(1) Curve distressing may be required in curves when curves have chorded in or moved in during cold temperatures or due to heavy maintenance activities in curves such as:

(i) Out-of-face surfacing and aligning of track

(ii) Out-of-face tie installation

(iii) Undercutting of track

(iv) Shoulder ballast cleaning

(2) Heavy maintenance activities performed when CWR is in tension generally makes curve move in and/or chord in.

(3) More specifically, when curves undergo lateral movements due to temperature changes, either naturally or due to maintenance, the result can be substantial changes in neutral temperature which requires readjustment by distressing.

(4) There are two methods of distressing curves: (1) cutting rail out (preferred), and (2) curve realignment out.

(5) Distressing via curve realignment is the easier of the two methods, but requires knowledge of the curve position (i.e., the amount of movement), hence, requires curve staking, monitoring, record keeping, and correct tamper lining management.

(6) Appendix "A" addresses the need to stake curves ≥3°. **At a minimum, curves ≥3° shall be staked when surfacing and aligning when the rail temperature is below 55°F or 50°F below the preferred RLT of 105°F.** See Form "TM," "Report of Track Movement" in Attachment E.

(7) Staking of curves: At a minimum, stake curves ≥3° prior to out-of-face surfacing and lining.

(8) MassDOT Rail and Transit Division may require the staking of curves for other types of work as given in (j) (1).

(9) Place a minimum of three reference stakes uniformly spaced around the curve. Additional stakes may be required due to the overall length of the curve (see Form "TM," Attachment E).

(10) Inspecting for curve movement: Inspect for curve movement periodically after the work, especially during periods of large temperature changes. **Where a curve has been staked and curve has chorded 3" or more (≥3") to the inside, the curve shall be lined out and/or distressed.**

(11) **A temporary speed restriction (TSR) of 40F/40P MPH or less shall be applied if the curve is not lined out or the rail is not distressed when the rail temperature reaches the target RLT of 105°F.** Take additional remedial action as required.

Example 1: Programmed Distressing (spot distressing): It is suspected that a 1,000' section of rail on wood ties with cut spikes and DSC plates and anchors was laid "cold" (well below the territory's RLT), and it needs to be distressed to readjust to RLT = 105°F. The rail is being cut for distressing at a rail temperature of 70°F. How to proceed?

Step 1: Add match marks on both sides and within 10' of the rail to be cut. From these match marks determine the amount of rail moving together when the rail is cut. Place marks at 50' stations for up to 200' on either side of the proposed rail cut to monitor and record rail movement when rail is cut and then when rail is expanded to a RNT of 105°F.

Step 2: Add "witness stakes" in area where rail is to be cut. Measure any panel "pull back" on both sides of rail cut. Panel "pull back," if any in inches, must be added to required rail expansion discussed below. **DO NOT ADD RAIL**

Step 3: For this example assume that the rail is in compression. Cut rail at midpoint with a rail saw if possible and bypass rail ends. If the rail is in compression, torch cutting may be required. If torch cutting is required an 18' plug or larger shall have to be cut in because the minimum cut back with a rail saw on either side of a torch cut is 2" or a minimum of 4" of rail plus the width of the torch cut is removed.

Step 4: For this example assume the rail was able to be cut with a saw. This means that the rail had a neutral temperature just below 70°F.

Step 5: From match marks determine amount of rail moving together.

Step 6: Unfasten 500' in both directions starting from the rail cut and working away from the rail cut. After anchors are removed, tap or vibrate rail and let rail continue to run. Place base of rail on spikes and/or rollers to get rail out of plates if that helps to expand rail. Add spikes and/or rollers starting at joint or cut and working backwards to beginning of string to be expanded.

Step 7: Record total rail movement on Form "TD" at a rail temperature of 70°F.

Step 8: Cut out the excess rail moved together, leaving the rail ends just touching. At this point this unfastened rail has a neutral temperature of 70°F which needs to be raised to RLT=105°F.

Step 9: Check rail temperature and refer to "Report of Rail Clipping/Anchoring," Form "RC" in Attachment E to compute required expansion in inches for a temperature differential of 105°F - 70°F = 35°F and calculate the gap required for two pieces at 500' or; 2 x 1-3/8" = 2-6/8" or 2-3/4".

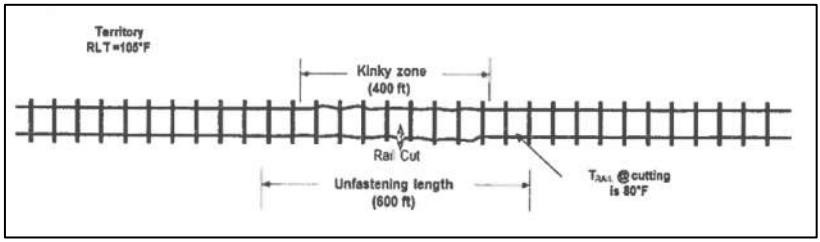
Step 10: Expand rail with ambient temperature and/or rail puller.

Step 11: Cut out the 2-3/4" + 1" for field weld allowance; pull the rail together for the 1" gap, field weld and reapply anchors.

Step 12: Record total amount of rail removed, distressing temperature, temperature differential, and the readjusted neutral temperature on Form "TD."

Step 13: Proceed to distress the other rail.

Example 2: Reactive Distressing: Adjusting Tight, Wavy, Nervous Rail: There is a 400' rail segment exhibiting a wavy/tight rail condition or rail kink. A kink is a formation or a misalignment greater than 1" on track not related to work done by MW Forces. A kink normally occurs when rail temperatures are thought to be high. The territory's RLT is 105°F, and the distressing is done at a rail temperature of 80°F. How to proceed with the distressing?



Step 1: Distress length is 400'; cut rail out with torch at midpoint until no more rail movement.

Step 2: Remove fasteners for 1.5 x kinky zone or 600' (300' on either side of cut note 600' = 1.5 x 400). Start at the torch cut and remove fasteners moving away from the cut. Keep letting rail run until no more rail movement.

Step 3: Measure rail temperature (here 80°F); and compare with RLT = 105°. The temperature differential is 25°F.

Step 4: Here the rail temperature is **lower** than laying temperature; therefore more rail needs to be removed. So rail needs to be expanded. See Form "RC," Attachment E.

Step 5: Proceed to Attachment E to determine additional rail to cut out for a 25°F distress temperature differential and the (2x300') 600' length, this is 1-1/4".

Step 6: Cut out the rail expansion required of 1-1/4" plus the 1" weld allowance if rail is to be field welded.

Step 7: If CWR is torch cut, both rails on either side of the torch cut shall have to be cut back at least 2" with a rail saw. Because only 1-¼" of expansion is required, a plug rail will have to be cut in. A minimum of 18' plug shall be installed in tangent track. Rail to be cut out if an 18' plug rail is installed includes:

- The length of the plug rail.
- The amount that the rails on either side of the torch cut are to be expanded from Form "RC." In this case 2 x 5/8" = 1-1/4" total.

- An additional 1" allowance for each end of the plug if it is to be field welded (2X1" = 2").
- If the plug is to be jointed and not welded, no additional rail other than the plug length and the required expansion amount of 1-¼" needs to be removed. Comply with FRA §213.119(c).
- **DO NOT ADD RAIL.**

Step 8: Expand rails (both sides of torch cut) by the ambient temperature and with a rail heater and/or rail puller, cut in plug rail, reapply anchors or fasteners, make field welds and/or drill rail ends and apply 6 hole joint bars.

Step 9: Record rail temperature (80°F); RLT (105°F); distress length (400'); unfastening length (600') and 1-1/4" rail cut out on Form "RC."

Step 10: Proceed to distress other rail.

ATTACHMENT C

RECOMMENDED PROCEDURES (RPS) FOR READJUSTING/DISTRESSING CONTINUOUS WELDED RAIL (CWR) AFTER A BREAK, PULL-APART (SERVICE FAILURE) OR CUT BELOW THE TARGET RAIL LAYING TEMPERATURE (RLT = 105°F)

(a) **Definitions:**

(1) The "Rail Laying Temperature" (RLT) is the target installation temperature of welded rail for the MassDOT Rail and Transit Division.

(2) For existing CWR in track, when service failures are repaired and cuts in CWR are made by Railroad Operating Companies, the minimum acceptable RLT to be achieved when making repairs and/or cuts is RLT -10°F or 95°F.

(3) All readjustments/distressing of CWR on MassDOT Rail and Transit Division shall be made to achieve a target RLT of at least 105°F.

(4) As per Section 3.0, "Installation and Adjustment of CWR," MassDOT requires rail to be installed at RLT=105°F with construction tolerance of -10 to +10°F (i.e., 95°F to 115°F).

(5) The "Rail Neutral Temperature" (RNT) is the rail temperature at which the net longitudinal force in the rail is zero, and is referred to as rail neutral temperature.

(b) **Overview:**

(1) These procedures address readjusting the RNT under the following conditions:

(i) Service Failures:

- Broken joint bars
- Broken welds/field or plant
- Pull-aparts with broken bolts and bent bolts
- Broken rails
- Defective glued plug insulated joint rails

(ii) Rail defect or rail removals (cutting rail).

(iii) Cutting rails and installing plug rails.

(2) Rail that has pulled apart, broken, or been cut for defect removal must be readjusted to the RLT -10 safe range prior to rail temperatures exceeding those outlined in Table 1 below.

Table 1. Temperature When CWR (RNT) Must be Adjusted or Speed Restrictions Applied For Rail Breaks on One Rail Only

Rail Temperature (°F) at Which Rail Break or Cut Occurred	Rail Temperature (°F) at Which to Readjust or Apply Temporary Speed Restriction (TSR)
60	110*
50	110*
40	110*
30	110*
20	110*
10	110*
0	105*
-10	100*
-20	95*
-30	90*
*Table based on FRA/RSAC, but modified for MassDOT Rail and Transit Division requirements.	

Note: For the special case where both rails break and/or are cut within 200' of each other and when both rail's readjustment and permanent repairs are deferred to warm temperatures, the following formula shall apply:

T Return = (T RB1 + T RB2)/ 2 +70°F, and T Return shall not exceed 110°F.

(As an example, rail 1 breaks at 10°F, and rail 2 at 30° F, the return temperature is 90°F, and NOT as would be individually designated by Table 1)

(3) If rail RNT has not been adjusted prior to rail return temperatures exceeding the values in Table 1:

(i) **A temporary speed restriction (TSR) of not more than 25F/25P MPH shall be applied**, or

(ii) A temporary speed restriction of not more than 40F/40P MPH can be applied when a mandatory daily inspection is conducted during the heat of the day.

(iii) **If rail return temperatures do not exceed Table 1 values, the RNT shall be readjusted within 365 days.**

(4) The following data must be recorded on Form "TD" at the time of the break, pull-apart, and/or cut:

(i) Rail temperature at the time of the pull-apart/break/cut,

(ii) Gap size (as measured within ± 1/32"),

(iii) Rail size,

(iv) Tie type (wood or concrete),

(v) Anchor/fastener type (anchors or elastic fasteners); and the condition as described by "weak", "average", and "strong" as described below:

- Weak: missing anchors; the majority are not tight against the ties; evidence of rail slipping or moving longitudinally through anchors/clips;

crib ballast more than 2" below the tops of the ties; poor tie condition; more than half of the tie insulators are cracked, broken or not seated in the shoulder; tie pads are slipping or deteriorated; evidence of rail seat abrasion.

- Average: anchors are in place and tight against the ties; no evidence of rail creep; tie condition is good; full ballast section; most insulators are sound and seated correctly; tie pads are not worn or moving in the rail seat; no evidence of rail seat abrasion.
- Strong: new construction or relay rail with new anchors or fasteners; full ballast section and well consolidated AND which do not exhibit any of the "weak" or "average" characteristics.

(vi) The anchor pattern (every tie versus every other tie), and

(vii) If any "special conditions" apply* (see (5) below).

(5) Attachment A tables for the determination of pre-break/cut RNTs, do not apply for "special conditions" which are defined as:

(i) Breaks/cuts clustered in "close" proximity to each other on the same rail (i.e., within 800' of each other);

(ii) Breaks/cuts are within 400' of a "fixed" point; or

(iii) Breaks/cuts in iced rail/frozen ballast conditions.

(6) Use the tables in Attachment A to determine the pre-break/cut RNT, but note special conditions and/or exclusions (as above). Table 2 provides a guide as to the information found and where it is located in Attachment A (see below):

Table 2. Attachment A Table Use

Rail Base Size	Rail Weight	Anchorage Type	Attachment A Table to Use
6"	136/132	Every other tie anchored	1A
5-1/2"	115/100	Every other tie anchored	1B
6"	136/132	Every tie anchored*	2A*
5-1/2"	115/100	Every tie anchored*	2B*
* Use for concrete ties, and for wood ties with elastic fasteners.			

(7) 6" base rail found in Attachment A is currently the standard rail being purchased and installed by the MassDOT Rail and Transit Division.

(8) 5-½" base rail found in Attachment A was laid on MassDOT Rail and Transit owned rail lines and is still in track.

(c) **Procedures Used to Readjust Rail When A Service Failure Occurs and/or CWR Is Cut**

(1) The procedures used to readjust rail after a break or cut vary based upon Table 3's summary below.

Table 3 – RNT Readjustment Procedures Summary

APPLICATION	DESCRIPTION
Attachment A + Tables 1 & 2	Evaluation of pre-break/cut RNTs and return temperatures for adjustment. Results are required inputs Scenarios 1-3.
Scenario 1a	RNT readjustment procedure when repairing broken/defect cut rail when it can be performed at the time of break/cut. Such requires a pre-break/cut RNT in the RLT-10 range thus allowing rails to be pulled together through anchors and fasteners for an RNT restoration to RLT-10
Scenario 1b	Same as 1a, but when additional rail removal is required for readjustment, and when rail is pullable through anchors/fasteners. This Scenario provides additional rail removal required for RNT restoration to RLT-10
Scenario 2	Procedure for readjusting RNT after rail break/defect cut when interim repairs are required (such rail addition via plug) and when RNT readjustment are deferred for a later time as per Table 1 at which time conventional destressing of 780 ft of rail is required to RLT
Scenario 3	Readjustment procedure for special cases when Attachment A is NOT applicable. These include: (a) Multiple breaks on same rail within close proximity (800 ft) of each other (b) Breaks/cuts within 400 ft of fixed points (bridges, tunnels, crossings, switches/turnouts, etc.) (c) Extremely stiff, frozen rail/ballast conditions

Notes: (i) if for any reason in 1a or 1b the rail gap to be closed for adjustment is NOT pullable through anchors/fasteners, revert to Scenario 2, (ii) Scenario 3's (a) and (b) reverts to Scenario 2, and (iii) Scenario3's (c) is as indicated in Table 5

(2) **Scenario 1a: Breaks or cuts occurring when the pre-break/neutral temperature was within the RLT -10°F range when a permanent repair is possible**. Repairs can be made at the time of the break/cut by pulling rail ends together with a rail puller without any removal of anchors or clips. Attachment A is used to determine existing and final (repaired) RNT.

(3) **Scenario 1b: Breaks or cuts occurring when the pre-break/cut neutral temperature was below the RLT -10°F range when a permanent repair is possible by cutting additional rail out**. Repairs can be made at the time of the break/cut by pulling rail ends together with a rail puller without any removal of anchors or clips. Attachment A is used to determine extra rail to cut out, and existing and final (repaired) RNT. If repairs cannot be made by pulling, then see Scenario 2 under (4).

(4) **Scenario 2: Breaks or cuts occurring, when permanent repairs cannot be made at the time of the break/cut.** If a plug is added (RAIL IS ADDED), or the rail pulled together and bolted as an interim repair, then permanent repairs or adjustments to the RNT shall be made before reaching the rail return temperature in Table 1, and by distressing 780' of rail.

Note that under this Scenario:

(i) the readjustment here is to RLT (and NOT to RLT-10), and

(ii) the potential benefit of the single joint interim repair approach versus the plug rail (i.e., offering the 1 weld vs. 2 welds later upon readjustment), and

(iii) the interim benefit of rail pulled together approach's resetting reduced RNT to the pre-break value.

(5) **Scenario 3: For "Special Cases"** where breaks or cuts occur:

(i) in close proximity on the same rail, or;

(ii) near fixed structures, or;

(iii) in extremely stiff or frozen rail/ballast conditions.

NOTES:

(a) **IN THE ABOVE CASES, TABLES IN ATTACHMENT "A" DO NOT APPLY (I.E. PRE-BREAK/CUT RNTs CANNOT BE DETERMINED.)**

(b) **SCENARIO 3 ADJUSTMENT OF RLT IS AS GIVEN IN SCENARIO 2 (I.E. REQUIRING RETURN TEMPERATURES AS PER TABLE 1, AND UNFASTENING/DISTRESSING 390' OF RAIL ON EITHER SIDE OF THE BREAK/CUT, OR 780' TOTAL, WITH THE EXCEPTION OF (iii) WHICH ADOPTS TABLE 5 FOR DISTRESS LENGTHS). SEE BELOW.**

(d) **Recommended Procedures to Readjust Rail RNT.** The procedures used to readjust rail after a break and/or service failure or cut are given below for the above Scenarios:

(1) **Scenario 1a: Single Break/Cut Occurred when the RNT was Within 10° of the RLT (105°-10=95°F), when a permanent repair is possible at the time of break/cut. Note the following:**

(i) Rail can be pulled together through the anchors or fasteners and the gap can be closed. A minimal amount of anchors are removed around the service failure and/or at the cut in CWR.

(ii) Permanent repair is made when service failure is discovered or CWR is cut.

(iii) RNT is restored to within the range of RLT -10°F.

(iv) No rail is added.

(v) No additional repairs are required (except for repositioning displaced anchors/fasteners resulting from rail pulling).

(vi) Following are the steps to be followed when making a repair:

- Step 1: Obtain the rail temperature at the time of the break/cut, gap size, rail size, tie type (wood or concrete), anchor/fastener type, and the anchor pattern (every tie versus every other tie) and record on Form "TD."
- Step 2: Use Table 2 above to determine which table in Attachment A should be used to determine the pre-break/cut RNT.
- Step 3: determine if the pre-break/cut temperature is within 10°F of the RLT. If so, proceed to Step 5.
- Step 4: If not, proceed to Scenario 1b or 2 depending upon the conditions.
- Step 5: No adjustment is required for breaks or cuts that occurred when the pre-break/cut RNT was within the RLT -10°F. The gap can be closed using the following procedures:
  - Remove a limited number of anchors or fasteners (~5-10 ties) either side of the break/cut (to facilitate an easier rail pull).
  - Cut 1" for the weld allowance if the rail ends are to be welded.

- Use a rail puller to close the gap or to leave the 1" weld allowance. If the gap closes, apply joint bars or make the weld and record all pertinent data.
- If the gap does not close, close the gap by adding a plug rail. Record the gap size, temperature, and the rail added, and return later to readjust using Scenario (2).
- After applying joint bars or making the weld, record the gap size, pre-break/cut RNT, the restored RNT and rail temperature on Form "TD." Permanent repairs at the service failure, break and/or cut location shall be made within 30 days in accordance with FRA §213.119(c)(3).
- If working in a curve, proceed to check alignment to be sure rail has not chorded in after pulling rail with a rail puller. Realign if necessary.

(vii) Above procedure requires pulling rail through the anchors or fasteners; hence, needing sufficient puller/tensor capacity especially in concrete tie track or on wood ties with elastic fasteners. If puller capacity is not adequate or puller is not available, use procedures in Scenario 2

(viii) MassDOT Rail and Transit Division requires that all permanent repairs that can be made immediately (Scenario 1), be accomplished by adjusting RNT to at least RLT -10°F or 95°F.

(ix) ILLUSTRATIVE EXAMPLE OF SCENARIO 1a:

Consider a rail break or defect removal on wood tie, every other tie anchored (EOTA) 136# rail segment, when the rail broke/cut at 40°F, and the resulting gap size is 3 inches. How to make the repair/readjustment?

ANSWER: from Table 1a (ATTACHMENT "A") the pre-break cut RNT is: 99°F. This is within MassDOT's RLT-10 safe range (i.e. within 105 – 10), hence a candidate for Scenario 1a! After cutting an extra inch for the weld allowance, close the gap to the 1" weld gap via rail puller (without any anchor removal), and proceed to make the weld. Record all pertinent data, and be sure to reposition any moved/displaced anchors. Then the readjusted RNT here is 99°F.

Note: if for any reason the rail could not be pulled together, proceed to make an interim repair via a plug rail requiring adding 3" of rail, and then apply Scenario 2 to readjust before rail temperature exceed 110°F (as per Table 1)

(2) **Scenario 1b: Single Break/Cut RNT is below the RLT -10°F Range (<95°F), when a permanent repair is still possible. Note the following:**

(i) This is a modification of Scenario 1a as it requires more rail to be cut out to compensate for the RNT being below RLT -10°F. As such, this requires pulling rail together through "*larger*" gaps. The gap now consists of the sum of present break/cut gap, and the additional rail removal required to compensate for pre-break/cut RLT being below RLT -10°F as well as the 1" weld allowance if field welding. The **Required Steps When RNT is below RLT -10°F Range (<95°F):**

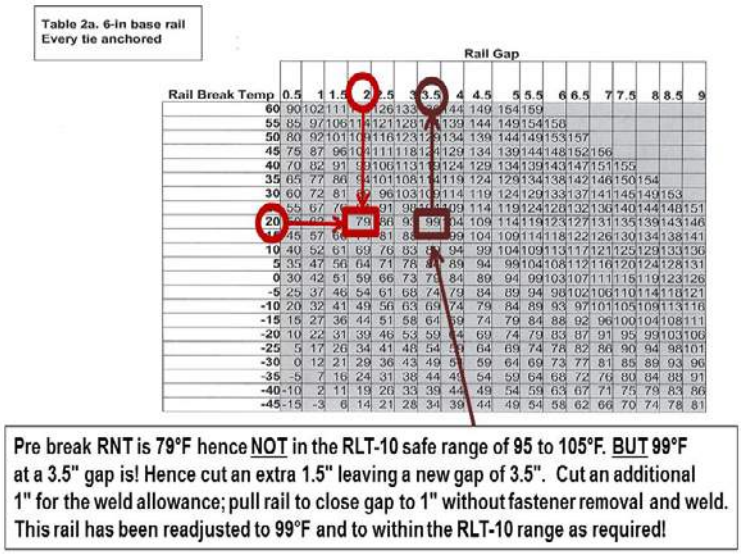
- Step 1: Measure/record the rail temperature at the time of the break/cut, gap size, rail size, tie type (wood or concrete), anchor/fastener type, and the anchor pattern (every tie versus every other tie) and record on Form "TD."

- Step 2: Use Table 2 information to choose appropriate table in Attachment A to determine the pre-break/cut RNT.
- Step 3: Determine if the pre-break/cut temperature is below the RLT -10°F. If so proceed to Step 4. If above the RLT -10°F range, proceed to Scenario 1a depending on the conditions and schedule readjustments in compliance with the rail return temperature in Table 1. **Step 4: Use the selected table in Attachment A to determine the *additional* amount of rail to cut out to readjust to at least 95°F.** Add this amount rail to be removed to the existing gap size plus the 1" weld allowance, if a weld is to be made. This is known as the final pull-gap amount (i.e., FG.).
- Step 5: Determine if FG is *pullable,* with the rail puller on site, to the 1" gap required for welding or closing the gap if joint bars are to be added, remembering that rail is to be pulled through the anchors/fasteners without removal. If gap is pullable, proceed to Step 6.
- Step 6: Cut out additional rail required for expansion and closing the joint by adding joint bars or by field welding. Pull rail through the anchors to close the gap for joint bars and/or leave 1" to close with a field weld.
- Step 7: If required gap cannot be closed, there are two possible temporary repairs. They are:
  - Only close the gap that was found in the field when the rail broke and/or was cut. The RNT will be the existing RNT when the rail broke and/or was cut as determined from Attachment A. Return to make permanent repair in accordance with Scenario 2 and Step 8.
  - If initial gap observed when rail broke and/or was cut cannot be closed, add rail by installing a plug rail. The RNT will be the existing rail temperature when the rail broke and/or was cut. Return to make permanent repair in accordance with Scenario 2.
- Step 8 After making permanent repairs as in Step 6, inspect fasteners and readjust (reposition anchors) where necessary so they are tight against the tie.
- Step 9: If working in a curve, proceed to check the alignment to determine if the rail has chorded in. Realign if necessary and or take appropriate remedial action.

(3) ILLUSTRATIVE EXAMPLE OF SCENARIO 1b:

Consider a 136# rail is cut for a defect removal at a rail temperature of 20°F in an every tie fastened rail segment resulting in a rail gap of 2". The territory's designated laying temperature is 105°F. How to make readjustment in line with the RLT-10 criterion at the time of defect cut?

Answer: apply Scenario 1b (as illustrated below)



Pre break RNT is 79°F hence NOT in the RLT-10 safe range of 95 to 105°F. BUT 99°F at a 3.5" gap is! Hence cut an extra 1.5" leaving a new gap of 3.5". Cut an additional 1" for the weld allowance; pull rail to close gap to 1" without fastener removal and weld. This rail has been readjusted to 99°F and to within the RLT-10 range as required!

(e) **Procedures to Readjust Rail RNT for Scenario 2**

(1) Scenario 2: Breaks or cuts occurring when permanent repairs cannot be made at the time of the break/cut. If a plug is added as an interim fix, then permanent repairs or adjustments to the RNT shall be made before reaching the rail return temperature in Table 1.

(i) Step 1: Use Attachment A Tables to document pre-break RNTs.

(ii) Step (2): **If a plug rail is cut in, record the amount of rail added on Form "TD."**

(iii) Step (3): A special requirement of Scenario 2 is to distress by removing anchors or clips on 390' of CWR on both sides of plug or joint (for a total of 780') when returning for repair, and readjusting to RLT of 105 **°F** (and not to RLT-10)

(2) ILLUSTRATIVE EXAMPLE OF SCENARIO 2:

***Example**: a 136# rail is cut for a defect removal at a rail temperature of 20°F in a concrete tie territory resulting in a rail gap of 2". The territory's designated laying temperature is 105°F. Scenario 1b was attempted but the rail could not be pulled together to close the 3.5"gap (see example above). How to proceed?*

***ANSWER:** follow Scenario 2 (with Options 1 or 2 below):*

OPTION 1 - in case rail could not be pulled together to close the 3.5" gap, the procedure is to apply Scenario 2. This requires recording/documenting all pertinent data, and making interim plug repair of adding 2" of rail and applying Table 1 to establish return temperature for adjustment (i.e. in this case prior to rail temperatures exceeding 110°F). Return at or prior to this rail temperature and make adjustment as per Scenario 2 which requires adjustment by destressing via unfastening ± 390 ft of rail (total of 780 ft).

OPTION 2 - instead of making interim plug repair of adding 2" of rail as per above, consider pulling rail together through the 2" gap (without unfastening) and closing rail via bolted joint. This restores RNT to 79°F. It is still required to return for a later adjustment, but Table 1 doesn't apply anymore in this case, hence more flexibility on when to return for the final adjustment. The required unfastening length is still ±390ft (780ft total).

Note: Option 2 has the benefit of some immediate *partial RNT restoration* (thereby offering some interim safety against a buckling potential during the onset of warm temperatures), and an easier final adjustment of requiring one weld versus two.

(f) **Procedures to Readjust Rail RNT for Scenario 3 (Special Cases) when:**

(1) Case 1: Multiple breaks/cuts occurring in "close" proximity on the same rail (i.e., within 800' of each other).

(2) Case 2: Breaks/cuts within 400' of "fixed structures/locations."

(3) Case 3: Breaks/cuts in iced rail/frozen ballast conditions.

(4) Case 4: Where the break/cut occurs on both rails within 200' of each other.

(5) For detailed readjustment procedure for Special Cases 1 and 2 above refer to conventional distressing procedure and application of Scenario 2 as in (e) above, requiring the adjustment of 780' of rail and cutting rail out as dictated by the temperature differential (TD).

(6) Use Table 4 below with the caveat that additional rail removal may be required if the end points at ±390 are measured to be moving in when applying the rail puller to close the gap.

Table 4. Special Cases: Additional Rail to Remove for Readjustment for the 780' of Unfastening Length

Temperature Differential (°F)*	Additional Rail to Remove (inches)
5	1/4
10	1/2
15	1
20	1-1/4
25	1-1/2
30	1-3/4
35	2-1/4
40	2-1/2
45	2-3/4
50	3-1/4
55	3-1/2
60	3-3/4
65	4
70	4-1/2
*MassDOT Rail and Transit Division Preferred Rail Laying Temperature (RLT=105°F)	

Note: The above procedures for Scenario 2 and Scenario 3"s Special Cases 1 and 2 are based on best practice engineering assumption, that for **all** rail break/defect cut/pull-apart cases, **one** unfastening length of 390' on either side of the cut/break is adequate for readjustments. Although some break/cut influence zones can be longer, hence requiring longer unfastening lengths, the 780' total length is an acceptable "best practice" compromise. For "*bad*" breaks (i.e., break gaps exceeding 3"), longer unfastening lengths are recommended. Additionally, note that the above Scenario 2 procedure readjusts to RLT instead of the RLT -10°F value! This is for "added safety" to counteract the "*one unfastening length of ± 390' satisfying all break/cut influence zone"* assumption.

(g) **Procedures to Readjust Rail RNT Scenario 3:** For Special Case 3 (breaks/cuts in frozen rail/ballast conditions):

(1) Apply Scenario 2 as per (e) above; however, the recommended unfastening lengths are reduced as per Table 5 below.

(2) Use Form "RC" in Attachment E to calculate the required expansion amounts that correspond to the unfastening lengths given in Table 5.

Table 5. Unfastening Lengths for Frozen Ballast Conditions

Measured Gap Size (in) when Broke/Cut	Unfastening Length (ft) in Each Direction
<1/2	100
½ - 1	150
>1	200

(h) **Procedures to Readjust Rail RNT Scenario 3:** For Special Case 4 where the break/cut occurs on both rails within 200' of each other.

(1) Use Scenarios 1-3 as applicable for rail breaks on each individual rail.

(2) The return/readjustment time (return rail temperature) given in Table 1 is not applicable for this Special Case 4 when both rails have breaks in close proximity (within 200' of each other).

(3) The following formula must be used to determine the "return rail temperature."

$$T_{RETURN} = (T_{RB_1} + T_{RB_2})/2 + 70°F$$

Where T_{RB1} is the rail break temperature of one rail, and T_{RB2} is the rail break temperature of the other (opposite) rail.

(4) Example: One rail breaks or is cut for defect removal at 10°F and left for a later adjustment in line with Scenarios 2 or 3. The other rail breaks or is cut later at 30°F which is also deferred for later return adjustment. If both repairs were not made at the time of the rail break and/or cut, but were deferred to at a later date, then the return temperature is at/below a rail temperature of 90°F. The calculation is shown below:

T_{RETURN} = (10°F +30°F)/2 + $70°F$ or 20°F+70°F = 90°F

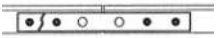
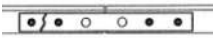
Note that this is a lower return temperature than either individual breaks/cut temperature given by Table 1.

This page intentionally left blank

ATTACHMENT D

JOINT DEFECT GUIDELINES / MAXIMUM ALLOWABLE TEMPORARY SPEED RESTRICTIONS (TSR's)

Joint Defect Guidelines in CWR Track

Condition	FRA Part 213 Reference	Illustration****	Action
One Broken Joint Bar Not Between Middle Holes	§213.121(b) §213.121(e)		10F/15P MPH* (per FRA §213.9(b))
One Broken Joint Bar Between Middle Holes	§213.121(c)		Out of Service until Repaired (per FRA §213.9(b)) and Visually Supervise**
Both Joint Bars Broken Not Between Middle Holes	§213.121(b) §213.121(e)		10F/15P MPH* (per FRA §213.9(b))
Both Joint Bars Broken Between Middle Holes	§213.121(c)		Out of Service until Repaired (per FRA §213.9(b))and Visually Supervise**
Less than Two Bolts in Rail End	§213.121(e)		10F/15P MPH* (per FRA §213.9(b))
Unbolted Rail End Pulled Apart 1-1/2" - 2"	§213.121(e)		Inspect (per FRA §213.9(b)) Repair within 24 hrs.
Unbolted Rail End Pulled Apart 2" - 4"	§213.121(e)		Visually Supervise** Must maintain continuous communications w/train crew (per FRA §213.9(b)) Repair within 24 hrs.
Unbolted Rail End Pulled Apart >4"	§213.121(e)		Out of Service until Repaired

Notes:

* All speeds shown are maximum allowable. Qualified employees may impose more stringent remedial action (FRA §231.7(a)(b)(c)(d)), depending on the presence of a combination of defects or particular site conditions.

** "Visually supervise" means that an employee qualified under FRA §213.7(a)(b)(c) must observe each operation over the defect and/or in accordance with FRA §213.7(d).

*** Solid circle is bolt hole with bolt. Open circle is bolt hole without bolt.

**** Track surface and joint tie conditions shall be considered when determining temporary slow order (TSO) maximum speeds.

This page intentionally left blank

ATTACHMENT E

PREPARATION OF FORMS

This page intentionally left blank

FORM "TD"
REPORT OF DISTURBANCE OF CWR TRACK

Part A: CWR Track Disturbance Due to Track Work					
Route:		**Date:**		**Rail Temp**	**Time:**
M.P. Location From:		**To:**		**Track No:**	
Type of Work Performed:					
Additional Repairs Required:					
Remedial Action Required:					
Part B: Rail Cut Or Service Failure in CWR Territory					
Route:		**Date:**		**Rail: North / South / East / West**	
M.P. Location From:		**To:**		**Track No:**	
Type of Work Performed:					
Additional Repairs Required:					
Remedial Action Required:					
Operating Railroad Employee (Print):					
Operating Railroad Employee (Signature):					

ATTACHMENT E

**INSTRUCTIONS FOR PREPARATION OF THE
REPORT OF DISTURBANCE OF CWR TRACK (FORM "TD")**

A report of disturbed track , Form "TD", shall be made out as required by Section 10.0. The report will be completed and signed by the Contractor/Operating Railroad Employee in charge of the work as follows:

Part A - This part will be completed in its entirety any time heavy maintenance work is performed on CWR track. See Section 6.0, "Trackwork that Disturbs CWR Track and the Protection of Disturbed Track" for the information required on Form "TD", Part A.

Part B - This part will be completed any time main track CWR is cut or broken and/or there is a service failure.

A. See Section 5.0, "Maintenance of the Desired Rail Neutral Temperature in Previously Installed CWR" for the information required on Form "TD", Part B.

B. See Attachment C, "Recommended Procedures for Readjusting Continuous Welded Rail (CWR), After a Break, Pull-Apart (Service Failure) or Cut Below the Target Rail Laying Temperature (105°F)" for the information required on Form "TD", Part B.

C. See Attachment A, "Determination of Estimate of Pre-Break/Pre-Cut Neutral Temperature for a Service Failure in CWR" for the information required on Form "TD", Part B.

Parts A & B

A. Form "TD" shall be filled out in accordance with Section 10.0, "Reporting Requirements for CWR Track."

B. Form "TD" shall be filled out and kept by the Operating Railroad in accordance with Section 11.0, "Record Keeping."

FORM "TM"
REPORT OF TRACK MOVEMENT: CURVES ≥3°

Route:		**Type of Work Performed*:**	**Surfacing ☐ Install Ties ☐**	**Date of Work:**	
M.P. Location :	**From:**		**To:**	**Track No:**	
Curve No:		**Degree of Curve:**		**Elevation:**	
Rail Temperature at which Surfacing Tie Installation was Done:					

Distance from Reference
(Reference Points Must be no Further than 200 ft. apart):

Reference Point Number	Location of Reference Point	Before Work	After Work	Movement	Within 7 Days	Movement
TS (Tangent to Spiral Tag)						
SC (Spiral to Curve Full Body Tag)						
Additional Full Body Tag As Required**						
Additional Full Body Tag As Required**						
CS (Curve to Spiral Full Body Tag)						
ST (Spiral to Tangent Tag)						
Uniform Movement	----------	----------				

***Types of work that requires a Form "TD." Out-of-face surfacing and alinement and installing more than 540 ties per mile.**

Railroad Employee Making Measurements (Print Name): _____

Railroad Employee Making Measurements (Signature): _____

Railroad Employee in Charge of Surfacing (Print Name): _____

Railroad Employee in Charge of Surfacing (Signature): _____

**Use additional sheets if the number of stations exceeds the number of lines.

ATTACHMENT E

INSTRUCTIONS FOR PREPARATION OF THE REPORT OF TRACK MOVEMENT DUE TO SURFACING OR OUT-OF-FACE TIE RENEWAL (FORM "TM")

(a) In curves of 3° or over, prior to the start of high speed surfacing, or installing more than 540 ties per mile, the Operating Railroad and/or Contractor shall set reference points each curve at the locations given on Form "TM" along the gage side of the high rail of the curve.

In no case may the points be more than 200' apart.

(1) In no case will the points be more than 200' apart.

(2) In addition, offset stakes shall be set at each of the reference mark locations. These stakes will be set to the outside (high side) of the track, and out of the way of regulators or other equipment.

(3) In multiple track locations, a mark on the high rail or a tack in a tie on an adjacent and/or parallel track, may be used as an offset location.

(4) Adjacent and/or parallel tracks may be used for offset locations only if the track is not to be disturbed or will have any maintenance work performed when it is being used as for offset locations.

(5) Initial measurements shall be made from the reference points to the offset locations before any heavy maintenance work (The "Work") is performed and shall be recorded on Form "TM".

(b) Immediately after completion of the Work, the Operating Railroad Employee in charge of the track surfacing or tie installation will again measure and record the distances from the reference point to the offset locations. Both the distances and any movement shall be recorded on Form "TM".

(c) Within seven days after the Work, the Operating Railroad will again measure and record the distance from the reference point to the offset locations. Again, both distances and movement shall be recorded on Form "TM".

(d) If the curve has moved and/or chorded in at any location is 3" or more (≥3"), the curve shall be distressed by lining out and/or distressing the rail prior.

(e) The lining out of the curve and/or distressing of the curve shall be accomplished before:

(1) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division and; or

(2) If the ambient temperature and/or rail temperature is less than 40°F, all work will be suspended unless it is an emergency or directed by the MassDOT Field Representative.

(f) **Temporary Speed Restriction:** A temporary speed restriction (TSR) shall be placed if the curve has moved inward 3" or more in accordance with Section 6(e), until the curve is lined out and/or distressed. The curve will be considered to have lost its neutral temperature if movement is recorded as given below:

Curves 3° and Over	Measured Curve Movement that Requires Lining Out the Curve and/or Distressing the Rail
	3" or greater (≥3") to the inside

FORM "JE"
REPORT OF JOINT ELIMINATION BY FIELD WELDING
THERMITE (T) / FLASH BUTT (FB)

Track Name/No.	Rail (N/S/E/W)	MP	Rail Weight	Date/ Weld No.	Field Weld Type(2)	Mold Date	Portion Date	Weld Company/ Welder's Name	Weather/ Rail Temp °F	Rail Cut Out / or Consumed and/or Added (Inches)	Remarks	Weld Inspections			Results
												Date Inspected	Inspection Company	Test Results	

Notes:
(1) Reason for weld:
EJ – Eliminate Joint
EPR – Eliminate Plug Rail
EDW – Eliminate Defective Weld
RNT – Increase Rail Neutral Temperature
(2) Field Weld Types:
T – Thermite
FB – Flash butt
(3) A Form "TD" shall be made out when rail is cut and/or broken.

Operating Railroad Contractor's Signature: _____ **Date:** _____

Operating Railroad Contractor's Name (Print): _____

ATTACHMENT E

INSTRUCTIONS FOR THE PREPARATION OF THE REPORT OF JOINT ELIMINATION BY FIELD WELDING (FORM "JE")

(a) A Report of Joint Elimination by Field Welding shall be made out as required in Section 10.0. The report shall be completed by the Contractor/Operating Railroad Employee in charge of the work.

FORM "RC"
REPORT OF RAIL CLIPPING/ANCHORING

Operating Railroad/Contractor:	**Weather:**
Line Segment:	**Copy sent to MassDOT Rail and Transit Division (Yes/No)"**

Date	Rail[6]	String Number	Start MP	End MP	String Length (Feet)	Rail Temp (°F)[(1)]	Required Temp. Change (°F)[(2)]	Required Expansion (Inches)[(3)]	Method of Expansion[(5)]	String Vibrated (Y/N)	Time Started/ Finished Clipping	Actual Expansion Recorded (Inches) Obtained at ¼ Points[(4)]				Notes
												1/4	1/2	3/4	Full	

Notes:
(1) Temperature to be measured with approved rail thermometer.
(2) Required temperature change in °F is preferred RNT of 105°F minus the actual rail temperature at the time of expansion.
(3) See formula and table on reverse side of Form.
(4) After string is anchored and/or clipped.
(5) Method of Expansion: Natural (N); Rail Heater (RH); Rail Puller (RP); Cooled (C).
(6) Rail locations" N, S, E, W

Operating Railroad Contractor's Signature: _____ **Date:** _____

Operating Railroad Contractor's Name (Print): _____

ATTACHMENT E

INSTRUCTIONS FOR THE PREPARATION OF THE REPORT OF RAIL CLIPPING/ANCHORING (FORM "RC")

Formula for Coefficient of Linear Expansion of Rail:

$A = 0.000078 \times (T_D - T_E) \times L$

A	=	Adjustment or Required Expansion amount for rail string (in inches)
T_D	=	Desired RNT which should be 105°F if possible as conditions permit
T_E	=	Existing or Actual Rail Temperature (°F) prior to heating or expansion measured with an approved rail thermometer
L	=	Length of string to be adjusted (in feet)

Calculations:

Change In Rail Length Due to Change In Rail Temperature

A = Change In Rail Length In Inches = 0.000078ΔT x L
L = Length of Rail to be Expanded in Feet
ΔT = Change in Temperature in Degrees Fahrenheit: Desired RNT minus Actual Rail Temperature

Length of Rail (ft)	Change in Temperature in Degrees Fahrenheit															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Change in Rail Length in Inches															
100	1/8	1/8	1/8	1/4	1/4	1/4	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8	5/8	5/8
200	1/8	1/4	1/4	3/8	1/2	1/2	5/8	5/8	3/4	7/8	7/8	1	1-1/8	1-1/8	1-1/4	1-1/4
300	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8	1-7/8
400	1/4	3/8	1/2	5/8	7/8	1	1-1/8	1-1/4	1-1/2	1-5/8	1-3/4	1-7/8	2-1/8	2-1/4	2-3/8	2-1/2
500	1/4	1/2	5/8	7/8	1	1-1/4	1-3/8	1-5/8	1-7/8	2	2-1/4	2-3/8	2-5/8	2-3/4	3	3-1/8
600	1/4	1/2	3/4	1	1-1/4	1-1/2	1-3/4	1-7/8	2-1/8	2-3/8	2-5/8	2-7/8	3-1/8	3-3/8	3-5/8	3-3/4
700	3/8	5/8	7/8	1-1/8	1-3/8	1-3/4	2	2-1/4	2-1/2	2-3/4	3-1/8	3-3/8	3-5/8	3-7/8	4-1/8	4-3/8
800	3/8	5/8	1	1-1/4	1-5/8	1-7/8	2-1/4	2-1/2	2-7/8	3-1/8	3-1/2	3-3/4	4-1/8	4-3/8	4-3/4	5
900	3/8	3/4	1-1/8	1-1/2	1-7/8	2-1/8	2-1/2	2-7/8	3-1/4	3-5/8	3-7/8	4-1/4	4-5/8	5	5-3/8	5-5/8
1000	1/2	7/8	1-1/4	1-5/8	2	2-3/8	2-3/4	3-1/8	3-5/8	4	4-3/8	4-3/4	5-1/8	5-1/2	5-7/8	6-1/4
1100	1/2	7/8	1-3/8	1-3/4	2-1/4	2-5/8	3-1/8	3-1/2	3-7/8	4-3/8	4-3/4	5-1/4	5-5/8	6-1/8	6-1/2	6-7/8
1200	1/2	1	1-1/2	1-7/8	2-3/8	2-7/8	3-3/8	3-3/4	4-1/4	4-3/4	5-1/4	5-5/8	6-1/8	6-5/8	7-1/8	7-1/2
1300	5/8	1-1/8	1-5/8	2-1/8	2-5/8	3-1/8	3-5/8	4-1/8	4-5/8	5-1/8	5-5/8	6-1/8	6-5/8	7-1/8	7-5/8	8-1/8
1400	5/8	1-1/8	1-3/4	2-1/4	2-3/4	3-3/8	3-7/8	4-3/8	5	5-1/2	6-1/8	6-5/8	7-1/8	7-3/4	8-1/4	8-3/4
1440	5/8	1-1/8	1-3/4	2-1/4	2-7/8	3-3/8	4	4-1/2	5-1/8	5-5/8	6-1/4	6-3/4	7-3/8	7-7/8	8-1/2	9
1600	5/8	1-1/4	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8	7-1/2	8-1/8	8-3/4	9-3/8	10

FORM "CWR"

REPORT OF SEMI-ANNUAL INSPECTION (SPRING/FALL) OF CWR TRACK

Operating Railroad/Contractor:	**Weather:**
Line Segment:	**Copy sent to MassDOT Rail and Transit Division (Yes/No):**

Track No.	Rail (N/S/E/W)	MP (Start)	MP (Finish)	Ties		Ballast		Anchors			Longitudinal Rail Movement					Remarks/ Remedial Action Required
				Type	Condition	Crib	Shoulder	Type	Pattern	Position	Turnouts	Crossovers	Grade X-ings	Open Deck Bridges	Other	

Operating Railroad Contractor's Signature: _____ **Date:** _____

Operating Railroad Contractor's Name (Print): _____

ATTACHMENT E

INSTRUCTIONS FOR THE PREPARATION OF THE
REPORT OF SEMI-ANNUAL INSPECTION (SPRING/FALL) OF CWR TRACK

(FORM "CWR")

(a) A Report of Semi-Annual Inspection (Spring/Fall) of CWR Tack shall be filled out as required in Section 10.0. The report shall be completed by the Operating Railroad Employee making the inspection.

ATTACHMENT F

TORCH CUTTING RAIL (FIGURE/REMARKS)

(a) General: Cutting Continuous Welded Rail (CWR) In Compression:

(1) Cut rail with a torch any time the existing rail temperature is suspected of being above the Rail Neutral Temperature (RNT) and/or the rail is in tension.

(2) Rail in compression has many forms to include:

(i) Tight rail

(ii) Nervous/wavy rail

(iii) Kinky rail

(iv) Misaligned track

(v) Buckled track

(3) The area where the rail is in compression may exhibit the following characteristics:

(i) Rail is lifting out of the tie plates; or,

(ii) Rail is bunching and/or crowding shoulders of the tie plates; or,

(iii) Rail is moving longitudinally in anchors and/or elastic fasteners; or,

(iv) Ties are skewing; or,

(v) Crib and/or shoulder ballast is pushing due to longitudinal and/or lateral track movement; or,

(vi) There are numerous consecutive high spikes; or

(vii) The rail appears to be kinking; or

(viii) One rail appears to be straighter than the other opposite rail; or

(ix) There is noticeable variation in track gage.

(b) The Contractor and Operating Railroad shall have their own specific Safety Procedures developed for torch cutting rail.

(c) The Contractor and/or Operating Railroad shall designate personnel that are qualified and are trained on an annual basis to torch cut rail using the above Safety Procedures.

(d) Minimum Recommended Procedures When Torch Cutting CWR:

(1) Locate the area where the rail appears to be in compression; and

(2) If the track is already misaligned and/or buckled:

(i) Line track out at misalignment and/or buckle to reduce compressive stresses in the rail; and

(ii) Make cut away from misalignment and/or buckle area to make cut in an area of potentially reduced compressive forces.

(3) In all cases, make the torch cut, as shown below, before removing any spikes, lags or fasteners; and

(4) In all cases, make the torch cut, as shown below, before removing any joints and/ or anchors or elastic fasteners; and,

(5) In all cases, make the torch cut in the rail as described and shown below.

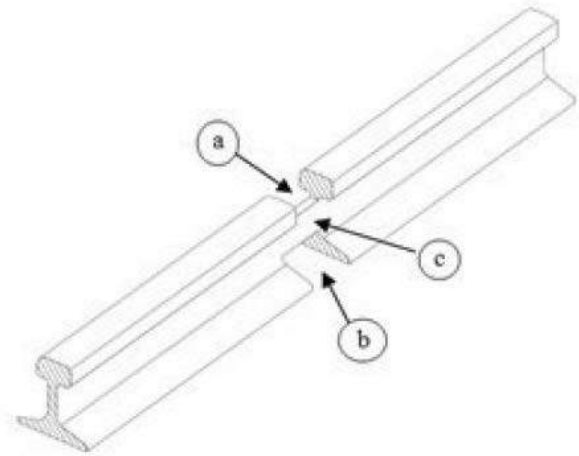
(e) Torch Cutting Rail In Compression: Use the so called “H” Pattern Method:

(1) First, cut and remove the rail head as shown in “a”; then

(2) Second, cut and remove both sides of the base as shown in “b”; then

(3) Third, cut and remove the remaining portion of the web from the top of the web near the rail head towards the base of the rail as shown in “c”.

(4) Note: Removing the rail head and then both sides of the rail base, before removing the web of the rail, is preferred, in order, if possible, to minimize excessive vertical and/or lateral movement of the rail when the rail is cut.



(f) After Torch Cutting Rail:

(1) If the rail that is torch cut is to be field welded and/or jointed:

(i) Trim or cut back the torch cut rail ends with a rail saw.

(ii) Remove all indication of the torch cut and/or heat affected zone which can be accomplished by:

- Cutting back a minimum of 2" behind the torch cut on each rail end (AREMA Chapter 4); and/or
- Cutting back the heat affected zone from behind the torch cut on each rail end;
- Use whichever cut back amount is larger.

(iii) Also see Attachment B, Paragraph (g) “Torch Cutting CWR in Track.”



APPENDIX B

UNDERBALANCE TABLES
MAXIMUM ALLOWABLE OPERATING SPEED ON CURVES

APPENDIX B

UNDERBALANCE TABLES
MAXIMUM ALLOWABLE OPERATING
SPEED ON CURVES

Page

Table 1 3" Underbalance Table..... B-1

Notes:

(a) The enclosed tables can be used to determine V_{max} in accordance with FRA §213.57.

(b) The Chief Engineer shall maintain a list of curves and the designated “underbalance” to be used.

(c) To operate at speeds which use “underbalance” greater than 3", the equipment must be qualified and approved by the Federal Railroad Administration.

(d) The Chief Engineer shall authorize all elevations in excess of 4".

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		0-0	0-1/4	0-1/2	0-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	80	83	86	89
0° 50'	0.83	71	74	77	80
1° 00'	1.00	65	68	70	73
1° 15'	1.25	58	60	63	65
1° 30'	1.50	53	55	57	59
1° 45'	1.75	49	51	53	55
2° 00'	2.00	46	48	50	51
2° 15'	2.25	43	45	47	48
2° 30'	2.50	41	43	44	46
2° 45'	2.75	39	41	42	44
3° 00'	3.00	37	39	40	42
3° 15'	3.25	36	37	39	40
3° 30'	3.50	34	36	37	39
3° 45'	3.75	33	35	36	37
4° 00'	4.00	32	34	35	36
4° 15'	4.25	31	33	34	35
4° 30'	4.50	30	32	33	34
4° 45'	4.75	30	31	32	33
5° 00'	5.00	29	30	31	32
5° 30'	5.50	27	29	30	31
6° 00'	6.00	26	27	28	29
6° 30'	6.50	25	26	27	28
7° 00'	7.00	24	25	26	27
7° 30'	7.50	23	24	25	26
8° 00'	8.00	23	24	25	25
8° 30'	8.50	22	23	24	25
9° 00'	9.00	21	22	23	24
9° 30'	9.50	21	22	22	23
10° 00'	10.00	20	21	22	23
10° 30'	10.50	20	21	21	22
11° 00'	11.00	19	20	21	22
11° 30'	11.50	19	20	20	21
12° 00'	12.00	18	19	20	21
12° 30'	12.50	18	19	20	20
13° 00'	13.00	18	18	19	20
13° 30'	13.50	17	18	19	19
14° 00'	14.00	17	18	18	19
14° 30'	14.50	17	17	18	19
15° 00'	15.00	16	17	18	18

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		1	1-1/4	1-1/2	1-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	82	85	87	90
1° 00'	1.00	75	77	80	82
1° 15'	1.25	67	69	71	73
1° 30'	1.50	61	63	65	67
1° 45'	1.75	57	58	60	62
2° 00'	2.00	53	55	56	58
2° 15'	2.25	50	51	53	54
2° 30'	2.50	47	49	50	52
2° 45'	2.75	45	46	48	49
3° 00'	3.00	43	44	46	47
3° 15'	3.25	41	43	44	45
3° 30'	3.50	40	41	42	44
3° 45'	3.75	39	40	41	42
4° 00'	4.00	37	38	40	41
4° 15'	4.25	36	37	38	39
4° 30'	4.50	35	36	37	38
4° 45'	4.75	34	35	36	37
5° 00'	5.00	33	34	35	36
5° 30'	5.50	32	33	34	35
6° 00'	6.00	30	31	32	33
6° 30'	6.50	29	30	31	32
7° 00'	7.00	28	29	30	31
7° 30'	7.50	27	28	29	30
8° 00'	8.00	26	27	28	29
8° 30'	8.50	25	26	27	28
9° 00'	9.00	25	25	26	27
9° 30'	9.50	24	25	26	26
10° 00'	10.00	23	24	25	26
10° 30'	10.50	23	24	24	25
11° 00'	11.00	22	23	24	24
11° 30'	11.50	22	22	23	24
12° 00'	12.00	21	22	23	23
12° 30'	12.50	21	22	22	23
13° 00'	13.00	20	21	22	22
13° 30'	13.50	20	21	21	22
14° 00'	14.00	20	20	21	22
14° 30'	14.50	19	20	21	21
15° 00'	15.00	19	20	20	21

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		2	2-1/4	2-1/2	2-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	90	90	90	90
1° 00'	1.00	84	86	88	90
1° 15'	1.25	75	77	79	81
1° 30'	1.50	69	70	72	74
1° 45'	1.75	63	65	67	68
2° 00'	2.00	59	61	62	64
2° 15'	2.25	56	57	59	60
2° 30'	2.50	53	54	56	57
2° 45'	2.75	50	52	53	54
3° 00'	3.00	48	50	51	52
3° 15'	3.25	46	48	49	50
3° 30'	3.50	45	46	47	48
3° 45'	3.75	43	44	45	46
4° 00'	4.00	42	43	44	45
4° 15'	4.25	40	42	42	43
4° 30'	4.50	39	40	41	42
4° 45'	4.75	38	39	40	41
5° 00'	5.00	37	38	39	40
5° 30'	5.50	36	36	37	38
6° 00'	6.00	34	35	36	37
6° 30'	6.50	33	33	34	35
7° 00'	7.00	31	32	33	34
7° 30'	7.50	30	31	32	33
8° 00'	8.00	29	30	31	32
8° 30'	8.50	28	29	30	31
9° 00'	9.00	28	28	29	30
9° 30'	9.50	27	28	28	29
10° 00'	10.00	26	27	28	28
10° 30'	10.50	26	26	27	27
11° 00'	11.00	25	26	26	27
11° 30'	11.50	24	25	26	26
12° 00'	12.00	24	25	25	26
12° 30'	12.50	23	24	25	25
13° 00'	13.00	23	24	24	25
13° 30'	13.50	23	23	24	24
14° 00'	14.00	22	23	23	24
14° 30'	14.50	22	22	23	23
15° 00'	15.00	21	22	22	23

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		3	3-1/4	3-1/2	3-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	90	90	90	90
1° 00'	1.00	90	90	90	90
1° 15'	1.25	82	84	86	87
1° 30'	1.50	75	77	78	80
1° 45'	1.75	69	71	72	74
2° 00'	2.00	65	66	68	69
2° 15'	2.25	61	62	64	65
2° 30'	2.50	58	59	60	62
2° 45'	2.75	55	56	58	59
3° 00'	3.00	53	54	55	56
3° 15'	3.25	51	52	53	54
3° 30'	3.50	49	50	51	52
3° 45'	3.75	47	48	49	50
4° 00'	4.00	46	47	48	49
4° 15'	4.25	44	45	46	47
4° 30'	4.50	43	44	45	46
4° 45'	4.75	42	43	44	45
5° 00'	5.00	41	42	43	43
5° 30'	5.50	39	40	41	41
6° 00'	6.00	37	38	39	40
6° 30'	6.50	36	37	37	38
7° 00'	7.00	34	35	36	37
7° 30'	7.50	33	34	35	35
8° 00'	8.00	32	33	34	34
8° 30'	8.50	31	32	33	33
9° 00'	9.00	30	31	32	32
9° 30'	9.50	30	30	31	31
10° 00'	10.00	29	29	30	31
10° 30'	10.50	28	29	29	30
11° 00'	11.00	27	28	29	29
11° 30'	11.50	27	27	28	28
12° 00'	12.00	26	27	27	28
12° 30'	12.50	26	26	27	27
13° 00'	13.00	25	26	26	27
13° 30'	13.50	25	25	26	26
14° 00'	14.00	24	25	25	26
14° 30'	14.50	24	24	25	25
15° 00'	15.00	23	24	24	25

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		4	4-1/4	4-1/2	4-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	90	90	90	90
1° 00'	1.00	90	90	90	90
1° 15'	1.25	89	90	90	90
1° 30'	1.50	81	83	84	85
1° 45'	1.75	75	76	78	79
2° 00'	2.00	70	71	73	74
2° 15'	2.25	66	67	69	70
2° 30'	2.50	63	64	65	66
2° 45'	2.75	60	61	62	63
3° 00'	3.00	57	58	59	60
3° 15'	3.25	55	56	57	58
3° 30'	3.50	53	54	55	56
3° 45'	3.75	51	52	53	54
4° 00'	4.00	50	50	51	52
4° 15'	4.25	48	49	50	51
4° 30'	4.50	47	47	48	49
4° 45'	4.75	45	46	47	48
5° 00'	5.00	44	45	46	47
5° 30'	5.50	42	43	44	44
6° 00'	6.00	40	41	42	42
6° 30'	6.50	39	39	40	41
7° 00'	7.00	37	38	39	39
7° 30'	7.50	36	37	37	38
8° 00'	8.00	35	35	36	37
8° 30'	8.50	34	34	35	36
9° 00'	9.00	33	33	34	35
9° 30'	9.50	32	33	33	34
10° 00'	10.00	31	32	32	33
10° 30'	10.50	30	31	31	32
11° 00'	11.00	30	30	31	31
11° 30'	11.50	29	30	30	31
12° 00'	12.00	28	29	29	30
12° 30'	12.50	28	28	29	29
13° 00'	13.00	27	28	28	29
13° 30'	13.50	27	27	28	28
14° 00'	14.00	26	27	27	28
14° 30'	14.50	26	26	27	27
15° 00'	15.00	25	26	26	27

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)				
		5	5-1/4	5-1/2	5-3/4	6
		Speed in Miles Per Hour (V_{max})				
0° 10'	0.17	90	90	90	90	90
0° 20'	0.33	90	90	90	90	90
0° 30'	0.50	90	90	90	90	90
0° 40'	0.67	90	90	90	90	90
0° 50'	0.83	90	90	90	90	90
1° 00'	1.00	90	90	90	90	90
1° 15'	1.25	90	90	90	90	90
1° 30'	1.50	87	88	89	90	90
1° 45'	1.75	80	82	83	84	85
2° 00'	2.00	75	76	77	79	80
2° 15'	2.25	71	72	73	74	75
2° 30'	2.50	67	68	69	70	71
2° 45'	2.75	64	65	66	67	68
3° 00'	3.00	61	62	63	64	65
3° 15'	3.25	59	60	61	62	62
3° 30'	3.50	57	58	58	59	60
3° 45'	3.75	55	56	56	57	58
4° 00'	4.00	53	54	55	55	56
4° 15'	4.25	51	52	53	54	55
4° 30'	4.50	50	51	51	52	53
4° 45'	4.75	49	49	50	51	52
5° 00'	5.00	47	48	49	50	50
5° 30'	5.50	45	46	46	47	48
6° 00'	6.00	43	44	44	45	46
6° 30'	6.50	41	42	43	43	44
7° 00'	7.00	40	41	41	42	42
7° 30'	7.50	39	39	40	40	41
8° 00'	8.00	37	38	38	39	40
8° 30'	8.50	36	37	37	38	38
9° 00'	9.00	35	36	36	37	37
9° 30'	9.50	34	35	35	36	36
10° 00'	10.00	33	34	34	35	35
10° 30'	10.50	32	33	34	34	34
11° 00'	11.00	32	32	33	33	34
11° 30'	11.50	31	32	32	32	33
12° 00'	12.00	30	31	31	32	32
12° 30'	12.50	30	30	31	31	32
13° 00'	13.00	29	30	30	31	31
13° 30'	13.50	29	29	29	30	30
14° 00'	14.00	28	29	29	29	30
14° 30'	14.50	28	28	28	29	29
15° 00'	15.00	27	28	28	28	29

[1] In degrees and minutes
[2] In decimals



APPENDIX C

GLOSSARY

APPENDIX C

GLOSSARY

TABLE OF CONTENTS

Page

- A - C-1
Adjusting/De-stressing C-1
Alignment – General C-1
Alignment – Line C-1
Aggregate C-1

- B - C-1
Ballast C-1
Ballast Cleaning C-1
Ballast Section C-1
Ballast Shoulder C-1
Bar – Joint C-1
Batter – Rail C-1
Braking Force C-1
Bridge – Ballast Deck C-2
Bridge Timber C-2
Buckling Incident C-2

- C - C-2
Cant C-2
Clip C-2
Clip – Switch C-2
Closure Rail C-2
Coefficient of Thermal Expansion – Rail C-2
Compression C-2
Compromise Joint Bar C-2
Continuous Welded Rail (CWR) C-2
Crossing – At Grade (Highway) C-2
Crossing – At Grade (Track) C-2
Crosslevel C-3
Crossover C-3
Curvature – Degree of C-3
Curve – Compound C-3
Curve – Reverse C-3
Curve – Simple (Horizontal) C-3
Curve – Vertical C-3

- D - C-3
Derail C-3
Derailment C-3
Desired Rail Installation Temperature Range (DRTR) C-3
Deviation C-3
Disturbed Track C-3
Dynamic Train Loading C-3

- E - C-4
Elastic Rail Fastener C-4
Engine Burn C-4
Expansion Joint C-4

TABLE OF CONTENTS
(Continued)

Page

- F - C-4
Facing Point C-4
Federal Railroad Administration (FRA) C-4
Fishing Space C-4
Flangeway C-4
Flow of Metal (Rail) C-4
Fracture – Detail C-4
Frog C-4
Frog – 1/2" Point C-4
Frog – Railbound Manganese (RBM) C-4
Frog – Self-Guarded (SGM) C-4
Frog – Spring C-5
Frog – Theoretical Point C-5
Frog – Throat of C-5
Frogs – End C-5
Frog Angle C-5
Frog Number C-5

- G - C-5
Gage Line C-5
Gage of Track C-5
Gage Rod C-5
Gaging of Track C-5
Grade C-5
Grade Line C-5
Grade Rail C-5
Guard Rail – Frog C-5
Guard Rail – Inner Track C-6
Guard Rail – Outer Track C-6

- H - C-6
Head Block – Switch C-6
Head or No. 1 Rod C-6
Heel Block – Fixed C-6
Heel Block – Floating C-6
Heel Length – Frog C-6
Heel of Frog C-6
Heel of Switch C-6
Heel Spread – Frog C-6
Heel Spread – Switch C-6
Highway – Crossing Warning Devices (Active) C-6

- I - C-6
Interlockings C-6

- J - C-7
Joint Bar C-7
Joint Bar – Compromise C-7
Joint – Frozen C-7
Joint – Insulated C-7
Joints – Supported and Suspended C-7
Joint Tie C-7

TABLE OF CONTENTS
(Continued)

Page

- L - C-7
Latch – Switch Stand C-7
Lateral Acceleration C-7
Lateral Resistance C-7
Lead (Conventional) C-7
Lead – Theoretical (Tangential) C-7
Level Board C-7
Lift Rail C-8
Line C-8
Line Rail C-8
Lining Track C-8
Longitudinal Resistance C-8
L/V Ratio C-8

- M - C-8
Maximum Authorized Speed C-8
Mechanical Stabilization C-8
Middle Ordinate C-8
Miter Rail C-8
Moveable Bridge C-9

- N - C-9
Neutral Temperature C-9
Neutral Temperature Management C-9
Number – Turnout C-9

- O - C-9
Out-of-Face Surfacing or Lining C-9
Out-of-Face Tie Renewal C-9
Out-of-Face Undercutting C-9

- P - C-9
Post – Bumping C-9
Preferred Rail Laying Temperature (PRLT) C-9
Profile C-9

- R - C-9
Rail – High C-9
Rail – Low C-9
Rail – Nervous Track C-9
Rail – Scrap C-9
Rail Anchors C-10
Rail Bender C-10
Rail Bond C-10
Rail Brace C-10
Rail Brand C-10
Rail Fastening System C-10
Rail Joint – Pumping C-10
Rail Section C-10
Rail Stretcher Expander C-10
Rail Temperature C-10
Rail Weight C-10
Relay Material C-10

TABLE OF CONTENTS
(Continued)

Page

Roadbed C-10
Rod – Operating C-10
Running Rail C-11
Runoff – Curve C-11
Runoff – Surface C-11

- S - C-11
Scrap C-11
Screw – Lag C-11
Shim – Track C-11
Side Planning – Undercutting C-11
Spot Surfacing C-11
Spot Tie Renewal C-11
Stock Rail C-11
Stock Rail Bend C-11
Stringlining C-11
Sub-ballast C-11
Sub-grade C-12
Superelevation – Equilibrium C-12
Superelevation C-12
Switch C-12
Switch – Insulated C-12
Switch – Spiked/Clamped C-12
Switch – Throw of C-12
Switch Heater C-12
Switch Lock C-12
Switch Machine C-12
Switch Machine Rod Basket C-12
Switch Obstruction Test C-12
Switch Plate C-12
Switch Point C-13
Switch Point – Undercut C-13
Switch Point Guard C-13
Switch Point Lug (Clips) C-13
Switch Point with Graduated Risers C-13
Switch Point with Uniform Risers C-13
Switch Rod C-13
Switch Stand C-13
Switch Target C-13

- T - C-13
Tension C-13
Thimble (Insulated Joints) C-13
Throat of Frog C-13
Tie C-13
Tie – Centerbound C-13
Tie Plate C-14
Tie Plate – Twin C-14
Tie Plug C-14
Tie Spacing C-14
Toe End of Frog C-14
Toe Spread C-14
Track C-14
Track Buckling C-14

TABLE OF CONTENTS
(Continued)

Page

Track Lateral Resistance C-14
Track Longitudinal Resistance C-14
Track – Skeletonized C-14
Track Spike (Cut Spike) C-14
Track – Surface C-14
Tractive Force C-14
Trailing Point C-14
Train-induced Forces C-14
Transition Rail C-15
Transition Spiral C-15
Transpose Rail C-15
Turnout (TO) C-15
Turnout (Premium Design) C-15
Turnout – Conventional C-15

- U - C-15
Underbalance C-15

- W - C-15
Washer – Spring (Lock) C-15
Weld – Flash Butt C-15
Weld – Thermite C-15
Wheel Tread C-15
Wing Rail C-15

APPENDIX C

GLOSSARY

- A -

Adjusting/De-stressing
The procedure by which a rail's temperature is re-adjusted to the desired neutral temperature range. It typically consists of cutting the rail and removing rail anchoring devices, which provides for the necessary expansion, and then re-assembling the track.

Alignment – General
The physical appearance of the railroad as viewed from above, which consists of a series of straight lengths of track, referred to as tangents and spirals, connecting simple, compound or reverse curves.

Alignment-Line
The condition of track in regard to uniformity of direction over short distances on tangents and in curves.

Aggregate
The sand, gravel, broken stone or combinations thereof with which the cementing material is mixed to form a mortar or concrete. The fine material used to produce mortar for stone and brick masonry and for the mortar component of concrete is commonly termed "fine aggregate," while the coarse material used in concrete only is termed "course aggregate."

- B -

Ballast
Select material placed on the roadbed to support and hold track in line and surface. Ballast preferably consists of sized hard particles that distribute the load, drains well and maintains proper line and surface.

Ballast Cleaning
The process of separating contaminants from the ballast by shaking and then depositing stone back onto the track.

Ballast Section
The cross section of a track between and under the crossties and between the ballast shoulders.

Ballast Shoulder
The portion of ballast between the end of the tie and the bottom of the ballast slope. It distributes the traffic load over a greater width of roadway and helps hold the track in alignment by providing lateral resistance.

Bar - Joint
Bars that are used to physically connect two rail ends and ensure proper rail head and gage face alignment. Also called a joint bar.

Batter - Rail
Deformation of the surface of the rail head, usually close to the end of the rail, caused generally by wheel impact loads.

Braking Force
The longitudinal and lateral force induced into the rail as a result of the brake application of a train.

Bridge - Ballast Deck
A bridge with a solid floor provided with drains and covered with ballast to provide uniform support for track.

Bridge Timber
A sawed tie usually pre-framed on all four sides and of the size and length required for track on an open deck bridge.

Buckling Incident
The formation of a lateral misalignment sufficient in magnitude to cause a general instability of track which may constitute a deviation from Class requirements specified in §213.55 of Part I. These normally occur when rail temperatures are relatively high and are caused by high longitudinal compressive forces.

- C -

Cant
Tilt or inclination of the base of the rail. Canting of the rail is achieved with the use of a tie plate or rail seat designed to cant the rail inward towards the center-line of track and should be installed accordingly. Typical cant is 1:40.

Clip
An elastic fastener that is applied parallel or perpendicular to the base of the rail and replaces and eliminates the need for a cut spike and anchor. A clip can be used on wood or concrete ties.

Clip - Switch
The device by which the switch rod is joined to the switch points. It is normally connected to the switch points by bolts protected by cotter keys or pins. It sometimes has staggered bolt holes in the horizontal leg for making detailed adjustments in the positions of the switch points.

Closure Rail
The lead rails connecting the heel end of the switch with the toe ends of a frog.

Coefficient of Thermal Expansion – Rail
A multiplier based on the physical properties of rail steel used to calculate the change in rail length with change in temperature. The coefficient is 0.000078 when the length of the rail is in feet.

Compression
A uniform axial force within the rail caused by equal and opposite forces pushing at the ends of the rail.

Compromise Joint Bar
See Joint Bar – Compromise

Continuous Welded Rail (CWR)
Rail that has been welded together into lengths exceeding 400 feet. See Part I, §213.119.

Crossing – At Grade (Highway)
A crossing or intersection of a railroad and a highway at the same level or grade.

Crossing – At Grade (Track)
A structure, used where one track crosses another at grade, which consists of four connected frogs. Crossing angles can be defined as:

Low angle:	Up to and including 30°
Medium angle:	31° to 60°
High angle:	61° to 90°

Crosslevel
The difference in elevation between the rails at the same location.

Crossover
Two turnouts with the track connected at their frogs, arranged to form a passage between two nearby and generally parallel tracks.

Curvature - Degree of
A measure of the sharpness of a simple curve where a 1" offset at the mid-point of a 62' chord is equal to 1°.

Curve - Compound
A curve composed of two or more simple curves that are joined by easement spirals and that lead in the same general direction (i.e., to left or right, but each with different radii).

Curve - Reverse
A curve composed of two simple curves that are joined by a common tangent point or by a short tangent track which bear in opposite directions.

Curve - Simple (Horizontal)
A curve in the form of a circular arc that is bounded by two tangents. By definition these curves do not have spirals and may be found in yards and on secondary track.

Curve - Vertical
A curve in the profile of a track to connect intersecting grade lines and to permit safe and smooth operation of trains over summits and across sags.

- D -

Derail
A track device to guide rolling stock off the rails at a selected spot and divert the rolling stock away from the track that is being protected. Derails provide protection against collisions or side swipes. Derails are generally of three kinds: the “split switch,” the “sliding block,” and the “hinged block” type.

Derailment
Anytime a wheel of a car or engine comes off the head of the rail.

Desired Rail Installation Temperature Range (DRTR)
The rail temperature range, within a specific geographical area, at which forces in CWR should not cause a buckling incident in extreme heat, or a pull apart during extreme cold weather. Definition from FRA Part 213, §213.119(g).

Deviation
Difference between a design or published standard and actual measurement at any one location.

Disturbed Track
The disturbance of the roadbed or ballast section, as a result of track maintenance or any other event, which reduces the lateral and longitudinal resistance of the track.

Dynamic Train Loading
Vertical, horizontal and longitudinal forces that are imparted to the track structure during the passing of a train due to wheel action and vehicle response.

- E -

Elastic Rail Fastener
A rail hold down system that secures the running rail to wood or concrete ties and/or a concrete slab. The fastener uses rail clips and a base plate with or without resilient pads. This system provides lateral, longitudinal and vertical rail restraint during the passage of trains. (See additional information under “Rail Fastening System.”)

Engine Burn
Damage to the rail head metal caused by slipping or “spinning” powered wheels. Engine burn fracture is a rail break caused by an engine burn.

Expansion Joint
A device that allows thermal movement in rail to be relieved by allowing the rail on one side of the joint to freely expand and contract. Often installed on the approaches to moveable bridges so that thermal forces and movements in continuous welded rail adjacent to the bridge cannot be transferred into the bridge or the miter rail assembly, where it could jam and prevent needed movement.

- F -

Facing Point
A facing point move is one where the rail vehicle moves over the switch points and then the frog.

Federal Railroad Administration (FRA)
A government agency in the U.S. Department of Transportation.

Fishing Space
Space between the head and base of a rail occupied by a splice bar (angle bar, joint bar).

Flangeway
Measured space between running rail, guard rail, frog casting, frog wing rail and road crossing to provide clearance for passage of wheel flanges.

Flow of Metal (Rail)
Deformation of the top of the rail head on the crown of a rail toward the gage or field side. Common on the low side of a curve where trains run at less than balanced speed.

Fracture – Detail
A progressive transverse fracture originating in the head of a rail.

Frog
A device used where two running rails intersect, with flangeways to permit wheels and wheel flanges on either rail to cross one another.

Frog – 1/2" Point
The 1/2" point of frog is the point at which the spread between gage lines is 1/2". All measurements in the field are usually made from the 1/2" point of frog.

Frog – Railbound Manganese (RBM)
A frog assembly that consists of wing rails surrounding a manganese casting with a rigid frog point and flangeways. A conventional guard rail is used with this type of frog.

Frog – Self-Guarded (SGM)
A frog with a guard member for guiding the flange of a wheel past the point of frog by engaging the tread rim of the wheel in a horizontal plane above the top of the running surface of the frog. This makes a conventional guard rail unnecessary.

Frog – Spring
An appliance that contains, among other things, a fixed frog point, a moveable spring wing rail, a rigid wing rail, frog hold-down assemblies, and spring box. The frog makes use of a long guard rail (on the straight side). The spring frog design provides a continuous bearing surface for the wheel tread as it traverses through the frog point area on the straight side of the turnout.

Frog – Theoretical Point
The theoretical point of the intersection of the gage lines. The theoretical frog point is at a distance, in inches, ahead of the 1/2" point which is equal to one-half the frog number (i.e., number 10 frog is 5").

Frog – Throat of
Point at which the converging wings of a frog are closest together.

Frogs – End
The two frogs at the opposite ends of the long diagonal of a crossing or slip.

Frog Angle
Angle formed by intersecting gage lines of the rails in a frog.

Frog Number
The frog angle expressed as the number of units of centerline length in which the spread is one unit (i.e., 10:1 is a number 10 frog).

- G -

Gage Line
A line 5/8" below the running surface of a rail on the side of the head nearest the track center. The line from which measurements of gage are made.

Gage of Track
Distance between gage lines of rails laid in track.

Gage Rod
A device for holding track to correct gage, generally consisting of 1-1/4" rod with a forged jaw on one end and a malleable jaw on the other end, adjustable through a locknut. Sometimes consists of a rod made in two parts with a solid jaw on each end, united by a turnbuckle.

Gaging of Track
Bringing the rail heads of a track into their correct distance apart.

Grade
Rate of rise or fall of the grade line, expressed as a percentage of the feet of rise or fall per 100' of length. A steady rise or fall of 1' per 100' is a 1% grade.

Grade Line
The line representing top-of-rail elevations and the profile of the track.

Grade Rail
The rail first surfaced to track elevation; the line rail on tangents, the inner or low rail on curves.

Guard Rail - Frog
A rail section assembly used in a turnout with a railbound manganese (RBM) frog, spring rail frog, or in track crossings. The guard rail is designed to guide the wheel set through the proper flangeway of the frog. The guard rail prevents the wheel flange from wearing, striking or picking the frog point.

Guard Rail – Inner Track
An additional rail or rails laid parallel to and between the running rails of bridges, bridge approaches, and at other critical locations to prevent derailed equipment from striking a bridge or other structure and to keep the derailed wheels on the ties of the bridge.

Guard Rail – Outer Track
Additional timber laid parallel to the running rails of long-span viaducts.

- H -

Head Block - Switch
Ties used to support the switch-point operating mechanism (powered or unpowered) and the switch stand.

Head or No. 1 Rod
The switch rod nearest the point of a switch, usually placed between the two head block ties.

Heel Block - Fixed
A rigid heel block assembly at the switch heel to maintain the proper horizontal heel spread between the switch rail and stock rail. The heel block limits the amounts of longitudinal movement between the switch point and stock rail. The heel block is bolted to the switch rail and stock rail.

Heel Block - Floating
An assembly at the switch heel to maintain the proper horizontal heel spread between the switch rail and stock rail. If the assembly is bolted to the switch rail only, the switch heel "floats" and is called a floating heel block.

Heel Length - Frog
Distance between the heel end and half-inch point of a frog measured along gage lines.

Heel of Frog
The end of a frog farthest from the switch point.

Heel of Switch
The end of the switch where the switch point connects to the closure rails (see Heel Block – Fixed and Floating). The heel of the switch can be either fixed to the stock rail or allowed to float freely.

Heel Spread - Frog
Distance between gage lines at the heel end of a frog.

Heel Spread - Switch
The distance between the gage lines of the stock rail and switch rail at the heel of the switch.

Highway-Crossing Warning Devices (Active)
An arrangement of one or more highway-crossing signals, with or without gates at a highway grade crossing.

- I -

Interlockings
An arrangement of signals, switch locks, and signal appliances so interconnected that their movements succeed each other in a predetermined order. It may be operated manually or automatically.

- J -

Joint Bar
A steel angle bar or other shape used to fasten together the ends of rails in a track. They are used in pairs and are designed to fit the space between head and base of rail (fishing space) closely. They are held in place by track bolts. Also called angle bar, rail joint bar and splice bar.

Joint Bar – Compromise
A special rail joint, sometimes called a step joint, for joining rails of different sections. The joint is made so that it brings gage faces and rail heads into line so that a continuous smooth surface is present for the treads and flanges of passing wheels. The hand of a compromise joint is designated by standing in the gage of track at the small rail section looking or facing towards the heavier rail section to be joined or compromised. In this location in track, the right hand compromise joint is on the right and left hand is on the left. A compromise joint is described by indicating the heavier rail section and then the light rail section to be compromised (i.e., 136/115).

Joint – Frozen
A joint so tight that the rails cannot move within the joint bar as temperature varies.

Joint – Insulated
A rail joint designed to prevent the flow of electric current from rail to rail by means of insulation so placed as to separate the rail ends and other connecting metal parts at the joint.

Joints – Supported and Suspended
A supported rail joint has a tie directly under the rail ends. A suspended joint is one in which ends of the rail joint are not resting on a tie.

Joint Tie
A cross tie used under a rail joint.

- L -

Latch - Switch Stand
A device for catching and holding the lever of switch stand in position, also called a switch keeper. Two latches are used at each switch stand.

Lateral Acceleration
The horizontal acceleration experienced by a rail vehicle that is perpendicular to the direction of travel. Lateral acceleration is a measure of ride quality and measured in units of ft./sec^2(g).

Lateral Resistance
The ability of the track structure to remain in position under the influence of in-service forces that are generated in a plane perpendicular to the line of the rail. Lateral resistance is a product of interaction of the ballast with the sides, bottom and end face of the tie.

Lead (Conventional)
The length between the actual point of switch and the 1/2" point of frog, measured on the line of the straight track.

Lead – Theoretical (Tangential)
The length between the actual point of switch and the theoretical point of a moveable point frog, measured on the line of the straight track.

Level Board
A tool used to determine the cross-level or super elevation of a track.

Lift Rail
The portion of a miter rail assembly that is attached to the moveable span of a moveable bridge. Sometimes called the bridge rail or moveable rail.

Line
The condition of a track in regard to uniformity in direction over short distances on tangents or uniformity in variation in direction over short distances on curves.

Line Rail
The rail on which alignment is based; the east rail of tangent track running north and south, the north rail of tangent track running east and west, the outer rail on curves, or the outside rails in multiple track territory.

Lining Track
Shifting the track laterally to conform to an established alignment. Maintenance lining is ordinarily done during repairs. Lining is done to make the track conform to predetermined alignment.

Longitudinal Resistance
The ability of the track structure to remain in position under the influence of train and temperature forces that run parallel with the rail. Longitudinal resistance is a product of the interaction of the ballast, the tie, rail anchors, rail clips and other elastic fasteners.

L/V Ratio
The relationship of lateral force on the rail to the vertical force on the rail, which is produced by the wheel of railroad rolling stock, locomotives, work equipment and other equipment moving along the track.

- M -

Maximum Authorized Speed (MAS)
That maximum speed for a portion of track as specified in the current Employee's Timetable.

Mechanical Stabilization
A procedure used to restore lateral and longitudinal stability of disturbed track following maintenance operations. This procedure may incorporate dynamic track stabilizers which are units of work equipment that are used as a substitute for the action provided by the passage of tonnage trains.

Middle Ordinate
The distance measured from gage line of rail to the middle of a string drawn taut and held to contact with the gage line of rail at its end. The middle ordinate provides a means of measuring curvature. Can also be used in bending rails to a desired curvature.

Miter Rail
A rail assembly on a moveable bridge that spans the gap between the moveable span and the adjacent stationary portion of the bridge. The miter rail typically consists of two pieces. One rail is stationary or fixed and attached to the non-moving portion of the bridge and the second rail is attached to and moves with the moving portion of the bridge.

The term miter is used because typically the abutting ends of the two portions of the miter rail assembly, rather than being cut square as in a conventional rail joint, are cut at an acute angle or "mitered" relative to each other. The miter can provide the wheels with continuous support over the rail gap.

Because one rail must be able to move relative to the other when the bridge is being opened, the abutting ends of the miter rail assembly are not bolted to each other as in a conventional rail joint, but rather sit in bed plates that align one end of the miter rail relative to the other.

Moveable Bridge
Any bridge span over a navigable waterway that can be moved to accommodate the passage of vessels taller than the normal underclearance of the bridge.

- N -

Neutral Temperature
The temperature at which rail is secured in a stress-free condition.

Neutral Temperature Management (See Appendix A)
Maintaining the condition of the track structure so that the neutral temperature of the rail remains within the acceptable neutral temperature range.

Number - Turnout
The number corresponding to the number of the frog used in a turnout.

- O -

Out-of-Face Surfacing or Lining (See Appendix A)
The continuous surfacing and/or lining of a piece of track greater than 200' in length.

Out-of-Face Tie Renewal (See Appendix A)
Tie replacement at the rate of more than six (6) ties per 39' of rail. Not more than two (2) consecutive ties nor more than six (6) ties per 39' of rail can be replaced in any one pass.

Out-of-Face Undercutting (See Appendix A)
Undercutting of more than two (2) consecutive ties or more than six (6) ties in 39' of track.

- P -

Post – Bumping
A device at the end of stub track to prevent rolling stock from going off the ends of the rails.

Preferred Rail Laying Temperature (PRLT)
The desired temperature (i.e., 95ºF) at which continuous welded rail (CWR) is to be laid. The PRLT is region-specific and is the temperature at which there will be no stress in the CWR.

Profile
A longitudinal section through a track that shows elevation of the grade rails. The profile is usually obtained from levels taken on top of the rail.

- R -

Rail - High
The outer or elevated rail of a curved track, which is maintained as the line rail.

Rail - Low
The inner rail of a curve which is maintained as the grade rail.

Rail – Nervous Track
CWR which exhibits minute alignment irregularities which indicate that the rail is in a considerable amount of compression.

Rail - Scrap
Rails of standard section not fit for use as relayer rail.

Rail Anchors
Those devices which are attached to the base of the rail and bear against the side of the crosstie to control longitudinal rail movement. Certain types of rail fasteners also act as rail anchors and control longitudinal rail movement by exerting a downward clamping force on the upper surface of the rail base.

Rail Bender
A tool for bending stock rails.

Rail Bond
A device used to transfer an electric circuit across rail ends at a rail joint or discontinuity in the rail.

Rail Brace
A device used at switches, moveable-point frogs, guardrails, etc., in combination with switch, tie or gage plates, for holding rail in place in the plate and preventing lateral displacement.

Rail Brand
An identification mark, including manufacturer's name or initials, month and year the rail was rolled, manufacturer's identification label, weight per lineal yard, initials of section, number of the heat, portion of the ingot and process of manufacture.

Rail Fastening System
The hold-down appliances that provide the required combination of horizontal, lateral and vertical restraint to permit the safe operation of rail vehicles. Examples of conventional systems found include the cut spike and rail anchor. Examples of elastic fastening systems include the Pandrol "e" clip, fast clip with a pin (lock spike) or lag screw.

Rail Joint - Pumping
A poorly supported rail joint that has excessive up and down movement under the passage of trains.

Rail Section
The pattern of dimensional details of rail, such as width of base, height of rail, thickness of web, width and thickness of head, angle of head and angle of base. Each particular pattern is identified by a brand name or symbol, such as ASCE, AREA, ARA, PRR, PS, etc., in addition to its weight per yard.

Rail Stretcher Expander
A rail puller/expander operated by hand or by machine that is used to increase or decrease the gap between adjoining rail ends.

Rail Temperature
The temperature of the rail, measured with a rail thermometer on the shaded side of the web.

Rail Weight
The weight of a three (3) foot-long section of rail expressed in pounds per yard.

Relay Material
Useable secondhand rail, ties or other track material (OTM).

Roadbed
The finished sub-grade surface upon which the track and ballast rest.

Rod - Operating
A rod attached to a switch, derail, or other device, for moving it from one position to another. The operating or throw rod can be reset to adjust the amount of throw occurring at the switch.

Running Rail
The rail or surface on which the wheel bears.

Runoff - Curve
The change in superelevation in the spiral/easement from the full body of a curve to tangent or between compound curves.

Runoff - Surface
An area of grade change in track where the raised portion of a track is connected with the existing grade. The runoff between the two elevations is made along the two rails at a designated rate of change per 31' station for comfort and safety.

- S -

Scrap
Rail, ties or other track materials (OTM) that are not suitable for reuse.

Screw - Lag
A cylindrical threaded steel spike with a square head designed to be turned with a special appliance into holes bored into ties.

Shim - Track
A bearing piece, usually wood or metal of various thickness, at least equal to the width and length of the tie plate, for temporary use between the tie plate and ties to raise (surface) the rail to a desired relative elevation. Usually used to spot surface a track when the roadbed is frozen and the ties cannot be tamped and surfaced.

Side Planing - Undercutting
Cuts made on sides of the head of the switch rail to form a taper from the full width of the head to the switch point. Also used in a stock rail to match undercut switch points.

Spot Surfacing (See Appendix A)
Surfacing a piece of track up to 200' in length.

Spot Tie Renewal (See Appendix A)
The installation of six (6) or less ties per 39' of rail with no more than two adjacent ties replaced in a row. The new ties must be promptly tamped and the ballast properly dressed.

Stock Rail
The two running rails that support the operation of the switch points. The straight stock rail is on the straight side of a lateral turnout The bent stock rail or curved rail is on the diverging side of the turnout. The switch points fit securely against or are undercut into the stock rail to permit the transfer of wheel load from the stock rail to the switch point. An equilateral turnout has two straight stock rails.

Stock Rail Bend
The bend or set that must be given the stock rail to allow the switch point to follow the gage line through the turnout. Usually, the stock rail on the diverging side of a turnout is bent. The opposite stock rail is straight .

Stringlining
A method for determining the alignment of a curve, by measuring mid-ordinates to the outer rail with string and paddles.

Sub-ballast
Any approved granular material which is placed between the ballast and finished sub-grade of the roadbed, to provide distribution of the load to the roadbed, better drainage, and prevent upheaval of the sub-grade by frost.

Sub-grade
The top of natural materials, gravel or crushed rock, usually inferior to ballast or sub-ballast, placed in fills or at the bottom of cuts that lie directly below the sub-ballast and ballast.

Superelevation – Equilibrium
The elevation of the outer rail which balances the centrifugal forces while negotiating a curve at a given design speed.

Superelevation
The height at which the outer rail is raised above the inner or grade rail on curves to resist the centrifugal force of moving trains.

Switch
A connection between two lines of track to permit flange wheeled rail vehicles to pass from one track to another.

Switch – Insulated
A switch in which the fixtures, principally the gage plates and the switch rods connecting one rail to the other, are provided with insulation so that electric currents will not be shunted.

Switch – Spiked/Clamped
A switch point that is secured in one position through the use of spikes, blocks and clamps.

Switch – Throw of
The distance measured between the switch point and stock rail at the point of switch.

Switch Heater
A device for melting snow with heat generated by an electric current, gas or propane. This device enables a switch which is so equipped to be thrown in inclement weather when there are accumulations of sleet, ice or snow.

Switch Lock
A fastener, usually a spring padlock used to secure the switch or derail stand in place.

Switch Machine
The signal appliance that powers and provides for the positive movement and locking of the switch points and/or moveable point frog to permit the safe, uninterrupted movement of rail vehicles through a turnout.

Switch Machine Rod Basket
The appliance that connects the operating rod to the No. 1 tie rod in the switch or to the frog point lug of a moveable point frog

Switch Obstruction Test
This test is used as part of the criteria to determine if the switch points in signal territory are properly fitting up against the straight and bent stock rails or if the moveable point of a moveable point frog fits against the moveable point frog housing. This test ensures that the proper signal indication is being conveyed as the points move and are seated.

Switch Plate
A special metal tie plate for use on switch ties, each plate being long enough to extend not only under the stock rail and its supporting braces, but also under the switch point in the open position. Switch plates are furnished in sets to correspond with switch length. There are two plates to each tie. However, at the point of switch and at helper locations, the two plates may be replaced by a gage plate(s) that carries both switch points. A type of high-profile switch plate used in some turnouts which contain two elastic clips to secure the stock rail to the switch plate.

Switch Point
The moveable rail of a switch which determines the direction of train movement.

Switch Point – Undercut
A switch point that is planed on the field side to fit securely against an undercut stock rail.

Switch Point Guard
A structure made of rail or manganese steel secured to the field side of the running rail at the point of switch, with suitable flares to engage the tread rims of wheels and guide the wheel past the switch point. This appliance is intended to reduce or eliminate switch point contact and wear. This appliance is to be used where operating speeds are 15 mph and less.

Switch Point Lug (Clips)
The lug attached to a switch point, to which the front rod is connected.

Switch Point with Graduated Risers
A switch in which the switch points are gradually elevated by means of graduated riser plates, until they reach the required height above a stock rail and sloping back to zero at the fixed heel block.

Switch Point with Uniform Risers
A switch in which the switch points have a uniform elevation on riser plates for the entire length of the switch, and therefore do not have a heel slope. The switch point rail rise is run off in back of the floating heel block.

Switch Rod
The rods that connect the left hand and right hand switch point to ensure proper gage, alignment and adjustment throughout the switch.

Switch Stand
A manually operated device by which a switch is thrown, locked, and its position indicated. It consists essentially of a base, spindle, lever, connecting rod and target.

Switch Target
A signal placed adjacent to or fixed on the spindle of a switch stand with reflective materials indicating the position of the switch.

- T -

Tension
An axial force caused by equal and opposite forces pulling at the ends of the rail.

Thimble (Insulated Joints)
The cylindrical pieces of an insulating joint that surround portions of the bolts.

Throat of Frog
The point at which the converging wing rails of a frog are close together just ahead of frog point.

Tie
A transverse support to which rails are fastened to keep them in line, gage and grade. Usually wooden or concrete.

Tie - Centerbound
Ballast condition where an unusually large percentage of the wheel load is carried at the center of the tie. This is an undesirable situation as compacted ballast under the rail seats should carry the load.

Tie Plate
A metal plate at least 6" wide and long enough to provide a safe bearing area on the tie, with a shoulder to restrain lateral movements of the rail.

Tie Plate - Twin
A tie plate in two parts that mate to form a combined width equal to that of the stand tie plate, for use back of the heel of switch to the point where standard tie plates may be applied.

Tie Plug
A wooden plug driven in to fill an unused spike hole or lag hole in a tie, to exclude moisture, prevent decay, and provide solid wood for re-driving of the spike. Usually supplied in the form of sticks containing several plugs.

Tie Spacing
The distances between tie centers in track or turnouts.

Toe End of Frog
The end of a frog nearest the switch.

Toe Spread
The distance between gage lines at the toe end of the frog.

Track
The rail, ties, rail fastenings, hardware and roadbed between points not less than 4' outside of each rail.

Track Buckling
The sudden formation of large lateral misalignments caused by high compressive forces, in the presence of some other influencing factors.

Track Lateral Resistance
The resistance provided to the rail/crosstie structure against lateral displacement.

Track Longitudinal Resistance
The resistance provided by the rail anchors/rail fasteners and the ballast section to the rail/crosstie structure against longitudinal displacement.

Track - Skeletonized
Track with ballast removed from the cribs between ties.

Track Spike (Cut Spike)
A rectangular metal fastener with an elliptical head designed to secure tie plates and/or rail to wood ties and timber.

Track - Surface
The condition of the track structure as to vertical evenness or smoothness.

Tractive Force
The longitudinal force induced into the rail as a result of the tractive effort exerted by the powered axles of rail vehicles.

Trailing Point
A trailing point move would pass over the frog and then the switch points.

Train-induced Forces
The vertical, longitudinal and lateral dynamic forces which are generated during train movement.

Transition Rail
A rail that joins two rails of different sections. It consists of two different rails flash butt welded to a middle forged section of rail. This rail is used in place of compromise bars.

Transition Spiral
An easement curve from the tangent to the curve.

Transpose Rail
Changing rail from one side to the other on curves because of headwear.

Turnout (TO)
An arrangement of a switch and a frog with closure rails, by which rolling stock can be diverted from one track to another.

Turnout (Premium Design)
A turnout that contains premium materials such as fully heat treated rail with elastic fasteners on wood and/or concrete ties. The design of premium turnouts may incorporate such things as tangential geometry, asymmetrical switch points and moveable point frogs or spring frogs.

Turnout – Conventional
A turnout whose transition from tangent to curve is abrupt because of alignment changes between the switch point and frog. These turnouts are usually constructed on wood ties, but can also be constructed on concrete ties. These turnouts usually have a “tee” rail switch point section and a self-guarded manganese (SGM) frog or railbound manganese (RBM) frog.

- U -

Underbalance
The difference between the actual superelevation and the amount of superelevation calculated for equilibrium conditions. Design underbalance on the MassDOT operated railroads is 1-1/2".

- W -

Washer – Spring (Lock)
A spring tensioned member designed to prevent movement of a nut and the loosening of a bolted member due to wear, stretch or other deterioration.

Weld – Flash Butt
A butt weld joining two abutting rails. This weld serves to join the rail ends using only parent materials. Electric flash_butt rail welding is accomplished with a stationary or portable electrical plant.

Weld - Thermite
A weld joining two abutting rails. The weld serves to unite the abutting rails with the introduction of metal weldment into a preset gap. This is an alumnothermic process that is accomplished by using weld kits..

Wheel Tread
The flat or tapered surface of a railway wheel that contacts the top surface of the rail head.

Wing Rail
The left and right rails that are run from the toe to the flared end of a moveable point frog, railbound manganese frog (RBM) or spring frog.

APPENDIX D

PLACEMENT OF TEMPORARY SPEED SIGNS

APPENDIX D

PLACEMENT OF TEMPORARY SPEED SIGNS

1.0 TEMPORARY SPEED RESTRICTION

(a) Protection shall be provided for any track that is considered not satisfactory for the passage of trains at maximum authorized speed, including placing an appropriate temporary speed restriction and notification to the Train Dispatcher.

(b) Portions of Tracks, on which temporary speed restrictions have been placed, are to be marked by placing a reflectorized Advanced Speed Limit sign, and Speed Limit and Resume Speed signs to the right of each track for both directions of traffic.

  (1) The general arrangement, details of construction and assembly, height and distance from the track, of signs, shall be as shown on the following plans.

  (2) Signs are to be placed so as to give the greatest practical unobstructed view considering alignment and other local physical conditions. Reflecting surfaces of signs must be kept clean to preserve their reflecting ability.

  (3) Speed Limit and Resume Speed signs are to be placed with the Speed Limit sign at the point where the actual restriction begins and the Resume Speed sign at the point where it ends.

  (4) Advanced Speed Limit signs, with numerals indicating the speed restriction, are to be placed far enough ahead of the Speed Limit signs in the direction from which trains are approaching to permit trains to reduce from normal speed to the speed permitted by the restriction.

(c) When a condition arises requiring a speed restriction, the following must be done:

  (1) Notification must be given to the dispatcher governing movement on the track where restriction is required.

  (2) Notification must be given to Track Supervisor.

  (3) Notification must include:

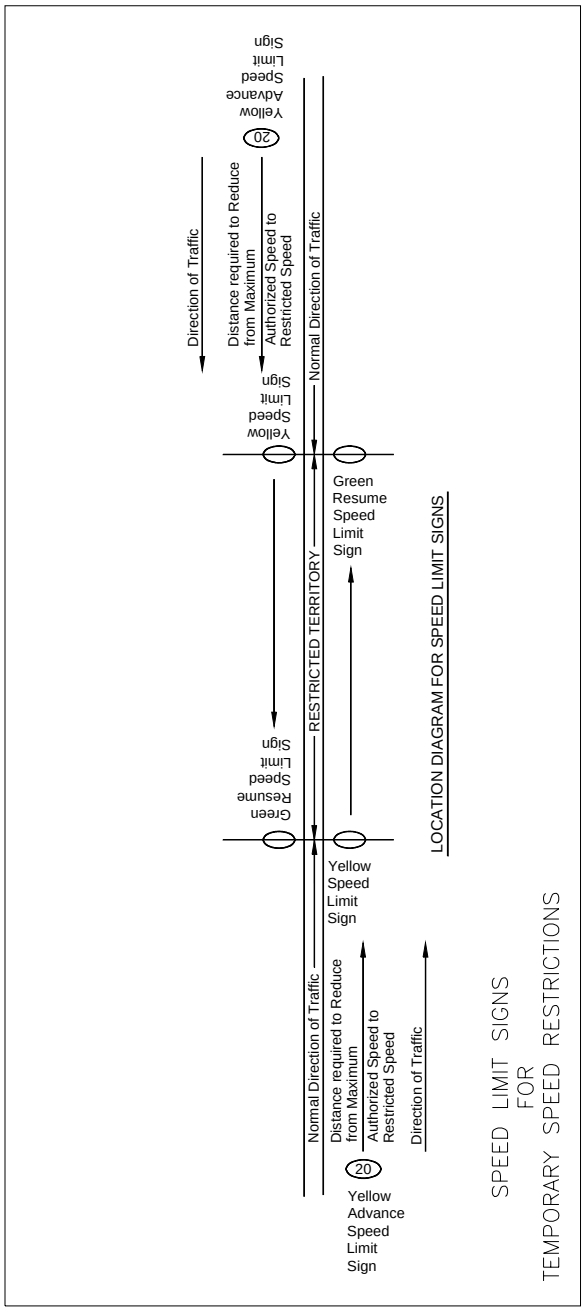
    (i) Limits of restriction by milepost station.

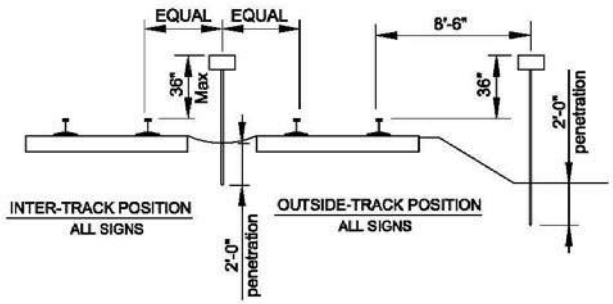
    (ii) Speed to which track is restricted.

    (iii) Reason for restriction.

    (iv) Action being taken to correct condition.

  (4) Immediate action must be initiated to remove restriction.


SPEED LIMIT SIGNS
FOR
TEMPORARY SPEED RESTRICTIONS
LOCATION DIAGRAM FOR SPEED LIMIT SIGNS
Yellow Advance Speed Limit Sign
20
Distance required to Reduce from Maximum Authorized Speed to Restricted Speed
Direction of Traffic
Normal Direction of Traffic
RESTRICTED TERRITORY
Yellow Speed Limit Sign
Green Resume Speed Limit Sign
Green Resume Speed Limit Sign
Yellow Speed Limit Sign
Distance required to Reduce from Maximum Authorized Speed to Restricted Speed
20
Yellow Advance Speed Limit Sign
Direction of Traffic
Normal Direction of Traffic



SPEED LIMIT SIGNS
FOR
TEMPORARY SPEED RESTRICTIONS

Note:
Where local conditions make it desirable, the Resume Speed Sign and The Speed Limit Sign may be mounted back to back on the same support

Temporary Speed Limit Signs

Advance Speed Limit sign with numerals indicating restricted speed shall be placed a sufficient distance in advance of restricted territory to permit a train to reduce from maximum authorized speed to the restricted speed.

Speed Limit sign shall be placed to mark the entrance to the restricted territory.

Resume Speed sign shall be placed to mark the end of restricted territory. When entire train has passed this point, speed may be resumed.

Advance Speed Limit sign shall have background of Flat Top Yellow Scotchlite. Superimposed on the yellow background shall be 7" high x 11-1/2" wide black numerals showing speed permitted over restricted territory. Numerals shall be furnished in multiples of 10 miles per hour.

Speed Limit sign shall have background of Flat Top Yellow Scotchlite.

Resume Speed sign shall have background of Flat Top Green Scotchlite.

(d) Marking of Temporary Speed Restrictions:

(1) Where it is anticipated that restriction will be of other than the most temporary nature, reflectorized slow boards will be used.

(2) Information concerning slow orders:

(i) Will be communicated to train and engine service personnel by train order or general notice.

(ii) Limits of slow orders in train order or general notice must be consistent with placement of slow boards on the ground, and order must so state.

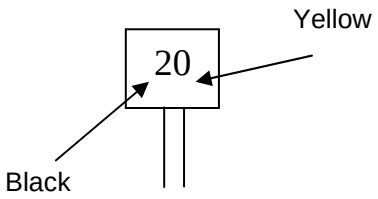
(iii) Where slow order is of short duration and is issued on train order, slow boards need not be displayed.

(3) Slow board placement:

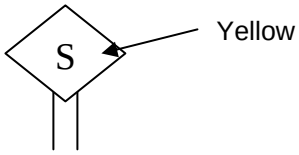
(i) Slow boards will be of reflectorized material, clean and in good repair.

(ii) They will be located to the right of and adjacent to the track protected, where they are unobstructed and can be clearly seen.

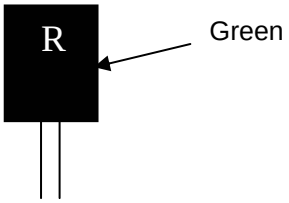
(iii) Advance Speed Limit Sign – a yellow sign with the speed to which trains are restricted displayed thereon in black numerals will be placed ahead of the point of restriction to allow a train moving at maximum authorized speed to reduce to the restricted speed at the point of restriction.



(iv) Yellow Speed Limit Sign – placed at the point at which restriction begins:



(v) Green Resume Sign – placed at the point at which restriction ends:





APPENDIX E

WEIGHTS AND MEASURES

This page intentionally left blank

APPENDIX E

WEIGHTS AND MEASURES

1. Tie Plates E-1
2. Joint Bars E-1
3. Ballast E-2
4. Fasteners E-2
5. Ties and Timbers E-2
6. Bonded Joints and Rails E-3
   6.a Bonded Insulated Rail Joints E-3
   6.b Rails E-3
7. Turnout Panels E-4
   7.a Conventional No. 8 on Wood Ties E-4
   7.b Conventional No. 10 on Wood Ties E-4
   7.c Conventional No. 15 on Wood Ties E-4
   7.d Conventional No. 20 on Wood Ties E-4
8. Hook Flange Guard Rails E-5
9. Railbound Manganese Frogs E-5
10. Diamond Track Crossings E-5
11a. AREMA Switch Rails (115-119 RE) E-6
11b. AREMA Switch Rails (136 RE) E-6
12. Wood-Tie Track Panels E-6
13. Highway Grade Crossings – Concrete E-7
14. Highway Grade Crossings – Rubber E-7
15. Decimals of an Inch E-8

This page intentionally left blank

APPENDIX E

WEIGHTS AND MEASURES

The weights contained in these tables are for informational purposes only. Before moving and handling materials, the weights should be ascertained by contacting the appropriate manufacturer and/or supplier.

1. TIE PLATES

Tie Plate Description Conventional	Length of Plate	Width of Plate	Rail Base	Approximate Weight (lbs)
SSC(1)	10"	7-1/2"	4-7/16" to 5-1/8"	11.3
SSC	11"	7-1/2"	5-1/8" to 5-1/2"	13.1
DSC(2)	12"	7-3/4"	5-3/8"	16.2
DSC	11"	7-3/4"	5-1/2"	13.6
DSC	12"	7-3/4"	5-1/2"	16.2
DSC	13"	7-3/4"	5-1/2"	19.9
DSC	14"	7-3/4"	5-1/2"	23.3
Pandrol	15-1/8"	7-3/4"	5-1/2"	23.5
Pandrol	15-3/4"	7-3/4"	6"	24.5

Notes:
(1) Single Shoulder Canted
(2) Double Shoulder Canted

2. JOINT BARS(1)

Rail Section	Length of Bar	Approximate Weight Per Single Bar (lbs)
115/119 RE	36"	46.9
136 RE	36"	55.2

Note:
(1) If handling compromise bars, use the heavier rail weight section for the estimate of the bar weight.

3. BALLAST

	Average Weight Per Cubic Foot		Average Weight Per Cubic Yard	
Type of Ballast	**Loose (lbs)**	**Compacted (1bs)**	**Loose (1bs)**	**Compacted (lbs)**
Granite	88	98	2,375	2,650
Trap Rock	104	114	2,800	3,075

4. FASTENERS

Type	Approximate Weight (lbs)
Fast Clips (Bag of 50)	75
“e” Clips (Bag of 50)	88
Track Bolts (including Keg) (1" x 5-1/2")	210
Track Spikes (including Keg)	210
Lag Screws (Bag of 100)	110
115/119 RE Rail Anchors (Bag of 50)	125
136 RE Rail Anchors (Bag of 50)	150

5. TIES AND TIMBERS

Type	Size	Approximate Weight (lbs)
Wood Cross Tie Red or White Oak	7"x 9" x 8'-6"	246
Concrete Cross Tie	8'-6"	780
Concrete Switch Tie	9' to 16'	105 lbs/ linear foot
Wood Switch Timber (7"x 9" x Length) Total Tie Weight	9' 10' 11' 12' 13' 14' 15' 16' 21' 22'	260 289 318 347 376 405 434 462 607 636

6.0 BONDED JOINTS AND RAILS

6.a BONDED INSULATED RAIL JOINTS

Rail Size	Rail Length	Approximate Total Weight (lbs)
115 RE	19'-6"	860
115 RE	26’	1,110
115 RE	39'	1,490
136 RE	19'-6"	995
136 RE	26'	1,290
136 RE	39'	1,880

6.b RAILS

Rail Size	Calculated Weight Per Yard (lbs)	Approximate Weight (lbs)
100 NH @ 33'	100.00	1,100
107 NH @ 39'	107.00	1,391
115 RE @ 39'	114.75	1,492
136 RE @ 39'	135.80	1,766

7.0 TURNOUT PANELS

7.a TURNOUT PANELS – Conventional No. 8 on Wood Ties

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	39'	7.5
Frog Panel	39'	9.2

7.b TURNOUT PANELS – Conventional No. 10 on Wood Ties

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	39'	7.5
Frog Panel	39'	10.8

7.c TURNOUT PANELS – Conventional No. 15 on Wood Ties (26' Curved Switch)

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	66'	11.5
Frog Panel	52'	15.0

7.d TURNOUT PANELS – Conventional No. 20 on Wood Ties (39' Curved Switch)

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	70'	14.0
Frog Panel	44'	13.9

8. HOOK FLANGE GUARD RAILS

Length (136 RE)	Approximate Weight	
	(lbs)	(tons)
9'	950	0.5
13'	1,350	0.8
20'	2,100	1.1
27'	2,800	1.5

9. RAILBOUND MANGANESE FROGS[(1)]

Turnout No.	Length	Approximate Weight	
		(lbs)	(tons)
8	18'	4,025	2.1
10	23'	5,025	2.6
15	26'-8"	5,625	2.9
20	34'-2"	6,925	3.5

Note:
(1) Approximate weights are for maintenance frogs with extended wing rails.

10. DIAMOND TRACK CROSSINGS

3 Rail	Approximate Weight	
	(lbs)	(tons)
High Angle Crossing (Ties Not Included)	14,000	7.0
Low Angle Crossing (Ties Not Included)	18,000	9.0

11a. AREMA SWITCH RAILS (115-119 RE)

Turnout No.	Stock Rail			Split Switch Point		
	Length	Approximate Weight		Length	Approximate Weight	
		(lbs)	(tons)		(lbs)	(tons)
10	27'-0"	1071	0.55	16'-6"	655	0.35
15	38'-0"	1,507	0.75	26'-0"	1,031	0.55
20	59'-6"	2,360	1.2	39'-0"	1,547	0.78

11b. AREMA SWITCH RAILS (136 RE)

Turnout No.	Stock Rail			Split Switch Point		
	Length	Approximate Weight		Length	Approximate Weight	
		(lbs)	(tons)		(lbs)	(tons)
10	27'-0"	1,223	0.62	16'-6"	748	0.38
15	38'-0"	1,721	0.87	26'-0"	1,177	0.59
20	59'-6"	2,695	1.35	39'-0"	1,767	0.89

12. WOOD-TIE TRACK PANELS

(136 RE)	Approximate Weight (tons)
39' Panel Length[(1)] (w/o 3rd rail ties)	4.5
39' Panel Length[(1)] (with 3rd rail ties)	4.6

Note:
(1) Pandrol plates 6" base and 21-1/4" tie spacing

13. HIGHWAY GRADE CROSSINGS – CONCRETE

Std. Track Panel[(1)] (lbs/track foot)	Crossing Track Panel[(2,4)] (lbs/track foot)	Concrete Gage Crossing Module[(3,4)] (lbs/track foot)	Concrete Field Modules[(3,4)] (lbs/track foot)
490.5	629.1	458	247

Notes:

(1) Concrete ties 8'6" long, spaced at 24" o.c. with Pandrol fasteners including galvanized e-clips, and 136 RE CWR.
(2) Concrete ties 10'0" long, spaced at 24" o.c. with Pandrol fasteners including galvanized e-clips and 136 RE CWR.
(3) Concrete crossing modules (available 8' or 12' lengths) for gage of track or field side.
(4) Total approximate weight per track foot is the crossing panel weight, the gage crossing module weight and two (2) times the field module weight.

14. HIGHWAY GRADE CROSSINGS – RUBBER

Shipping Weight Average per Skid (lbs)	Full Depth Heavy Duty Rubber Gage Crossing Pad[(1,3)] (each)	Full Depth Heavy Duty Rubber Field Crossing Pad[(2,3)] (each)
3,111	595	224

Notes:

(1) Rubber gage pad 3' length x 58-1/2" width x 8-1/4" depth for 136 RE rail.
(2) Rubber field pad 3' length x 22" width x 8-1/4" depth for 136 RE rail.
(3) Total approximate weight per track foot is the crossing panel weight, the gage crossing module weight and two (2) times the field module weight.

15. DECIMALS OF AN INCH

Fraction (inches)	Decimal (inches)
1/32	0.03125
1/16	0.06250
3/32	0.09375
1/8	0.12500
5/32	0.15625
3/16	0.18750
7/32	0.21875
1/4	0.25000
9/32	0.28125
5/16	0.31250
11/32	0.34375
3/8	0.37500
13/32	0.40625
7/16	0.43750
15/32	0.46875
1/2	0.50000
17/32	0.53125
9/16	0.56250
19/31	0.59375
5/8	0.62500
21/32	0.65625
11/16	0.68750
23/32	0.71875
3/4	0.75000
25/32	0.78125
13/16	0.81250
27/32	0.84375
7/8	0.87500
29/32	0.90625
15/16	0.93750
31/32	0.96875
1	1.00000



APPENDIX F

FORMS

This page intentionally left blank

APPENDIX F

FORMS

These forms are typical forms used in the inspection of maintenance of track and special track work by the MassDOT Rail and Transit Division.

This page intentionally left blank

RAIL DEFECT INSPECTION REPORT

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Operating Railroad Name: _____ Date of Inspection: _____

Detector Car Operator Name: _____

Route Tested: _____ Track _____ MP _____ to MP _____

Inspection Company: _____ Track _____ MP _____ to MP _____

Detector Car #: _____ Track _____ MP _____ to MP _____

Detector Car Defect Number	Defect Type	Defect Size	Track Number	Mile Post	Immediate Corrective Action	Date	Final Corrective Action	Date

To be signed and submitted after all final active correction is complete:

*Operating Railroad Supervisor's Name: _____ Date: _____

*Operating Railroad Supervisor's Signature: _____

*NOTE: Operating Railroad Supervisor is the Railroad Supervisor riding the detector car.

This page intentionally left blank

SPECIAL TRACK INSPECTION REPORT

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Name of Operating Railroad:			
Date Inspection Made:		Line Segment:	
Reason for Inspection:		Weather:	Temperature:
Location		Conditions Noted / Repairs Made	
Track Name/No.	M.P. – M.P.		
Deficiencies/Defects Found		Corrective Action Taken	
Operating Railroad Inspector's Name: (Print)			
Operating Railroad Inspector's Signature:			

This page intentionally left blank

RAIL FAILURE REPORT

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Name of Operating Railroad:			
Date Discovered:		**Date Repaired:**	
Line Segment:	**MP:**	**Track:**	**Rail:** N / S / E / W
Defect Location:			
Rail: Tangent	**Curve:** High Rail Low Rail	Degree of curve:	
Notes:			
Special Work Type:	**MP:**	**Turnout Name:**	
Notes:			
Detector Car Defect: No Yes		**Defect No:**	
Type of Defect:		**Size of Defect:**	
Service Failure Defect: No Yes	**Type:**	**Found by:**	
Type of Rail: Jointed CWR			
Rail Weight:	**Rail Section:**	**Manufacturer:**	
Year Rolled:	**Month Rolled:**		
Type of Weld: Field Plant		**Joint Bars to Weld:** No Yes	
Rail Information:			
Temporary Speed Restriction (TSR): No Yes _____ MPH			
Defective Glued Plugged Rail: No Yes Length _____			
CWR Plug Rail Installed: No Yes Length _____		**Plug Rail Number:** _____ - _____ - _____	
Boxed Anchored 200' from Joints: No Yes		**Form "TD" Required:** No Yes	
Rail Temperature when Anchoring:			
To be signed and submitted after all final active correction is complete:			
Operating Railroad Supervisor's Name: (Print)			
Operating Railroad Supervisor's Signature:		**Date:**	

This page intentionally left blank

CWR RAIL EXPANSION/HEAT RECORD REPORT

Operating Railroad/Contractor:		Weather:
Line Segment:	MP:	Track:

Date	Track Name/No.	Rail (N,S,E,W)	String Number	Start MP	End MP	Rail Temp. (°F)[1]	Req'd Temp. Change (°F)[2]	String Length (Feet)	Required Expansion (Inches)[3]	Installation Temp. Achieved (°F)	String Vibrated (Y/N)	Actual Expansion Recorded (Inches) Obtained at 1/4 Points[4]			
												1/4	1/2	3/4	Full

Notes:
(1) Temperature to be measured with approved rail thermometer.
(2) Required temperature change in °F is preferred rail neutral temperature of 110°F (RNT) minus the actual rail temperature at the time of expansion.
(3) See formula and table on reverse side of form.
(4) After string is anchored and/or clipped.

Operating Railroad Foreman's Signature: _____ **Date:** _____

Operating Railroad Foreman's Name (Print): _____

Formula for Coefficient of Linear Expansion of Rail:

$A = 0.000078 \times (T_D - T_E) \times L$

- A = Adjustment or Required Expansion amount of rail string (in inches)
- T_D = Desired Rail Neutral Temperature (RNT) should be 110°F if possible as conditions permit
- T_E = Existing or Actual Rail Temperature (°F) prior to heating or expansion measured with an approved rail thermometer
- L = Length of string to be adjusted (in feet)

Calculations:

Change in Rail Length Due to Change in Rail Temperature

A = Change in Rail Length in Inches = 0.000078ΔT x L
L = Length of Rail to be Expanded in Feet
ΔT = Change in Temperature in Degrees Fahrenheit: Desired RNT minus Actual Rail Temperature

Length of Rail (ft)	Change in Temperature in Degrees Fahrenheit															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Change in Rail Length in Inches															
100	1/8	1/8	1/8	1/4	1/4	1/4	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8	5/8	5/8
200	1/8	1/4	1/4	3/8	1/2	1/2	5/8	5/8	3/4	7/8	7/8	1	1-1/8	1-1/8	1-1/4	1-1/4
300	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8	1-7/8
400	1/4	3/8	1/2	5/8	7/8	1	1-1/8	1-1/4	1-1/2	1-5/8	1-3/4	1-7/8	2-1/8	2-1/4	2-3/8	2-1/2
500	1/4	1/2	5/8	7/8	1	1-1/4	1-3/8	1-5/8	1-7/8	2	2-1/4	2-3/8	2-5/8	2-3/4	3	3-1/8
600	1/4	1/2	3/4	1	1-1/4	1-1/2	1-3/4	1-7/8	2-1/8	2-3/8	2-5/8	2-7/8	3-1/8	3-3/8	3-5/8	3-3/4
700	3/8	5/8	7/8	1-1/8	1-3/8	1-3/4	2	2-1/4	2-1/2	2-3/4	3-1/8	3-3/8	3-5/8	3-7/8	4-1/8	4-3/8
800	3/8	5/8	1	1-1/4	1-5/8	1-7/8	2-1/4	2-1/2	2-7/8	3-1/8	3-1/2	3-3/4	4-1/8	4-3/8	4-3/4	5
900	3/8	3/4	1-1/8	1-1/2	1-7/8	2-1/8	2-1/2	2-7/8	3-1/4	3-5/8	3-7/8	4-1/4	4-5/8	5	5-3/8	5-5/8
1000	1/2	7/8	1-1/4	1-5/8	2	2-3/8	2-3/4	3-1/8	3-5/8	4	4-3/8	4-3/4	5-1/8	5-1/2	5-7/8	6-1/4
1100	1/2	7/8	1-3/8	1-3/4	2-1/4	2-5/8	3-1/8	3-1/2	3-7/8	4-3/8	4-3/4	5-1/4	5-5/8	6-1/8	6-1/2	6-7/8
1200	1/2	1	1-1/2	1-7/8	2-3/8	2-7/8	3-3/8	3-3/4	4-1/4	4-3/4	5-1/4	5-5/8	6-1/8	6-5/8	7-1/8	7-1/2
1300	5/8	1-1/8	1-5/8	2-1/8	2-5/8	3-1/8	3-5/8	4-1/8	4-5/8	5-1/8	5-5/8	6-1/8	6-5/8	7-1/8	7-5/8	8-1/8
1400	5/8	1-1/8	1-3/4	2-1/4	2-3/4	3-3/8	3-7/8	4-3/8	5	5-1/2	6-1/8	6-5/8	7-1/8	7-3/4	8-1/4	8-3/4
1440	5/8	1-1/8	1-3/4	2-1/4	2-7/8	3-3/8	4	4-1/2	5-1/8	5-5/8	6-1/4	6-3/4	7-3/8	7-7/8	8-1/2	9
1600	5/8	1-1/4	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8	7-1/2	8-1/8	8-3/4	9-3/8	10

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00900

MASS COASTAL RAILROAD PROCEDURES FOR THE INSTALLATION, ADJUSTMENT, MAINTENANCE AND INSPECTION OF CWR AS REQUIRED BY 49 CFR 213.118

THIS PAGE IS INTENTIONALLY LEFT BLANK

MASSACHUSETTS COASTAL RAILROAD

Massachusetts Coastal Rail Road
CWR Plan Procedures for the
Installation, Adjustment, Maintenance, and Inspection
of CWR as Required by 49 CFR § 213.118

Effective Date: Effective Date May 19th, 2023

Includes all Code of Federal Regulation Title 49 Part 213.218

THIS PAGE INTENTIONALLY LEFT BLANK

Massachusetts Coastal Railroad, LLC
Office of the Chief Engineer
Operations, Engineering and Maintenance Division
Lakeville MA

NOTICE TO USERS OF THIS MANUAL

This MANUAL entitled "PROCEDURES FOR THE INSTALLATION, ADJUSTMENT, MAINTENANCE AND INSPECTION OF CWR" was prepared by the Office of Chief Engineer, a part of the Operations, Engineering and Maintenance Division of the MASSACHUSETTS COASTAL RAILROAD, LLC. to comply with the requirements of the Federal Railroad Administration under the authority contained in 49 CFR Part 213.118, requiring submission of Continuous Welded Rail Plan meeting the requirements contained in 49 CFR Part 213.119.

The intent of the Office of VP Engineering is that the Official Submission, and therefore, the Recognized Plan of Procedures submitted in compliance with 49 CFR Part 213.118 is this Document. Previous Editions of Manuals and Plans are obsolete and not for Official Use. Mass Coastal Railroad personnel qualified in CWR are to possess a copy of these PROCEDURES while performing duties involving the Installation, Adjustment, Maintenance, and Inspection of CWR. The CWR plan is a separate chapter in MCRR's MW-1 field reference materials, and that chapter contains only the complete CWR program. Amendments must be outlined in a clearly identifiable manner within each revised plan.

CWR is a complex system and appropriate attention must be given to this plan to successfully utilize CWR's strengths to overcoming its weaknesses.

We seek your assistance in meeting the goal of a safe railroad operating on safe track. For purposes of clarity, the title of VP of Engineering can be used interchangeably with Chief Engineer.

Massachusetts Coastal Railroad, LLC
200 Myles Standish Boulevard
Taunton MA 02780

Applicable Railroad: Massachusetts Coastal Railroad LLC

P. Christopher Podgurski

P. Christopher Podgurski-President-POC
cpodgurski@masscoastal.com

Renker-VP Engineering

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

TABLE OF CONTENTS 1
Section 1 - CWR Installation Procedures 1
1.1 Introduction 1
1.2 Fabrication and Distribution 1
1.3 Installation and Adjustment of CWR 2
1.4 Installation of CWR 2
1.5 THERMAL EXPANSION OF RAIL 4
Section 2 - Rail Anchoring Requirements When Installing CWR 7
2.1 Anchors 7
Section 3 - Maintenance of the Desired Rail Neutral Temperature Range in Previously Installed CWR 9
3.1 Track Maintenance Procedures 9
3.2 The Three Methodologies of Readjustment: 10
3.3 De-Stressing/Traditional Rail Adjustment Methodology 12
3.4 Lining Curves to Adjust Rail Neutral Temperature 13
3.5 Procedures for Making Repairs to Buckled Track 14
3.6 Additional Considerations for Installing Rail Plugs in CWR Track 14
3.7 Field Welding in CWR Track 15
Section 4 - Monitoring Curve Movement (§ 213.119(e)) 15
4.1 Staking of Curves 15
4.2 Inspecting for Curve Movement 16
Section 5 - Trackwork that Disturbs CWR Track and Protections Required 16
5.1 General Requirements 16
5.2 Responsibility for Placing Speed Restrictions 16
5.3 Protections (Speed Restrictions) for Track Surfacing: 16
Section 6 - Special Inspections of CWR Track 19
6.1 General Speed Restriction 19
6.2 Special Inspection in Hot Weather 20
6.3 Special Inspection in Cold Weather 20
6.4 Annual Walking Inspection 21

6.5 Protection of Substandard CWR Track 21
Section 7 - Joints in CWR Track 22
7.1 Installation of Joints in CWR Track 22
7.2 Opening of Joints in CWR 22
7.3 Failure of Joint Bars and/or Track Bolts In A Joint In CWR Track 22
7.4 Number of Bolts 23
7.5 Cracked or Broken Joint Bars 23
7.6 Inspection of Joints In CWR Track 23
7.7 Identification of CWR Rail Joints as required by 213.119(h)(7). 25
7.8 Embedded Joints 26
Section 8 - Training 26
8.1 Instruction and Testing 26
Section 9 - Reporting Requirements for CWR Track and Appendix 26
9.1 Report of CWR Installations (49 CFR § 213.119(j)(1)) 26
9.2 Report Maintenance Work in CWR 27
Appendix A – Report of Rail Clipping/Anchoring 2
Appendix B – Tables B-a, B-b, B-c, and B-d 43
Appendix C – Readjustment Field Verification Form 48
Appendix D – Thermal Expansion of Rail 50
Appendix E – Thermal Adjustment Table for 780’ of Rail 52
Appendix F – Report A Record of Disturbance of Main CWR Track 54
Appendix G – Walking Joint Bar Inspection Form 56
Appendix H – Effective Change in Rail Length Due to Curve Shifts 58
Appendix I – Curve Alignment Reference Form 60

Massachusetts Coastal Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR

This document details the Massachusetts Coastal Railroad's (MCRR) policy for installing, adjusting, maintaining, and inspecting Continuous Welded Rail (CWR) track. Each chapter details how the Massachusetts Coastal Railroad applies its procedures to comply with § 213.119 of the Federal Railroad Administration's (FRA) Track Safety Standards (TSS).

Section 1 - CWR Installation Procedures

1.1 Introduction

A. On the Massachusetts Coastal Railroad (MCRR) rail welded together to create a single, continuous piece of rail that exceeds 400' in length is considered CWR as per §213.119. Track containing that piece of CWR is then designated as "CWR Track" and will remain as such, regardless of whether a rail joint or plug rail is later installed. Rail between 160 ft. and 400 ft. is not considered CWR but will be adjusted according to this document. Any employee who installs, adjusts, maintains, and inspects CWR must have a copy of this plan in their possession during the process of the work.

B. Temperature variations affect rail length causing it to expand (lengthen) when warmed and to contract (shorten) when cooled. When a rail is prevented from moving longitudinally, such as when CWR is properly installed and restrained, these thermal variations create compressive and tensile forces within the rail. The procedures outlined in this plan are designed to ensure that CWR is installed and maintained in a manner that effectively manages these thermal variations.

1.2 Fabrication and Distribution

A. Unloading
   1. CWR should be unloaded as close as possible to the position where it is to be installed with a minimum of further handling, giving special attention to accurately locating the ends of CWR.
   2. CWR should be placed parallel with the track and base down, avoiding excessive bending or damage, making use of suitable mechanical equipment when available. Care should be taken to avoid placing rails on manhole covers or close to air lines.
   3. CWR ends must be laterally displaced and blocked.

B. Use
   1. CWR fabricated by an approved process may be laid without restriction in fully ballasted tracks. When welded rail is laid on curves, particularly those sharper than 6 degrees, it must be closely monitored for any indication of movement up out of the plates.
      a. CWR may be laid across open deck bridges where bridge ties are spaced with timber blocks between ties provided that the following conditions are satisfied:
         1) All ties and blocks in a panel are tightly jacked and fastened together with guard timbers or spacing bars secured by lag screws in every tie.

2) Every other bridge tie is securely fastened to steel structure by means of a hook bolt, a tie anchors or other holding device in a manner approved by the VP - Engineering.
3) The bridge structure is properly anchored to abutments and piers to prevent any movement other than normal expansion.
4) CWR is fully box anchored or clipped across the bridge and for 200 ft. in each direction in accordance with Section 2 of this document.
5) Where bridge ties are not spaced with timber blocks between ties, CWR may be laid across open deck bridges under the following conditions:
    a) Across bridges up to and including three hundred ft. (300') in length on tangents, provided every other bridge tie is fastened to the steel structure by means of approved tie anchors and the CWR is clipped or anchored every tie for two hundred ft. (200') on each approach to the bridge in accordance with Section 2 Rail anchors should not be used on ties across the bridge.
    b) Bolted rails not longer than seventy-eight ft. (78') should be laid across open deck bridges on open deck bridges longer than three hundred ft. (300') on tangents, unless authorized in writing by the MCRR VP - Engineering.
6) After application of hook bolts, tie anchors or other approved holding devices, these devices must be checked and retightened weekly until ties have been fully seated on top flanges of built-up members.

1.3 Installation and Adjustment of CWR

A. General Considerations
    1. CWR may only be installed in existing track after it has been determined satisfactory conditions exist.
    2. The ballast cross section is to be fully restored before installation.

B. Desired Rail Neutral Temperature (DRNT)
    1. Rail Neutral Temperature (RNT) is the temperature at which rail is neither in tension nor compression. MCRR's Desired Rail Neutral Temperature Range is between 95°F and 115°F (also known as the "Safe Range").
    2. MCRR CWR must be anchored or have resilient fasteners applied ("clipped") at a rail temperature of 105°F (MCRR's Desired Rail Neutral or Target Temperature). The entire string being installed must be in a stress-free state before the installation of rail anchors or resilient fasteners begins. The heating of the rail should continue until the proper expansion of the rail is achieved. The proper expansion is based on MCRR'S Target Rail Temperature.

1.4 Installation of CWR

A. Rail may be expanded after it has been laid in the tie plates before or after spiking but must be expanded before it is anchored, or the resilient fasteners are applied.

B. The following procedures shall be used to install CWR longer than 400 ft. These procedures do not apply to the installation of plug rails or short track panels. The amount of rail laid at any one time is limited to 1600'. Longer rails can have

considerable resistance to longitudinal movement during installation which can inhibit proper rail expansion and result in not achieving a uniform laid temperature. Additional precautions should be taken when long strings are adjusted, i.e.: additional observers through the string to ensure the entire string is moving.

1. An approved infra-red rail thermometer shall be used to measure the rail temperature of all CWR before it is laid in track. The thermometer should be attached to the center of the web of the rail on the side of the rail that is shielded from the direct rays of the sun and left there long enough to determine the temperature accurately. A magnetic thermometer should not be placed on any of the raised figures of the rail brand.
2. If installed correctly, the RNT is established, and is equal to the RT.
3. When the rail temperature is lower than 105°F an approved rail heating device and/or a hydraulic rail stretcher must be used for expanding the CWR to make proper adjustment. This includes those rail temperatures falls within the portion of the Desired Neutral Temperature Range between 95°F and 105°F.
    a. Determine the amount of adjustment required to achieve the Desired Rail Neutral Temperature (DRNT).
    b. As noted above; if the RT is within the safe range and between 105°F and 115°F, further adjustment may not be required. This is also known as "Destressing By Natural Means." Measure the RT at the location where the anchors or clips are being applied to restrain the rail. If at any time the RT is no longer within the safe range (95°F to 115°F), stop fastening the rail and use the following procedures to ensure the appropriate expansion is achieved.
    c. If the RT exceeds 115°F, the installation must stop until the rail temperature returns to within that range or provisions must be made for readjustment prior to the arrival of cold weather. After reviewing the pertinent records, the MCRR VP Engineering may determine no further adjustment is necessary.
    d. If the RT is lower than the DRNT of 105°, the temperature differential for the adjustment shall be calculated from the difference between the actual rail temperature (RT) and the DRNT (105°). The table below describes the amount of rail that needs to be added or removed to affect that change in the rail neutral temperature (RNT) over a specific length of rail. This table will be used when installing CWR per this section or performing adjustments per Section 3.2.

1.5 THERMAL EXPANSION OF RAIL

Table Showing Rail Adjustment (in inches) Required to Change the RNT Over a Specific Distance.

Temp. Diff (°F)	Rail Length (in feet)												
	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
5	1/8	1/4	1/4	1/4	3/8	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8
10	3/8	3/8	1/2	1/2	5/8	3/4	3/4	7/8	7/8	1	1 1/8	1 1/8	1 1/4
15	1/2	5/8	3/4	7/8	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8
20	5/8	3/4	7/8	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	1 7/8	2	2 1/8	2 3/8	2 1/2
25	3/4	1	1 1/8	1 3/8	1 1/2	1 3/4	2	2 1/8	2 3/8	2 1/2	2 3/4	2 7/8	3 1/8
30	7/8	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 3/4	3	3 1/4	3 1/2	3 3/4
35	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 1/2	2 3/4	3	3 1/4	3 1/2	3 7/8	4 1/8	4 3/8
40	1 1/4	1 4/8	1 7/8	2 1/8	2 1/2	2 3/4	3 1/8	3 3/8	3 3/4	4	4 3/8	4 5/8	5
45	1 3/8	1 3/4	2 1/8	2 ½	2 3/4	3 1/8	3 1/2	3 7/8	4 1/4	4 5/8	4 7/8	5 1/4	5 5/8
50	1 1/2	2	2 3/8	2 ¾	3 1/8	3 1/2	3 7/8	4 1/4	4 5/8	5 1/8	5 1/2	5 7/8	6 1/4
55	1 3/4	2 1/8	2 5/8	3	3 3/8	3 7/8	4 1/4	4 3/4	5 1/8	5 5/8	6 1/8	6 3/8	6 7/8
60	1 7/8	2 3/8	2 ¾	3 ¼	3 3/4	4 1/4	4 5/8	5 1/8	5 5/8	6 1/8	6 1/2	7	7 1/2
65	2	2 1/2	3	3 ½	4	4 5/8	5 1/8	5 5/8	6 1/8	6 5/8	7 1/8	7 5/8	8 1/8
70	2 1/8	2 3/4	3 ¼	3 7/8	4 3/8	4 7/8	5 1/2	6	6 1/2	7 1/8	7 5/8	8 1/4	8 3/4

The table above contains adjustments rounded to the nearest 1/8 inch.

The following formula may be used instead for more precise calculations, or if the adjustment exceeds the temperatures shown in the table above.

A = 0.000078 x (105°F - RT) x L

where:

A = the amount the length a CWR string must be increased or decreased, in inches, to achieve the desired neutral temperature range,

RT = the existing temperature of the CWR before the heating process has begun,

DRNT = the Desired Rail Neutral Temperature (i.e., the rail temperature at the completion of the adjustment process which is 105°F for MCRR)

L = the length of the CWR in ft.

For example: to adjust the length of a 1,450 ft. CWR, anchored at a rail temperature of fifty degrees existing (50°F) to correspond to the length of this rail at one hundred-five degrees (105°F), subtract fifty degrees (50°F) from one hundred-five degrees (105°F) to obtain a difference of fifty-five degrees (55°F) and then multiply as follows:

0.000078 x 1,450 x (105 – 50) =

0.000078 x 1,450 x 55 = 6.2 inches

A. If the rail is laid at a temperature less than 95° F, it must be adjusted, or a speed restriction of 30 mph (miles per hour) Passenger/25 mph Freight must be placed until adjusted to within the safe range (95° to 115°F). When obvious tight rail conditions exist, or evidence that the lateral resistance of the track structure has been compromised, be governed by Section 6.

B. Space equal to the amount of expansion needed for each string of CWR should be provided between the end of that string and the near end of the next adjacent string. The clipping or anchoring operation shall consist of sufficient trackmen so that the work will progress closely enough behind the rail heater so that the string is held in place, and no loss of expansion occurs.

C. As demonstrated in Figure 1-1 below, apply match marks between the base of the rail and the tie, or tie plate, at stations located at the quarter, half, and three-quarter points of the rail being installed. Write the required expansion on the rail next to the matchmarks.

Rail Expansion Match Marks

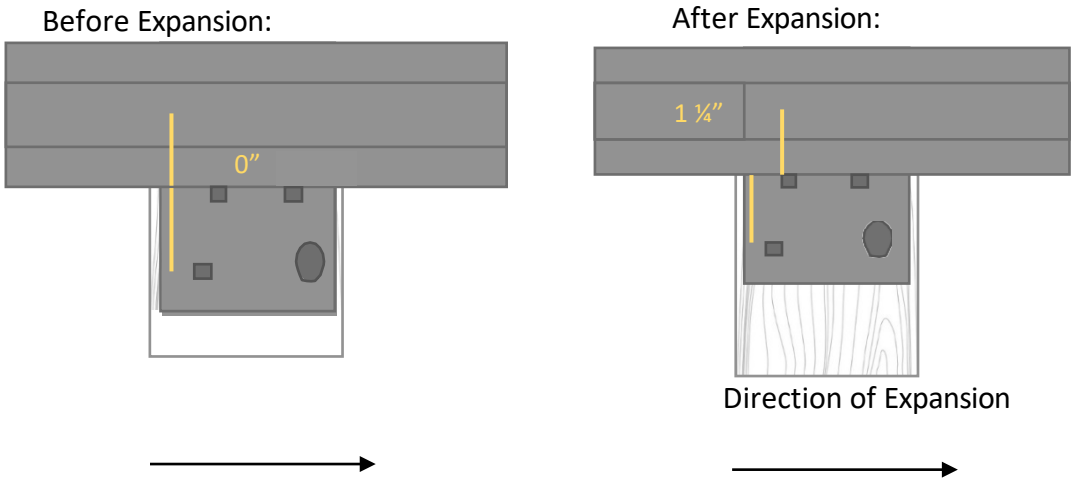


Figure 1-1

1. Quarter points should be marked on the rail and the tie plate toward the left edge of the plate, so that the amount of expansion can be accurately determined as shown below. The mark should extend high enough above the contact area of the clip to be seen, if resilient fasteners are being used, to fasten the rail. The tie plate used for marking as a reference point must be one that is either doweled or has been spiked, lock spiked, or screw lagged; so that it will not move as the rail expands. Particular attention must be paid to ensure that the rail does not bind on tie plates, spikes, or other obstructions.

D. Adjust the rail uniformly:
   1. Heat the rail evenly so that the rail expansion occurs at each station (as identified by match marks) as required. If the expansion is not achieved at a station, return to the previous station and heat that segment evenly until the proper amount is achieved.

2. Heating should be commenced at the beginning of the first CWR string and steadily applied while moving forward until the required expansion has been obtained at the end of the string. Uniformity of expansion is to be controlled by marking each quarter of the string and introducing expansion as follows:

   ¼ point - ¼ of total expansion

   ½ point - ½ of total expansion

   ¾ point - ¾ of total expansion

   End point – 100% of total expansion

3. If a rail puller is used for the adjustment, ensure the expansion is uniform and the required amount is achieved at each station.
4. Record all the rail installation information, location, and date on the appropriate rail installation form, Form "RC" Report of Rail Clipping/Anchoring located in Appendix A. Alternatively, these records may be retained in an electronic format as outlined per 49 CFR § 213.241(j).
5. Where CWR has been anchored at a rail temperature below 95°F or above 115°F, and not adjusted for temperature during the rail laying operation, a speed restriction of not more than 30 mph P and 25 MPH F shall be applied to the track until the CWR is properly adjusted. If the CWR is anchored or clipped at a temperature greater than 115°F the rail may remain in track without restriction with the permission of the MCRR VP Engineering.
6. The qualified person in charge of installing the CWR shall be responsible for recording on the appropriate form ("Rail Clipping/Anchoring Record", or the current approved form for this purpose) the rail temperature for which each CWR string is anchored. The Manager should forward copies to the Engineering office and to the MCRR VP Engineering, retaining one copy for his records.

E. Adjustment of Strings of CWR
   1. CWR may be adjusted by heating, the use of a hydraulic rail stretcher, or by natural means.
   2. All rail anchors or resilient fasteners must be left uninstalled or removed on strings of CWR requiring adjustment to permit the desired expansion or contraction. An approved mechanical vibratory device must be used to free the rail. If a vibrator is not available, and if the CWR Track is constructed with wood crossties the tie plates must be tapped with a hammer to free the rail. The rail must not be struck with a hammer during that process. If the CWR Track is constructed with concrete ties the head of the rail may be lightly tapped with a hammer, but only on the field side. No other portion of the rail should be struck. No trains should be run until all required rail anchors or resilient fasteners are reinstalled.
   3. If tapping of the rail fails to achieve movement of the plates or rail, a spike or roller should be placed between the base of the rail and the tie plate to allow the rail to move. The placement of the spike or roller should begin at the far end of the string and move towards the beginning of the string to prevent a binding of the string.

4. All rail anchors or resilient fasteners must be reapplied immediately after the CWR string has achieved proper expansion based upon the Desired Neutral Temperature Range. The application of anchors or resilient fasteners will begin once the proper expansion is achieved at the first quarter point.
5. CWR should be heated and vibrated so that expansion is introduced from one end of each string to the other in the direction of rail laying.
6. If the heated CWR string does not have the required expansion at each quarter point, the heater will back over the heated portion, without applying heat, and then reheat the rail until the necessary expansion is obtained.
7. During and subsequent to heating, resilient fasteners or anchors shall be applied to the patterns specified in Section 2 to prevent the rail from losing expansion. If resilient fasteners fail to hold expansion, rail anchors in the pattern of the following paragraph shall be applied.
8. When using rail anchors to control expansion in a string of CWR a minimum of twenty (20) consecutive ties shall be box anchored at the expanded end of the quarter in accordance with the standard pattern, immediately after the gap is closed, to hold the expansion. This assumes that the first three quarters of a string has been adjusted and anchored properly; and the last quarter of the string is being held in place by the 20 anchors for a brief period until fully anchored.
9. The entire CWR string is to be anchored in accordance with Section 2 before trains are permitted to operate over it.

Section 2 - Rail Anchoring Requirements When Installing CWR

2.1 Anchors

A. Where the anchoring function is otherwise provided, such as resilient rail fasteners that restrain the rail or bridges where the structure design precludes the use of anchors (e.g. bridges with rail expansion joints), rail anchors may be omitted.

B. Anchors shall not be applied where they will interfere with signal or other track appliances, where they are inaccessible for adjustment or inspection, or are opposite a rail joint on the other rail.

C. Anchoring requirements apply to CWR installation on all Classes of track.

D. When a crosstie has four properly installed resilient fasteners, it will be considered as a fully box anchored tie.

E. When using standard rail anchors, anchors must be applied to each rail at the crosstie; either on one side or both sides of the crosstie.

F. When rail anchors are the selected method to control expansion of CWR, all crossties will be Fully Box Anchored in accordance with the following:
   1. Curves three degrees (3°) and over
   2. Grades greater than 2.5%
   3. Through all rails of turnouts and crossovers as much as practicable
   4. For two hundred ft. (200') in each direction from:
      a. Highway Grade Crossings

b. Bolted ends of CWR strings, except when CWR strings are butt welded together
c. Main track turnouts and crossovers
d. Track crossings (diamonds)
e. Insulated joints (including glued plug joints)
f. Hot box, Dragging equipment and Wheel impact load detectors
g. Direct Fixation Track
h. Open deck bridges
i. On the fixed side of Expansion joints
j. Joint in CWR that has not been thermite welded or fully bolted before the passage of 60 days

G. Fully Box Anchor Every Other Crosstie:
1. Every other location not noted herein

H. Omit Rail Anchors Entirely:
1. On the moveable side of Expansion joints
2. Through the paved or paneled areas of Highway grade crossings

I. Bridge Pattern
1. When installing CWR, follow these bridge anchoring requirements:
a. Ballast deck bridges shall be anchored with the same pattern as in Sections 2.F and 2.F.4.
b. Open deck bridges shall be solid box anchored across the bridge and 200 feet in each direction.

J. Legacy Patterns
1. CWR installations completed before September 21, 1998, pre-existing railroad standard anchor patterns may remain if the rail is restrained to prevent track buckles, but rail must be adjusted (by increasing or decreasing the length of rail or by lining on curves) or anchors added to the rail if restraint is insufficient.

K. Anchor Pattern after Repair
1. When repairs result in a rail joint being added to CWR, the anchor pattern shall match the existing pattern in track. At least every other tie will be box anchored 200 feet in each direction unless anchoring is otherwise provided. When repairs are made to a stripped joint or failed joint bar, the adjustment or addition of anchors will be as prescribed in the following table. The adjustment or remedial action must be documented and retained.

Section 3 - Maintenance of the Desired Rail Neutral Temperature Range in Previously Installed CWR

3.1 Track Maintenance Procedures

A. Once the CWR string has been installed and adjusted correctly within the Safe Range, use the following track maintenance procedures to properly maintain RNT and reduce the risk of buckles in hot weather as well as pull-aparts and broken rails in cold weather. These procedures include an RNT Readjustment Method outlined in Section 3.2 and, for cases when that method is not applicable or desirable, a De-stressing (conventional RNT adjustment) method outlined in Section 3.3. Additionally, Section 3.4 contains procedures for the limited cases where RNT may be restored by lining of curves.

B. Table 3-A below uses the assumptions of what is often referred to as the 70/70 Rule. The table is based upon the assumptions that: only one rail has been cut or broken, the uncut rail's RNT is 70°F, and the track structure can restrain against the forces of a rail temperature that is at least 70°F above the average RNT of both rails. If either of these assumptions are known to be overly conservative, the temperature at which to adjust or apply a speed restriction shall be reduced accordingly.

Rail break or cut Temperature (°F)	Rail temperature (°F) at which to apply slow order
60	135
50	130
40	125
30	120
20	115
10	110
0	105
-10	100
-20	95
-30	90
-40	85

Table 3-A

C. The slow order based on the table 3-A above will be 30 P/25 F.

D. If both rails are cut (e.g., installing a short track panel), the above table will not apply. The adjustments, speed restrictions, and inspections described above will instead apply at a rail temperature no more than 70°F above the lowest rail temperature at the time of the separations.

E. At locations where the rail has separated, unless the reference marks are restored to their original position, the coldest rail temperature at which work is performed at the location shall be used. For example, if a plug rail is installed at a rail temperature of 40°F, and a joint later fails at 10°F, the appropriate line to reference on the table will be that for 10°F. If the reference marks are restored to their original position, the Pre-Break/Cut RNT may be used for applying the table.

F. CWR strings may be field butt welded by an approved process into long lengths in all classes of track. Where necessary to use a short rail to connect CWR strings, that rail should be at least fourteen ft. (14') in tangents and at least twenty-one ft. (21') in curves.

G. If it becomes necessary to apply joint bars temporarily the end bolt hole in each rail must not be drilled to permit subsequent prompt field welding. It may be necessary to apply additional anchors to prevent pull-aparts prior to a field weld being made.

H. If both rails are cut (e.g.: installing a short track panel), the above table will not apply. The adjustments, speed restrictions, and inspections described above will instead apply at a rail temperature no more than 70°F above the lowest rail temperature at the time of the separations.

I. At locations where the rail has separated, unless the reference marks are restored to their original position, the coldest rail temperature at which work is performed at the location shall be used. For example, if a plug rail is installed at a rail temperature of 40°F, and a joint later fails at 10°F, the appropriate line to reference on the table will be that for 10°F. If the reference marks are restored to their original position, the Pre-Break/Cut RNT may be used for applying the table.

3.2 The Three Methodologies of Readjustment:

A. The procedures in this section apply only to certain rail separations occurring in CWR. These separations include the placement of a single weld or replacement of rail, which is usually less than 100 feet in length. Which procedure is used is determined by the ability to accurately measure the distance between the reference marks. In addition to planned cuts in the rail, this section may be applicable to broken rails and failures in permanent glued insulated joints.

B. For the readjustment methodology to work as intended, the expected thermal forces must be present prior to the rail separation. Thermal forces must also not be prevented from being released due to extraordinary resistance from the track structure. Therefore, this methodology must not be used when the separation occurs:
    1. within 400 feet of a fixed object (e.g.: turnout, crossing, bridge);
    2. within 800 feet of a known location
    3. where there are other means of releasing the thermal force buildup (e.g., expansion joints); or
    4. where the thermal forces have been previously released.
    5. In all of these scenarios where this readjustment methodology doesn't apply, and in cases where there are incomplete records, Section 3.3 must be used.

C. Readjustment Methodology:
    1. Prior to cutting the rail, apply reference marks (RM) with a permanent paint pen outside of the rail section to be removed and beyond where they may be damaged by the work or covered by the application of joint bars. Reference
    2. marks should be placed a whole number of feet apart. Write the original distance between the reference marks to the outside of each reference mark.
    3. When applying reference marks at the location of a broken rail, do not include the gap between the rail ends as part of the reference mark distance.

4. Measure the RT in the center of the web on the shaded side of the rail.

D. Cut the rail and measure the gap between the rail ends after the cut, or upon arrival in the case of a broken rail. If the rail ends move apart, the gap will be a positive (+) number; if the rail runs in, the gap will be a negative (-) number.
    1. If there is a negative gap, which is indicated by the rail saw blade binding during the cutting process, torch cutting will be required. Remove anchors 200 ft. in each direction from the location of the cut; and tap the tie plates to ensure the rail is in a stress-free state prior to measuring the gap. Before measuring the negative gap, bypass the rail ends to allow the rail to run in.
    2. If the RT is outside of the safe range (95°F to 115°F) and the gap cannot be accurately measured for any reason, Section 3.2 does not apply, an adjustment must be made in accordance with Section 3.3.

E. Estimate the pre-break/cut RNT based on the measured gap and RT.
    1. If zero gap is observed, the pre-break/cut RNT is equal to the RT.
    2. If a positive gap is observed, refer to the appropriate Pre-Break/Cut Table in Appendix B for the rail size and fastener type.
    3. If a negative gap is observed, the current RNT is equal to the current RT. The rail run-in will be subtracted from the original reference mark distance when calculating any required adjustment.

F. Refer to MCRR's DRNT (Safe Range - 95° to 115°F) and determine the required adjustment from the pre- break/cut RNT (or current RNT for negative gaps).
    1. If within the safe range (95° to 115°F), no adjustment is required and the reference marks may be restored to their original measurement; however, it is preferable to adjust to 105°F.
    2. If outside the safe range (95° to 115°F), subtract the pre-break/cut RNT (or current RT for negative gaps) from the DRNT to determine the required RNT adjustment. Refer to the Thermal Adjustment Table for 780 Feet of Rail in Appendix E to determine how much the reference mark distance needs to change to achieve the desired RNT adjustment.

G. If the final adjustment and welds are not completed at this time, complete the designated form (Appendix F), and record the following on the rail in permanent paintpen:
    1. Work group/gang number
    2. Date
    3. Original reference mark distance
    4. Rail temperature from Step 3.2.C.4
    5. Gap size
    6. Change to reference mark distance, in parentheses

H. All follow-up work at this location prior to the final adjustment and closure weld shall be considered part of a single disturbance. For follow-up work, complete the designated form (Appendix F) and record the following on the rail in permanent paint pen:
    1. Gang/work group number
    2. Date
    3. Rail temperature at the time of the follow-up work

4. Change to reference mark distance, in parentheses

I. When making the final closure weld at the location, ensure to compensate for the weld material, or rail consumption, so the desired final reference mark distance determined in Step F. is achieved.

J. Remove anchors for 200 ft. in each direction to create a more uniformly adjusted RNT.

K. Complete the final closure weld and reposition or reapply the anchors.

L. Complete the designated form for the final repair and record the following on the rail in permanent paint pen:
   1. Milepost location (unless documented during Section 3.2.G)
   2. Work group/gang number
   3. Date
   4. Original reference mark distance (unless documented during Section 3.2.G)
   5. Rail temperature
   6. Gap size (unless documented during Section 3.2.G)
   7. Change to reference mark distance after work is complete, in parentheses

3.3 De-Stressing/Traditional Rail Adjustment Methodology

A. Rail can be restored to the safe range (105°F +10°F/-10°F) through destressing, also referred to as a traditional or conventional adjustment. This process is used at locations that are shorter than those applicable under Section 1 and those locations where Section 3.2 is not applicable. If there is any doubt that the opposing rail's RNT is within the safe range (105°F +10°F/-10°F), such as indications of running or tight rail, both rails must be de-stressed.

B. Rail being destressed may be under extreme compression and may move unexpectedly either vertically or laterally, especially in warmer weather. Use a designated safe procedure to cut the rail prior to removing anchors. When cutting both rails, stagger rail cuts on opposing rails by at least 3 ties.

C. De-stressing/Traditional Adjustment Procedures:
   1. Prior to cutting the rail, apply reference marks with a permanent paint pen outside of the rail section to be removed and beyond where they may be damaged by the work or the application of joint bars. Reference marks should be placed a whole number of feet apart. Write the original reference mark distance to the outside of each reference mark.
   2. Cut the rail using designated safe procedures or remove the joint bars.
   3. Remove anchors in both directions from the cut for a minimum of 390 feet, or up to a restriction that prevents rail movement such as a turnout, crossing, bridge, etc. Ensure the rail can move freely, tapping tie plates as needed, so all thermal forces are released.
   4. Measure the gap after the rail has been cut and unfastened. If the rail ends move apart, the gap will be a positive (+) number; if the rail runs in, the gap will be a negative (-) number.
   5. Take the rail temperature and reference against MCRR's DRNT of 105°F
      a. If the RT is above MCRR's DRNT, proceed to Section 3.3.C.5.g.

b. If the RT is below the MCRR's DRNT but within the safe range (95° to 115°), it is preferable to continue to Section 3.3.C.5.d, but acceptable to proceed to Section 3.3.C.5.g.
c. If the RT is below MCRR's 95°F, proceed to Section 3.3.C.5.d.
d. Use the formula below or reference the Thermal Expansion of Rail Table in Appendix A to determine the required adjustment for the length of rail being adjusted and the temperature differential between the RT and MCRR's DRNT (105°F).

$$A = 0.000078 \times (105°F - RT) \times L$$

e. When trimming the rail ends, ensure to compensate for the weld material, or rail consumption, so the desired adjustment is achieved.
f. Apply match marks between the base of the rail and the tie plate at stations located at the midpoints of rail being destressed. Write the required expansion on the rail next to the match marks.
g. Weld the rail or apply joint bars with provisions to ensure the adjustment is retained once welded.
h. Reapply the anchors.
i. Measure the reference marks to determine the RNT after the adjustment by referencing the Thermal Expansion of Rail Table in Appendix A or using the formula in Section 3.3.C.5.d.
j. Complete the designated form (Appendix F - CWR Track Disturbance Form TD) and record the following on the rail in permanent paint pen:
    1) Milepost location
    2) Work group/gang number
    3) Date
    4) Reference mark distance after rail is cut and de-anchored
    5) Rail temperature
    6) Gap after anchor removal
    7) Change to reference mark distance after work is complete, in parentheses
    8) "Adjusted" or "Adj." and the length of rail de-anchored
    9) Final RNT after the adjustment

3.4 Lining Curves to Adjust Rail Neutral Temperature

A. Under certain circumstances, lining of curves may be utilized to restore rails to the safe range (95°F to 115°F). This procedure is only applicable on curves that have been staked, with at least 3 stakes placed every 200 feet through the length of the curve; and had a known RNT on both rails prior to any track shifts or mechanical lining. If a staked curve that has a known RNT and has shifted, the curve may be realigned to the original stake distances to restore the RNT. If a rail separation has occurred and resulted in a change to the RNT, this section will not apply, and Section 3.2 or Section 3.3 must be employed.

B. In emergency situations, a curve may be lined outward to alleviate excessive compressive forces, but the RNT will need to be reestablished via one of the procedures outlined in this chapter.

C. This procedure may only be used with express written permission of the VP Engineering of MCRR.

3.5 Procedures for Making Repairs to Buckled Track

A. In the event of buckled track, the following conditions exist, and procedures are to be followed:
   1. Cut both rails with a torch one rail past the end of displacement using an "H" cut and if possible, before cutting the rail, line the track at the point of displacement in the direction of the displacement to further reduce the stresses in the rail. If the displaced area is near a joint, then the joint bars should be removed.
   2. Misalign the cut or uncoupled ends allowing the ends to bypass.
   3. Bring the track back into correct alignment.
   4. Both rails in both directions going away from the point of maximum displacement for a distance of 1,320 ft. are now considered to have lost their adjustment. These rails must be readjusted according to Section 3.2. In those cases where the buckle occurs at a fixed object (grade crossing, turnout, etc.) the readjustment need only take place in the direction away from the fixed object. However, a close inspection of the track on the other side of the fixed object is required to determine if there is any evidence of rail or track movement, rail bunching, etc. which may indicate improper adjustment in that location.
   5. If the area cannot be readjusted before running a train a 10-mph temporary speed restriction must be applied until the rails are readjusted. Alignment measurements should be taken to ensure that the track meets minimum alignment requirements for the Class of Track at which the track is to be returned to service as shown in the MW-1 §213.55.
   6. Rails that have been torch cut during the corrective procedure will be removed from track promptly and protected by a maximum 10 mph slow order until the rail is removed from track.
   7. New heat records will be prepared on the MCRR Maintenance Rail Clipping/Anchoring form with the new adjusted temperatures. The Manager will forward one copy to his immediate superior and one to the MCRR VP- Engineering, retaining one record for his records.

3.6 Additional Considerations for Installing Rail Plugs in CWR Track

A. CWR strings may be field butt welded by an approved process into long lengths in all classes of track. Where necessary to use a short rail to connect CWR strings, that rail should be at least fourteen ft. (14') long in tangent and at least twenty-one ft.(21') in curves.

B. If it becomes necessary to apply joint bars temporarily the end bolt hole in each rail must not be drilled to permit subsequent prompt field welding. It may be necessary to apply additional rail anchors to prevent pull-aparts prior to a field weld being made.

C. CWR strings are to be fastened to each other with fully bolted rail joints, except as provided in paragraph 3.6.B above.

3.7 Field Welding in CWR Track

A. When field welding joints between CWR strings that have been temperature adjusted, or field welding plugs previously installed in properly adjusted CWR Track; the necessary gap for welding will not be developed by allowing the rail to contract. The following method will be used:
   1. After removal of the joint bar, remove with an approved rail saw one inch (1") of rail to provide the required welding gap. If a "Wide Gap" Field weld is to be used the gap shall be as required by the manufacturer. Torch cutting of rail is prohibited.
   2. If required to maintain the proper gap apply a hydraulic expander to return the rail ends to the required gap and while holding this position, proceed to make the weld in accordance with existing procedures.
   3. If a hydraulic expander is used, remove rail anchors or rail clips for 200 ft. on both sides of the joint to be welded before the expander is applied.
   4. Upon completion of weld restore anchors or clips in each direction to effective positions as required before removal of the hydraulic expander.

B. All other provisions contained in §120.1 THERMITE FIELD WELDING of the MW-1 will be followed when field welding is conducted.

Section 4 - Monitoring Curve Movement (§ 213.119(e))

4.1 Staking of Curves

A. Before surfacing and lining curves on main tracks or sidings, stake the curve if it is 3° or sharper and the rail temperature is more than 50°F below the area's DRNT (or is forecasted to be in the next 24 hours), or the air temperature is 40°F or below.

B. To stake a curve prior to surfacing and lining, place at least 3 reference points uniformly spaced around the curve as well as each Full Body Tag. These reference points shall be placed no more than 200 feet apart. These points are to be recorded on Curve Alignment Reference Form included in Appendix "I" of this document. Measure from the reference point to the field side of the high rail of the track to be checked before any work is conducted; and record the results on the form. The reference points shall be remeasured immediately after the final surfacing pass by the surfacing gang foreman. The measurements shall be measured before track is returned to normal speed. If the curve has movement of 2" to the outside or 1" to the inside, protective slow order not to exceed 30 MPH shall be placed on the curve or curves in question. The restriction shall remain in effect until the curve is realigned to the original stake measurements or both rails are readjusted to the Desired Neutral Temperature Range. As an additional protection the reference points should also be remeasured 7 days after the work is completed. The same movement limits apply at that time.

4.2 Inspecting for Curve Movement

A. Inspect for curve movement periodically after the work, especially during periods of large temperature changes. Where a curve has been staked per Section 4.A and the curve has shifted inward more than 3 inches, the curve must be lined out or destressed prior to becoming a buckle prone condition. If the curve is not lined out or de-stressed, a speed restriction shall be applied as designated by someone qualified under 49 CFR § 213.7. Tight rail conditions are governed by Section 6.B.

Section 5 - Trackwork that Disturbs CWR Track and Protections Required

5.1 General Requirements

A. Speed restrictions facilitate safe train operations until the affected track stabilizes.

B. Restrictions need to stay in place to allow the ballast to consolidate, rail compressive forces to equalize, and the subgrade to compact. Take more restrictive measures when conditions warrant.

5.2 Responsibility for Placing Speed Restrictions

A. During the work or before returning the track to service, the supervisor or foreman in charge must ensure that the track speed does not exceed 15 mph P/ 10 mph F until the following conditions have been met:
   1. Gage, surface, and alignment have been re-established.
   2. Crib and shoulder ballast are up to standards, or lateral restraint is otherwise provided; and the rail is anchored as outlined in Section 2.

B. Place a temporary speed restriction anytime the roadbed or ballast section is disturbed as described in this Section, except where the maximum authorized speed of the track is equal.

5.3 Protections (Speed Restrictions) for Track Surfacing:

A. When the following track surfacing has been performed, place a speed restriction that complies with the guidelines below:

Air Temp.	Distance	Wood Tie Track Protection	Concrete Tie Track Protection
Protections to be applied for Surfacing with <u>NO</u> Dynamic Stabilizer:			
Does Not Exceed 70 deg.	0 ft. to 10 ft.	None	None
	11 ft. to 40 ft.	None*	None*
	41 ft. to 200 ft.	30 MPH P/25 MPH F for 24 hours and the passage of 12 trains	30 MPH P/25 MPH F for 24 hours and the passage of 12 trains**
	Over 200 ft.	30 MPH P/25 MPH F for 24 hours and the passage of 12 trains	30 MPH P/25 MPH F for 24 hours and the passage of 12 trains**
Does Exceed 70 deg.	0 ft. to 10 ft.	None	None
	11 ft. to 40 ft.	30 MPH P/25 MPH F for 24 hours and the passage of 12 trains	30 MPH P/25 MPH F for 24 hours and the passage of 12 trains**
	40 ft. to 200 ft.	30 MPH F/25 MPH F for 24 hours and the passage of 12 trains	30 MPH P/25 MPH F for 24 hours and the passage of 12 trains**
	Over 200 ft.	30 MPH F/25 MPH F for 24 hours and the passage of 12 trains	30 MPH for 24 hours and the passage of 12 trains**
Protections to be applied for Surfacing <u>USING</u> a Dynamic Stabilizer:			
Does Not Exceed 70 deg.	41 ft. and above **WITH** the use of a **Dynamic Stabilizer**	30 MPH P/ 25 MPH F for the first train, then 70 MPH P for the passage of 24 hours **and** 11 additional trains	30 MPH P/25 MPH F for the first train, then Normal Speed
Does Exceed 70 deg.	41 ft. and above **WITH** the use of a **Dynamic Stabilizer**	30 MPH for the first train, then 60 MPH for the passage of 24 hours **and** 11 additional trains	30 MPH for the first train, then 70 MPH for the passage of 24 hours **and** 11 additional trains
Applies to ALL Surfacing:			
Does Exceed 70 deg. And Rail Temp. Exceeds 105°F.	All Distances	STOP Work	STOP Work

* - If the air temperature does exceed 70 deg. during the 24 hours following the work, then a 30 MPH restriction must be placed on the worked area.

** - A Maximum Restriction of up to 60 MPH restriction may be applied only if a Shoulder and Crib Compactor is used immediately after surfacing. If a restriction greater than 30 MPH restriction is applied, the first train over the affected area must be limited to 30 MPH. A train in this table means a locomotive and at least 5 cars.

B. Other Provisions for Protecting Trackwork

1. Out of Face Curve Realignments
   a. When a curve is Realigned Out of Face in excess of the following amounts:

Curve Under 2°	2” to the Outside
	1” to the Inside
Curve 2° and Over	1” to the Outside
	1” to the Inside

   b. It will be considered to have lost its neutral temperature and will have to be adjusted in accordance with Section 3.3. Out-of-face curve realignment is defined as shifting a curve consistently in one direction at all throw points. The normal balancing of throws done during high-speed surfacing operations does not constitute out-of-face curve realignment.
2. Tie Renewal:
   a. The track affected by the tie renewal operation must be inspected by an MW-1 and CWR Plan qualified employee prior to returning the track to service at any speed.
   b. A protective slow order not to exceed 30 mph P/ 25 mph F will be applied for a period of twenty-four (24) hours and a minimum of twelve (12) trains over the affected track.
   c. If during the period of work the air temperature reaches or exceeds 85°F an MW-1 and CWR Plan qualified employee will conduct a second walking inspection after the passage of the first train to assure no deficiencies (i.e., misalignments, ballast section, anchoring, etc.) exist that would adversely affect the safe passage of trains.
3. Tie Renewal In Curves
   a. In addition to the protections for tie renewal in Section 5 E.(ii) above, if 1,000 ties per mile or more are installed, or if one in three or more ties are renewed in a particular curve, any curve in that mile or the curve in which one in three or more ties are renewed; the curve or curves in question should be staked (as described in Section 4.A) before tie installation begins. The movement should be measured before track is returned to normal speed. If the curve has movement of 2" to the outside or 1" to the inside, protective slow order not to exceed 30 MPH P/25 MPH F shall be placed on the curve or curves in question. The restriction shall remain in effect until the curve is realigned or both rails are readjusted to the Desired Neutral Temperature Range.
4. Use of Dynamic Stabilizer
   a. Whenever a Dynamic Stabilizer is to be used as a part of surfacing operation, it will be:
      1) Operated after each pass of the tamper; and
   b. Both vibration units must be fully operable, and the frequency of oscillation shall be in the range of 30-35 Hz, with a minimum vertical loading pressure of 870 psi and working speed shall be in the range of 1.0 - 2.0 MPH.

c. Track raises ahead of the use of a Dynamic Stabilizer should not exceed 3".
d. Cribbing:
    1) If three (3) or more ties are removed in any 39 foot track segment the protective slow order not to exceed 30 mph P/25 mph F for a period of twenty-four (24) hours and the passage of twelve (12) trains over the affected track once the cribs have been refilled and the track has been properly tamped.
e. Suspension of Work:
    1) In addition, the following work will be suspended when air temperatures are expected to be 95°F or above during a twenty four (24) hour period:
        a) High Speed Surfacing
        b) Smoothing (From 11:00 AM to 8:00 PM)
        c) Tie Renewal (Except under a continuous track outage)
f. Protection of Work Areas for Latent Effect
    1) Track that has been worked within seven (7) days prior to the onset of high heat will be reduced to the Slow Order speed required under Sections 5 D and E any time the air temperature reaches 95°F. This requirement applies until seven (7) days of traffic has been accumulated, or the period of high heat ends. The speed restriction, if required after the initial twenty-four (24) period, will be in effect during the period of the day that the air temperature at 95°F or above.
    2) Each foreman in a work block is responsible for the protection and inspection requirements of Section 5as they relate to the work conducted under the foreman's control. In the case where a foreman is working in an Out of Service block of track under the control of another foreman, but at a separate location from the foreman providing protection, this foreman will report the result of required inspections, if any, to the foreman in charge of the track before reporting clear of the track. This report must include any required speed restrictions and any other information that would affect the safe movement of trains.
    3) Deviations from this part will be done with the permission of the MCRR VP Engineering.

Section 6 - Special Inspections of CWR Track

6.1 General Speed Restriction

A. During periods of extreme heat, when air temperatures are 95°F or above during a twenty-four (24) hour period, a general speed restriction of 30 mph will be placed in effect over the affected territory for the period that the air temperature is 95°F or above. The general speed restriction will be placed and removed by the VP Engineer or his representative specifying the territory over which the restriction is to be applied.

6.2 Special Inspection in Hot Weather

A. Each day the air temperature is 95°F or above, all main tracks and sidings controlled by a train dispatcher will be inspected by qualified Track Inspectors in accordance with currently established inspection procedures, outlined in this plan. An inspection must also be conducted when there is an ambient temperature change exceeding 40°F in 24 hours. The Track Inspector will make out a Special Track Occurrence Report for this inspection, submit it to the Roadmaster of Track or equivalent and send a copy to the MCRR VP Engineering.

B. During this inspection, the Track Inspector must be particularly alert for wavy track, longitudinal rail movement, kinked joints in compression and evidence of lateral track movement. The Track Inspector must also be aware that the following conditions increase the possibility of buckling:
   1. Recently worked track
   2. Mud spots
   3. Existing deformations in line and surface
   4. Fixed facilities (i.e., turnouts, road crossings, bridges, etc.)
   5. At the bottom of sags
   6. Locations of heavy braking; near passenger platforms or near interlockings where trains repeatedly change tracks
   7. Sub-standard ballast section
   8. Sub-standard anchor pattern
   9. Kinky or wavy rail
   10. Improperly seated rail; rail canting or lifting out of the tie plates
   11. Shiny marks on the base of the rail indicating that the rail is running through the anchors and spikes
   12. Gaps in ballast at the ends of ties; or
   13. Churning ballast and ties.

C. If any track is identified as having any conditions which indicate the possibility of buckling, immediate protective action must be taken in the form of a slow order or removal from service, depending on severity.

6.3 Special Inspection in Cold Weather

A. The MCRR VP Engineering or his designee will initiate a cold weather inspection when the temperature reaches 5°F or below. This patrol will be completed within the next 12 hours. When the temperature does not exceed 5° for periods greater than 24 hours, the main track will be patrolled once each 24-hour period for the duration of the low temperature.

B. When for the first time in a season, the temperature reaches 20°F or below, a patrol of all main tracks and sidings will be conducted within the next twelve hours.

C. When the temperature drops from a temperature of 50°F or above to a temperature 10°F or below within a 24-hour period a patrol of all main tracks and sidings will be conducted within the next twelve hours.

D. When the temperature drops from a temperature of 50° or above to a temperature of 20°F or below within a 24-hour period for the first time in a season, a patrol of all main tracks and sidings will be conducted within the next 12 hours.

E. Inspectors will inspect, at a minimum, for:
   1. Broken rails
   2. Bent bolts
   3. Pull-aparts
   4. Curve movement
   5. Wide gap between rail-ends
   6. Cracked or broken joint bars (conventional and insulated)
   7. Canted rail

F. For purposes of compliance with this part on those routes maintained by MCRR, temperatures will be as reported by the National Weather Services at:
   1. Bourne/Hyannis NWS Station
   2. Cape Main Line
   3. Middleboro Secondary
   4. New Bedford Secondary
   5. Fall River Secondary
   6. Worcester NWS Station
   7. Framingham Secondary

6.4 Annual Walking Inspection

A. Between April 1 and May 1, a walking or hy-rail inspection of all CWR main track will be conducted. This inspection will be made by the VP Engineering or designee, in the company of the Track Roadmaster or equivalent. The inspection will concentrate on compliance with standards in the following areas:
   1. Anchor Pattern
   2. Anchor Position
   3. Ballast Section
   4. Evidence of longitudinal rail movement, particularly at fixed locations, such as turnouts and grade crossings.
   5. Condition of resilient fasteners
   6. Drainage and Roadbed stability

B. The MCRR VP Engineering will ensure completion of the inspection, submit to the File a report of the inspection that identifies track inspected by number and milepost limits, the name of the individuals inspecting, date inspected, and any exceptions found, with protective and corrective action identified.

6.5 Protection of Substandard CWR Track

A. If during the above inspections, or at any other time, any of the following conditions are found to exist, the following minimum protective action will be taken when the air temperature is expected to exceed 80°F:
   1. Substandard Anchor Pattern, or Ineffective Anchors: Reduce speed over the affected track to 30 mph P/25 mph F

2. Substandard Ballast Condition: Reduce speed over the affected track to 30 mph
3. Missing Clips: If both clips are missing on each side of a rail on one tie at a rate of more than four (4) ties per thirty-nine ft. (39') of rail, reduce speed to 30 mph over the affected track.

Section 7 - Joints in CWR Track

Condition	Action
Bolted joint in CWR experiencing service failure (stripped joint) or failed bar(s) with gap* present **A gap exists if it cannot be immediately closed by drift pin*	Weld joint **OR** Remediate joint conditions (per Section 6.5), replace bolts (new, in-kind, or stronger), and weld joint within 30 days, **OR** Replace failed bar(s), install 2 additional bolts, and adjust anchors, **OR** Replace failed bars, bolts (if broken or missing),and anchor every tie for 195' in both directions, **OR** Add rail, documenting provisions for later adjustments (if applicable), and reapply anchors.

7.1 Installation of Joints in CWR Track

A. When a joint or joints are installed in CWR, defined as a joint directly connected to CWR, during or subsequent to installation one of the following actions must be undertaken within 60 days:

B. Weld the joint;

C. Install additional bolts in the joint bar so that all holes in the bar contain a bolt; or

D. Fully box anchor every tie for 200 feet in both directions from the joint

7.2 Opening of Joints in CWR

A. The gap between rail ends shall not exceed 1½". If a joint is found to be open more than 1½" a 30 MPH P/25 MPH F Temporary Speed Restriction will be applied until the gap is reduced in size by heating the rail and installing new bolts in the case of bent bolts; or installing a longer piece of rail if the bolts are not bent.

7.3 Failure of Joint Bars and/or Track Bolts In A Joint In CWR Track

A. In the event of a cracked or broken joint bar or bars, and/or broken joint bolts (pull-aparts) one of the following actions must be taken:
   1. Weld the joint;
   2. Replace the broken bar[s], replace the broken bolts, adjust the anchors, and weld the joint within 30 days;
   3. Replace the broken bar[s], replace the broken bolts, install one additional bolt per rail end, and adjust anchors;
   4. Replace the broken bar[s], replace the broken bolts, and fully box anchor every
   5. tie 200 feet in both directions from the CWR joint; or
   6. Replace the broken bar[s], replace the broken bolts, add rail with provisions for later adjustment pursuant to Section 5 of this section, and reapply the anchors.

7.4 Number of Bolts

A. In CWR track each rail must be bolted with at least two (2) bolts at each bolted joint used to connect CWR strings, or CWR strings to conventional rail.

B. Where either of the following conditions are found to exist, the track must be protected by an appropriate speed restriction until the condition is corrected:
   1. Less than two (2) bolts in a rail end.
   2. One (1) rail end unbolted.

C. Each joint bar must be held in position by track bolts or fasteners and tightened sufficiently to provide support for abutting rail ends. When out-of-face, no-slip, or joint-to-joint rail contact exists by design; these locations are considered to be CWR track and must meet all the requirements for CWR in this part.

7.5 Cracked or Broken Joint Bars

A. If a joint bar is cracked, broken or because of wear allows vertical movement of either rail when all bolts are tight, it must be replaced.

B. If a joint bar is cracked (broken bars are covered in parts C and D) between the middle two bolt holes it must be replaced.

C. If between the middle two bolt holes both joint bars are found to be cracked or one joint bar is found to be broken entirely through, the track must be protected by an appropriate speed restriction until the affected bars are replaced

D. If both joint bars are found to be broken entirely through between the middle two bolt holes, trains may be operated only at the appropriate speed restriction and under the visual supervision of a person designated under MW-1 §213.7.

E. Appropriate speed restriction for the conditions noted in sections 7.B, 7.C & 7.D will be 15 mph Passenger and 10 mph Freight for pull-aparts not in excess of three inches (3"). Operation at this reduced speed may only be allowed when the pull-apart is under constant observation of person designated under MW-1 §213.7. For pull- aparts larger than three inches (3") the person designated under MW-1 §213.7 shall make a determination as to whether the track can continue in service based on, but not limited to, the following conditions: track alignment, track surface, tie condition and location, and rail location (high rail vs. low rail).

7.6 Inspection of Joints In CWR Track

A. Joints in CWR Track must be inspected on foot according to the following schedule. (See next page) Joints in CWR Track within turnouts, track crossings, expansion joints or lift rail assemblies need not be inspected during the walking inspection if they are inspected monthly as part of turnout inspection. The limits of the turnout for the purpose of this part are defined as a point 50 feet in advance of the points to the last long timber, or the heel of the frog if weave timbers are found at the heel. The limits of a track crossing, expansion joints or lift rail assembly will be any joint within 20 ft. of the device. This inspection should be indicated in the proper location on the turnout inspection form.

Class of Track	Tracks Carrying Passenger or Mixed Traffic		Tracks Carrying Freight Trains Only		
	Annual MGT Less Than 20	Annual MGT Greater Than or Equal to 20	Annual MGT Less Than 40	Annual MGT 40 to 60	Annual MGT Greater Than 60
Class 5	3	3	2	3	4
Class 4	2	3	2	3	4
Class 3	2	2	1	2	2
Class 2	1	1	None	None	None
Class 1 & Excepted Track	None	None	None	None	None

B. Inspections will be conducted during the following periods:
   1. When required 4 times a year one inspection will occur in each of the following periods: January to March, April to June, July to September and October to December with at least 60 calendar days between consecutive inspections.
   2. When required 3 times a year one inspection will occur in each of the following periods: January to April, May to August and September to December with at least 90 calendar days between consecutive inspections.
   3. When required 2 times a year one inspection will occur in each of the following periods: January to June and July to December with at least 120 calendar days between consecutive inspections.
   4. When required 1 time a year; consecutive inspections will be separated by 180 calendar days.

C. On-Foot Periodic and Follow-up Inspection Records (49 CFR § 213.119(h))
   1. Document each on-foot periodic and follow-up inspection on the date of the inspection, noting the following information:
   2. Date of the inspection
   3. Location and nature of identified CWR joint conditions specified in Table 7-A
   4. Corrective or remedial action taken by the person making the inspection
   5. Name and signature of inspector

D. Track subject to inspections under 49 CFR § 213.119, must comply with §§ 213.233,213.235,and 213.119(g).

E. During walking inspections of joints in CWR particular attention must be paid to the following conditions of the joint and the track surrounding the joint.

Rail Joint Condition	Action[1]
Visible cracks in joint bar	Replace bar
Loose bolts	Tighten bolts
Bent bolts	Replace bolts OR Re-inspect as per Section 7.B
Missing bolts [2]	Replace bolts
Tie(s) not effectively supporting joint	Tamp, replace, or repair tie(s)OR Conduct follow-up inspections every other week until the condition is repaired, or joint is removed
Broken or missing tie plate(s)	Replace tie plate(s)OR Conduct follow-up inspections every other week until the condition is repaired, or the joint is removed
Deteriorated insulated joint	Replace/repair joint OR Conduct follow-up inspections every other week until the condition is repaired, or the joint is removed
Rail end batter (More than 3/8" in depth and more than 6" in length measured with a 24” straight edge)	Repair by welding joint or removing rail OR Conduct follow-up inspections every other week until the condition is repaired, or the joint is removed
Rail end mismatch reaches limits specified by 49 CFR § 213.115	Weld or grind
Longitudinal rail movement greater than 2"	Add or adjust rail anchors, tighten bolts, and add or remove rail at appropriate time OR Conduct follow-up inspections every other week until the condition is repaired, or the joint is removed
Wide rail gap greater than 1.5"	Adjust rail gap and secure joint OR Conduct follow-up inspections every other week until the condition is repaired, or the joint is removed
Vertical joint movement (profile) that exceeds 75% of the allowable threshold for the designated class of track[3]	Surface joint OR Conduct follow-up inspections every other week until the condition is repaired, or the joint is removed
Joint lateral movement of the entire track structure (in a curve or spiral) that reaches 3/4"[3]	Correct lateral movement OR Conduct follow-up inspections every other week until the condition is repaired, or the joint is removed

Table 7-A

[1] *Action may also consist of placing a speed restriction or removing the track from service.*

[2] *A minimum of two (2) bolts per rail must be in place at each joint.*

[3] *Joint lateral and vertical movement is the apparent visible movement measured at the joint.*

7.7 Identification of CWR Rail Joints as required by 213.119(h)(7).

A. Each CWR rail joint requiring action as outlined in Section 7.C, D, E, or I shall be identified in the field with a highly visible marking. In addition, such joints shall also be identified as to location by specifying the subdivision, milepost, track number, and rail (north, south, etc.).

7.8 Embedded Joints

A. Permanently Embedded Joints
   1. Where embedded joints exist, it is not necessary to disassemble or remove the track structure (e.g., remove pavement or crossing pads) to conduct an inspection of CWR joints. Every effort must be made to inspect the visible portions of the bar in these structures. A note of this embedment should be included in the Joint Inventory of Section 7.J.
   2. In new construction no joints may be installed in a location which
   3. impedes the inspection of that bar without the permission of the MCRR VP Engineering.

B. Temporarily Embedded Joints
   1. Joints may be embedded for in a temporary construction crossing. Every effort should be made through the use of flangeway timbers, etc. to keep the joint bar visible for inspection. The joint should also be inspected immediately following the removal of the embedment.

Section 8 - Training

8.1 Instruction and Testing

A. To be considered qualified under §213.7 to supervise or conduct the installation, maintenance, adjustment, and inspection of CWR track; individuals will receive instruction in, and be tested on, the MCRR CWR Plan. Each year thereafter the individual will receive refresher instruction and be re- examined. To receive or maintain qualification in this area, individuals must achieve a test score of at least eighty percent (80%).

B. Training program will address, but is not limited to, the following:
   1. CWR installation procedures;
   2. Rail anchoring requirements;
   3. Maintaining a desired rail neutral temperature range;
   4. Preventive maintenance on CWR track;
   5. Monitoring curve movement;
   6. Placing temporary speed restrictions;
   7. Rail joint inspections;
   8. Standard ballast section requirements;
   9. Extreme weather inspections; and
   10. Recordkeeping.

Section 9 - Reporting Requirements for CWR Track and Appendix

9.1 Report of CWR Installations (49 CFR § 213.119(j)(1))

A. Records necessary to provide an adequate history of installing rail and achieving the DRNT will be maintained for at least one year following final adjustment.

B. These records will be maintained on the prescribed form as described in Appendix F Report "A" through and include the date of installation, location, rail size and length, initial rail temperature, desired RNT, expansion achieved, and adjusted RNT.

9.2 Report Maintenance Work in CWR

A. Maintenance performed on CWR track can affect the compressive and tensile forces within the rail, as well as the track's lateral and longitudinal resistance. To adequately comply with the procedures outlined in this plan, records shall be kept for at least one year after final corrective and must include the following:
   1. Record of each rail separation and all subsequent work or adjustments associated with that initial separation.

B. For rail separations that were not immediately de-stressed, include:
   1. Milepost location;
   2. Work group/gang number(s);
   3. Date(s);
   4. Original reference mark distance;
   5. Rail temperature(s) at the time each task was performed;
   6. Gap observed from the initial separation;
   7. The estimated pre-cut/break RNT (except where not applicable);
   8. Change(s) to reference mark distance for each task performed; and
   9. Estimated RNT after each task or adjustment.

C. For locations where Section 3.3 was utilized for final adjustment, include:
   1. Milepost location;
   2. Work group/gang number;
   3. Date;
   4. Reference mark distance after rail is cut and de-anchored;
   5. Rail temperature at the time of the adjustment;
   6. Change to reference mark distance after work is complete;
   7. Length of rail de-anchored; and
   8. Estimated RNT after the adjustment.
   9. Record of each curve that has been de-stressed in accordance with Section 3.3.
   10. Record of each curve which has been staked and has shifted inward.
   11. Record of each buckling incident and subsequent remedial action and repairs.
   12. Record of each pull-apart with a gap present and subsequent repairs.
   13. Record of CWR installations or maintenance work that does not conform to any of the written procedures of this plan.

D. MCRR VP Engineering must monitor these records to ensure necessary remedial actions and/or corrections and adjustments are made in accordance with this plan. Where field verifications of the records are performed, the Readjustment Field Verification form located in Appendix C may be utilized.

E. These records will be maintained on the prescribed forms (Appendix A, Appendix C, Appendix F. and Appendix G and include the date of installation, location, rail size and length, initial rail temperature, desired RNT, expansion achieved, and adjusted RNT.

APPENDICES

APPENDIX A –
Report of Rail Clipping/Anchoring

MCRR RAIL CLIPPING / ANCHORING RECORD

ROUTE: **STRING NO:** **LENGTH:**

DATE: **WEATHER:** **INITIAL RAIL TEMP:**

STRING LOCATION: BEGINNING MP/STATION ENDING MP/STATION:

TRACK: 1 [ ] 2 [ ] SINGLE [ ] OTHER:_____ **RAIL:** N [ ] S [ ] E [ ] W [ ]

EXPANSION POINTS:	**0**	**1/4**	**1/2**	**3/4**	**END**
RAIL EXPANSION CALCULATED: (MIN 95 DEG F)					
RAIL EXPANSION CALCULATED: (TARGET 105 DEG F)					
RAIL EXPANSION CALCULATED: (MAX 125 DEG F)					
RAIL EXPANSION ACTUAL:					
RAIL TEMPERATURE:					

RECORDED AT ANCHORING LOCATION (every 100' min.)

STATION:	**TIME**	**RAIL TEMP (deg F)**
A. AVERAGE RAIL TEMPERATURE:		

FLASH BUTT WELD RECORD (for use with Mobile Electric Flash Butt Welding only)

WELD NO.	**RAIL TEMP. CHANGE**	**DATE**
B. TOTAL		
FINAL STRING THEORETICAL NEUTRAL RAIL TEMPERATURE (A. + B.) =		

METHOD OF EXPANSION: NATURAL [ ] HEATED [ ] COOLED [ ] STRETCHED [ ] VIBRATED: YES [ ] NO [ ]

TIME ANCHORING STARTED: am/pm COMPLETED: am/pm

FOREMAN:

_____ _____

(PRINT NAME) (SIGNATURE)

REVIEWED BY:

_____ _____

(ROADMASTER - SIGN) (DATE)

_____ _____

(VP ENGINEERING - SIGN) (DATE)

NOTES:

Revised 2/15/2018

Temp. Diff. (°F)	Rail Length (in feet)												
	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
5	1/8	1/4	1/4	1/4	1/4	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8
10	1/4	3/8	1/2	1/2	5/8	3/4	3/4	7/8	7/8	1	1 1/8	1 1/8	1 ¼
15	1/2	5/8	3/4	7/8	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8
20	5/8	3/4	7/8	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	1 7/8	2	2 1/8	2 3/8	2 ½
25	3/4	1	1 1/8	1 3/8	1 1/2	1 3/4	2	2 1/8	2 3/8	2 1/2	2 3/4	2 7/8	3 1/8
30	7/8	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 3/4	3	3 1/4	3 1/2	3 ¾
35	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 1/2	2 3/4	3	3 1/4	3 1/2	3 7/8	4 1/8	4 3/8
40	1 1/4	1 4/8	1 7/8	2 1/8	2 1/2	2 3/4	3 1/8	3 3/8	3 3/4	4	4 3/8	4 5/8	5
45	1 3/8	1 3/4	2 1/8	2 ½	2 3/4	3 1/8	3 1/2	3 7/8	4 1/4	4 5/8	4 7/8	5 1/4	5 5/8
50	1 1/2	2	2 3/8	2 ¾	3 1/8	3 1/2	3 7/8	4 1/4	4 5/8	5 1/8	5 1/2	5 7/8	6 ¼
55	1 3/4	2 1/8	2 5/8	3	3 3/8	3 7/8	4 1/4	4 3/4	5 1/8	5 5/8	6	6 3/8	6 7/8
60	1 7/8	2 3/8	2 3/4	3 ¼	3 3/4	4 1/4	4 5/8	5 1/8	5 5/8	6 1/8	6 1/2	7	7 ½
65	2	2 1/2	3	3 ½	4	4 5/8	5 1/8	5 5/8	6 1/8	6 5/8	7 1/8	7 5/8	8 1/8
70	2 1/8	2 3/4	3 1/4	3 7/8	4 3/8	4 7/8	5 1/2	6	6 1/2	7 1/8	7 5/8	8 1/4	8 ¾

Operating Railroad Contractor's Signature: _____ **Date:** _____ **Operating**

Railroad Contractor's Name (Print): _____

The table above contains adjustments rounded to the nearest 1/8 inch.

The following formula which may be used instead for a more precise calculation.

A = 0.000078 x (DRNT - RT) x (Length in Feet)

where:

A = the amount the length a CWR string must be increased or decreased, in inches, to achieve the desired neutral temperature range,

RT = the existing temperature of the CWR before the heating process has begun,

DRNT = the Desired Rail Neutral Temperature (105°F for MCRR, i.e., the rail temperature at the completion of the adjustment process)

APPENDIX B –
TABLES B-A, B-B, B-C, AND B-D
For estimating Rail Neutral Temperature for A Broken or Cut Rail

- Table B-a: *Pre-Break/Cut RNT for 6" Base Rail & Every Other Tie Anchored*
- Table B-b: *Pre-Break/Cut RNT for 6" Base Rail & Every Tie Anchored*
- Table B-c: *Pre-Break/Cut RNT for 5½" Base Rail & Every Other Tie Anchored*
- Table B-d: *Pre-Break/Cut RNT for 5½" Base Rail & Every Tie Anchored*

Pre-Break/Cut RNT for 6" Base Rail & Every Other Tie Anchored (EOTA)

Green highlighted area is the "Safe Zone" Estimated Rail Neutral Temperature (°F) Prior to a Break or Cut

Rail Temp (°F)	Rail Gap (in inches)														
	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
125	125	149	159	167	173	179	184	189	193	198	201	205	209	212	215
120	120	144	154	162	168	174	179	184	188	193	196	200	204	207	210
115	115	139	149	157	163	169	174	179	183	188	191	195	199	202	205
110	110	134	144	152	158	164	169	174	178	183	186	190	194	197	200
105	105	129	139	147	153	159	164	169	173	178	181	185	189	192	195
100	100	124	134	142	148	154	159	164	168	173	176	180	184	187	190
95	95	119	129	137	143	149	154	159	163	168	171	175	179	182	185
90	90	114	124	132	138	144	149	154	158	163	166	170	174	177	180
85	85	109	119	127	133	139	144	149	153	158	161	165	169	172	175
80	80	104	114	122	128	134	139	144	148	153	156	160	164	167	170
75	75	99	109	117	123	129	134	139	143	148	151	155	159	162	165
70	70	94	104	112	118	124	129	134	138	143	146	150	154	157	160
65	65	89	99	107	113	119	124	129	133	138	141	145	149	152	155
60	60	84	94	102	108	114	119	124	128	133	136	140	144	147	150
55	55	79	89	97	103	109	114	119	123	128	131	135	139	142	145
50	50	74	84	92	98	104	109	114	118	123	126	130	134	137	140
45	45	69	79	87	93	99	104	109	113	118	121	125	129	132	135
40	40	64	74	82	88	94	99	104	108	113	116	120	124	127	130
35	35	59	69	77	83	89	94	99	103	108	111	115	119	122	125
30	30	54	64	72	78	84	89	94	98	103	106	110	114	117	120
25	25	49	59	67	73	79	84	89	93	98	101	105	109	112	115
20	20	44	54	62	68	74	79	84	88	93	96	100	104	107	110
15	15	39	49	57	63	69	74	79	83	88	91	95	99	102	105
10	10	34	44	52	58	64	69	74	78	83	86	90	94	97	100
5	5	29	39	47	53	59	64	69	73	78	81	85	89	92	95
0	0	24	34	42	48	54	59	64	68	73	76	80	84	87	90
-5	-5	19	29	37	43	49	54	59	63	68	71	75	79	82	85
-10	-10	14	24	32	38	44	49	54	58	63	66	70	74	77	80
-15	-15	9	19	27	33	39	44	49	53	58	61	65	69	72	75
-20	-20	4	14	22	28	34	39	44	48	53	56	60	64	67	70
-25	-25	-1	9	17	23	29	34	39	43	48	51	55	59	62	65

Pre-Break/Cut Table B-a

Pre-Break/Cut RNT for 6" Base Rail & Every Tie Anchored (ETA)

Green highlighted area is the "Safe Zone" Estimated

Rail Neutral Temperature (°F) Prior to a Break or Cut

Rail Temp (°F)	Rail Gap (in inches)														
	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
125	125	155	167	176	184	191	198	203	209	214	219	223	228	232	236
120	120	150	162	171	179	186	193	198	204	209	214	218	223	227	231
115	115	145	157	166	174	181	188	193	199	204	209	213	218	222	226
110	110	140	152	161	169	176	183	188	194	199	204	208	213	217	221
105	105	135	147	156	164	171	178	183	189	194	199	203	208	212	216
100	100	130	142	151	159	166	173	178	184	189	194	198	203	207	211
95	95	125	137	146	154	161	168	173	179	184	189	193	198	202	206
90	90	120	132	141	149	156	163	168	174	179	184	188	193	197	201
85	85	115	127	136	144	151	158	163	169	174	179	183	188	192	196
80	80	110	122	131	139	146	153	158	164	169	174	178	183	187	191
75	75	105	117	126	134	141	148	153	159	164	169	173	178	182	186
70	70	100	112	121	129	136	143	148	154	159	164	168	173	177	181
65	65	95	107	116	124	131	138	143	149	154	159	163	168	172	176
60	60	90	102	111	119	126	133	138	144	149	154	158	163	167	171
55	55	85	97	106	114	121	128	133	139	144	149	153	158	162	166
50	50	80	92	101	109	116	123	128	134	139	144	148	153	157	161
45	45	75	87	96	104	111	118	123	129	134	139	143	148	152	156
40	40	70	82	91	99	106	113	118	124	129	134	138	143	147	151
35	35	65	77	86	94	101	108	113	119	124	129	133	138	142	146
30	30	60	72	81	89	96	103	108	114	119	124	128	133	137	141
25	25	55	67	76	84	91	98	103	109	114	119	123	128	132	136
20	20	50	62	71	79	86	93	98	104	109	114	118	123	127	131
15	15	45	57	66	74	81	88	93	99	104	109	113	118	122	126
10	10	40	52	61	69	76	83	88	94	99	104	108	113	117	121
5	5	35	47	56	64	71	78	83	89	94	99	103	108	112	116
0	0	30	42	51	59	66	73	78	84	89	94	98	103	107	111
-5	-5	25	37	46	54	61	68	73	79	84	89	93	98	102	106
-10	-10	20	32	41	49	56	63	68	74	79	84	88	93	97	101
-15	-15	15	27	36	44	51	58	63	69	74	79	83	88	92	96
-20	-20	10	22	31	39	46	53	58	64	69	74	78	83	87	91
-25	-25	5	17	26	34	41	48	53	59	64	69	73	78	82	86

Pre-Break/Cut Table B-b

Pre-Break/Cut RNT for 5.5" Base Rail & Every Other Tie Anchored (EOTA)

Green highlighted area is the "Safe Zone" Estimated

Rail Neutral Temperature (°F) Prior to a Break or Cut

Rail Temp (°F)	Rail Gap (in inches)														
	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
125	125	151	162	171	178	184	190	195	200	204	209	213	217	220	224
120	120	146	157	166	173	179	185	190	195	199	204	208	212	215	219
115	115	141	152	161	168	174	180	185	190	194	199	203	207	210	214
110	110	136	147	156	163	169	175	180	185	189	194	198	202	205	209
105	105	131	142	151	158	164	170	175	180	184	189	193	197	200	204
100	100	126	137	146	153	159	165	170	175	179	184	188	192	195	199
95	95	121	132	141	148	154	160	165	170	174	179	183	187	190	194
90	90	116	127	136	143	149	155	160	165	169	174	178	182	185	189
85	85	111	122	131	138	144	150	155	160	164	169	173	177	180	184
80	80	106	117	126	133	139	145	150	155	159	164	168	172	175	179
75	75	101	112	121	128	134	140	145	150	154	159	163	167	170	174
70	70	96	107	116	123	129	135	140	145	149	154	158	162	165	169
65	65	91	102	111	118	124	130	135	140	144	149	153	157	160	164
60	60	86	97	106	113	119	125	130	135	139	144	148	152	155	159
55	55	81	92	101	108	114	120	125	130	134	139	143	147	150	154
50	50	76	87	96	103	109	115	120	125	129	134	138	142	145	149
45	45	71	82	91	98	104	110	115	120	124	129	133	137	140	144
40	40	66	77	86	93	99	105	110	115	119	124	128	132	135	139
35	35	61	72	81	88	94	100	105	110	114	119	123	127	130	134
30	30	56	67	76	83	89	95	100	105	109	114	118	122	125	129
25	25	51	62	71	78	84	90	95	100	104	109	113	117	120	124
20	20	46	57	66	73	79	85	90	95	99	104	108	112	115	119
15	15	41	52	61	68	74	80	85	90	94	99	103	107	110	114
10	10	36	47	56	63	69	75	80	85	89	94	98	102	105	109
5	5	31	42	51	58	64	70	75	80	84	89	93	97	100	104
0	0	26	37	46	53	59	65	70	75	79	84	88	92	95	99
-5	-5	21	32	41	48	54	60	65	70	74	79	83	87	90	94
-10	-10	16	27	36	43	49	55	60	65	69	74	78	82	85	89
-15	-15	11	22	31	38	44	50	55	60	64	69	73	77	80	84
-20	-20	6	17	26	33	39	45	50	55	59	64	68	72	75	79
-25	-25	1	12	21	28	34	40	45	50	54	59	63	67	70	74

Pre-Break/Cut Table B-c

Pre-Break/Cut RNT for 5.5" Base Rail & Every Tie Anchored (ETA)

Green highlighted area is the "Safe Zone" Estimated Rail Neutral Temperature (°F) Prior to a Break or Cut

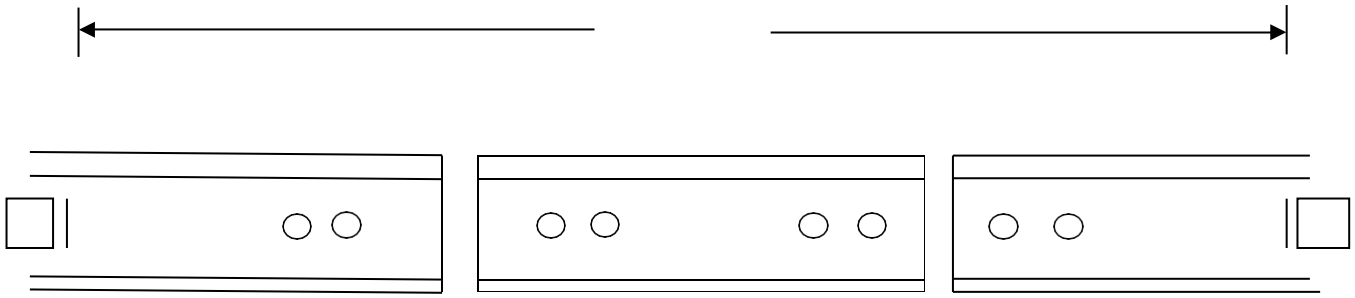
Rail Temp (°F)	Rail Gap (in inches)														
	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
125	125	157	171	181	190	197	204	211	217	222	227	232	237	242	246
120	120	152	166	176	185	192	199	206	212	217	222	227	232	237	241
115	115	147	161	171	180	187	194	201	207	212	217	222	227	232	236
110	110	142	156	166	175	182	189	196	202	207	212	217	222	227	231
105	105	137	151	161	170	177	184	191	197	202	207	212	217	222	226
100	100	132	146	156	165	172	179	186	192	197	202	207	212	217	221
95	95	127	141	151	160	167	174	181	187	192	197	202	207	212	216
90	90	122	136	146	155	162	169	176	182	187	192	197	202	207	211
85	85	117	131	141	150	157	164	171	177	182	187	192	197	202	206
80	80	112	126	136	145	152	159	166	172	177	182	187	192	197	201
75	75	107	121	131	140	147	154	161	167	172	177	182	187	192	196
70	70	102	116	126	135	142	149	156	162	167	172	177	182	187	191
65	65	97	111	121	130	137	144	151	157	162	167	172	177	182	186
60	60	92	106	116	125	132	139	146	152	157	162	167	172	177	181
55	55	87	101	111	120	127	134	141	147	152	157	162	167	172	176
50	50	82	96	106	115	122	129	136	142	147	152	157	162	167	171
45	45	77	91	101	110	117	124	131	137	142	147	152	157	162	166
40	40	72	86	96	105	112	119	126	132	137	142	147	152	157	161
35	35	67	81	91	100	107	114	121	127	132	137	142	147	152	156
30	30	62	76	86	95	102	109	116	122	127	132	137	142	147	151
25	25	57	71	81	90	97	104	111	117	122	127	132	137	142	146
20	20	52	66	76	85	92	99	106	112	117	122	127	132	137	141
15	15	47	61	71	80	87	94	101	107	112	117	122	127	132	136
10	10	42	56	66	75	82	89	96	102	107	112	117	122	127	131
5	5	37	51	61	70	77	84	91	97	102	107	112	117	122	126
0	0	32	46	56	65	72	79	86	92	97	102	107	112	117	121
-5	-5	27	41	51	60	67	74	81	87	92	97	102	107	112	116
-10	-10	22	36	46	55	62	69	76	82	87	92	97	102	107	111
-15	-15	17	31	41	50	57	64	71	77	82	87	92	97	102	106
-20	-20	12	26	36	45	52	59	66	72	77	82	87	92	97	101
-25	-25	7	21	31	40	47	54	61	67	72	77	82	87	92	96

Pre-Break/Cut Table B-d

APPENDIX C –
READJUSTMENT FIELD VERIFICATION FORM

Readjustment Field Verification Form

Type of disturbance:_____ **Sub:**_____ **Milepost:**_____
Track: (Single 1 2 3 SDG Other_____) **Side:** (Left / Right / Both)
Disturbance date:_____ **Observation date:**_____



Original break/cut gap:_____ **Break/cut rail temperature**:_____

Anchor pattern: (Every Other Tie / Every Tie / Other) **Anchor condition:** (Weak / Average / Strong)

Estimated pre-break/cut RNT:_____

Anchors removed/adjusted: (Yes / No) **Estimated distance each way:** _____
Observed change to reference mark distance: Is it equal to break/cut gap: (Yes /No)
Does the field measurement match the record: (Yes / No) **Difference in measurements:** _____
Estimated current RNT (If using 780' adjustment table, 1 = 16°F)**:**
Pre-break/cut RNT ± (Observed change to reference marks x 16°F) = Est. current RNT

_____ ± (_____x 16°F) = _____

Is the current RNT within the safe range (95°F to 105°F): (Yes / No)

APPENDIX D –
THERMAL EXPANSION OF RAIL

Appendix D – Thermal Expansion of Rail

The table below describes the amount of rail that needs to be added or removed to effect a change in the rail neutral temperature (RNT) over a specific length of rail. This table will be used when installing CWR per Section 2 and performing adjustments per Section 3.3.

Rail Adjustment (in inches) Required to Change the RNT Over a Specific Distance

Change in RNT (°F)	Rail Length (in feet)												
	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
5	1/8	1/4	1/4	1/4	¼	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8
10	1/4	3/8	1/2	1/2	5/8	3/4	3/4	7/8	7/8	1	1 1/8	1 1/8	1 1/4
15	1/2	5/8	3/4	7/8	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8
20	5/8	3/4	7/8	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	1 7/8	2	2 1/8	2 3/8	2 1/2
25	3/4	1	1 1/8	1 3/8	1 1/2	1 3/4	2	2 1/8	2 3/8	2 1/2	2 3/4	2 7/8	3 1/8
30	7/8	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 3/4	3	3 1/4	3 1/2	3 3/4
35	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 1/2	2 3/4	3	3 1/4	3 1/2	3 7/8	4 1/8	4 3/8
40	1 1/4	1 4/8	1 7/8	2 1/8	2 1/2	2 3/4	3 1/8	3 3/8	3 3/4	4	4 3/8	4 5/8	5
45	1 3/8	1 3/4	2 1/8	2 1/2	2 3/4	3 1/8	3 1/2	3 7/8	4 1/4	4 5/8	4 7/8	5 1/4	5 5/8
50	1 1/2	2	2 3/8	2 3/4	3 1/8	3 1/2	3 7/8	4 1/4	4 5/8	5 1/8	5 1/2	5 7/8	6 1/4
55	1 3/4	2 1/8	2 5/8	3	3 3/8	3 7/8	4 1/4	4 3/4	5 1/8	5 5/8	6	6 3/8	6 7/8
60	1 7/8	2 3/8	2 3/4	3 1/4	3 3/4	4 1/4	4 5/8	5 1/8	5 5/8	6 1/8	6 1/2	7	7 1/2
65	2	2 1/2	3	3 1/2	4	4 5/8	5 1/8	5 5/8	6 1/8	6 5/8	7 1/8	7 5/8	8 1/8
70	2 1/8	2 3/4	3 1/4	3 7/8	4 3/8	4 7/8	5 1/2	6	6 1/2	7 1/8	7 5/8	8 1/4	8 3/4

The table above contains adjustments rounded to the nearest 1/8 inch based on the following formula that may be used instead for more precise calculations.

$$A = 0.000078 \times (105°F - RT) \times Length$$

APPENDIX E –
THERMAL ADJUSTMENT TABLE FOR 780’ OF RAIL

Appendix E – Thermal Adjustment Table for 780’ of Rail

The table below describes the amount of rail that needs to be added or removed to effect a change in the rail neutral temperature (RNT) of 780 feet of rail. This table will be used when performing adjustments per Section 3.2 for determining how much the reference marks need to be changed to adjust the RNT as desired and can also be used in the calculation of the RNT after adjustments.

Thermal Adjustment Table for 780' of Rail	
Change in RNT (° F)	Adjustment (in inches)
5	1/4
10	5/8
15	7/8
20	1 1/4
25	1 1/2
30	1 7/8
35	2 1/8
40	2 3/8
45	2 3/4
50	3
55	3 3/8
60	3 5/8
65	4
70	4 1/4

The table above contains adjustments rounded to the nearest 1/8 inch based on the following formula that may be used instead for more precise calculations.

$$A = 0.000078 \times (DRNT - RT) \times 780 \text{ ft.}$$

APPENDIX F – REPORT “A”
RECORD OF DISTURBANCE OF MAIN CWR TRACK

Appendix F - Report "A"

Record of Disturbance of Main CWR Track

Part A: CWR Track Disturbance Due to Track Work

Route Initials:_____ Rail Size:_____ Date: _____

M.P. Location from:_____ to:_____ Track No.:_____

Plug Rail Number---------- _____
(Assigned by Territory Roadmaster. Route Initials-Plug Number-Year This should be written on the plug rail as well.)

Reason for Rail Replacement: _____
(i.e.. Replace Rail with Internal Defect)

Rail Temperature (at time of cut):
Temp.: _____

Time: : _____ AM/PM
Time: : _____ AM/PM

Reference Marks
Original _____

Air Temperature (at time of cut):
Temp.: _____

Changed_____

Estimated pre-cut break RNT :_____ Estimated RNT after task/adjustment_____

Anchoring Pattern in Accord. with MW1: Yes / No

If NO, explain _____

Ballast Section Per Standard Plan: Yes / No

If NO, explain Deficiency: _____

Part B: Rail Cut in CWR Territory

Rail: North / South / East / West

Rail Movement at Cut: _____
("Gap" or "Jump" which occurred when the rail was cut, from rail end to rail end including the saw blade width.)

Amount of Rail Removed: _____
(Length of Rail removed from track plus the combined width of all saw cuts. Easiest to measure rail after it has been cut out and removed from the track, then add saw cuts.)

Amount of Rail Installed: _____
(Length of Rail installed in track, end to end. Does not include the gaps at the joints.)

Amount of Excess Rail: _____
(Amount of Rail Installed **minus** Amount of Rail Removed. This will be positive if rail was added, negative if rail was removed.)

Record of Movement		
200 ft.	E / N	_____
150 ft.	E / N	_____
100 ft.	E / N	_____
50 ft.	E / N	_____
---- Rail or Joint ----		
50 ft.	W / S	_____
100 ft.	W / S	_____
150 ft.	W / S	_____
200 ft.	W / S	_____

Remarks: _____
(Additional helpful information for document reviewers.)

Foreman - (Print)_____ (Sign) _____
(All lines should be filled in before printing and signing.)

Roadmaster Reviewed (Sign)_____ (Date) _____

Senior Engineer Reviewed (Sign)_____ (Date) _____

APPENDIX G –
WALKING JOINT BAR INSPECTION FORM

Appendix G – Walking Joint Bar Inspection Form

Division: (North Side or South Side): _____

Route/Branch: _____

Inspector: _____

Signature: _____

Track	Mile Post	Rail (N/S/E/W)	Joint ID	Rail Size	Joint Type	Date Inspected	Conditions found	Action taken

APPENDIX H –
EFFECTIVE CHANGE IN RAIL LENGTH DUE TO CURVE SHIFTS

Appendix H – Effective Change in Rail Length Due to Curve Shifts

The table below provides an estimation of the effective amount of rail expansion per 1,000 feet of a curve that has shifted laterally. Numbers have been rounded to the nearest ¼ inch.

Effective Rail Length Added to Curve/1,000 Feet of Curve (Inches)

Curve Degree	Distance Curve Has Chorded Inward (Inches)					
	1	2	3	4	5	6
1/2	0	1/4	1/4	1/4	1/2	1/2
1	1/4	1/4	1/2	3/4	1	1
1 1/2	1/4	1/2	3/4	1	1 1/4	1 1/2
2	1/4	3/4	1	1 1/2	1 3/4	2
2 1/2	1/2	1	1 1/4	1 3/4	2 1/4	2 3/4
3	1/2	1	1 1/2	2	2 3/4	3 1/4
3 1/2	1/2	1 1/4	1 3/4	2 1/2	3	3 3/4
4	3/4	1 1/2	2	2 3/4	3 1/2	4 1/4
4 1/2	3/4	1 1/2	2 1/4	3 1/4	4	4 3/4
5	1	1 3/4	2 3/4	3 1/2	4 1/2	5 1/4
5 1/2	1	2	3	3 3/4	4 3/4	5 3/4
6	1	2	3 1/4	4 1/4	5 1/4	6 1/4
6 1/2	1 1/4	2 1/4	3 1/2	4 1/2	5 3/4	6 3/4
7	1 1/4	2 1/2	3 3/4	5	6 1/4	7 1/4
7 1/2	1 1/4	2 3/4	4	5 1/4	6 1/2	7 3/4
8	1 1/2	2 3/4	4 1/4	5 1/2	7	8 1/2
8 1/2	1 1/2	3	4 1/2	6	7 1/2	9
9	1 1/2	3 1/4	4 3/4	6 1/4	7 3/4	9 1/2
9 1/2	1 3/4	3 1/4	5	6 3/4	8 1/4	10
10	1 3/4	3 1/2	5 1/4	7	8 3/4	10 1/2
10 1/2	1 3/4	3 3/4	5 1/2	7 1/4	9 1/4	11
11	2	3 3/4	5 3/4	7 3/4	9 3/4	11 1/2
11 1/2	2	4	6	8	10	12
12	2	4 1/4	6 1/4	8 1/2	10 1/2	12 1/2

ΔS (in) = δ (in) x Deg x 0.175 x curve length(ft)/1000(ft)
ΔS (in) = Effective rail length added to curve (inches)
δ (in) = Maximum distance curve has chorded inward (inches)
Deg = Degree of curvature

APPENDIX I –
CURVE ALIGNMENT REFERENCE FORM

Appendix I – Curve Alignment Reference Form

Route/Branch:_____ **Track**:_____ **Curve**:#:_____

Degree of Curve: _____

Mile Post: **Beginning**:_____ **Ending**: _____

Work Direction: Increasing MP / Decreasing MP **Gang #**: _____

Type of work performed: _____

	Date:				
	Rail Temperature:				
	Employee Name:				
Stake No.	Description	Measurement 1 Before Work	Measurement 2 After Work	Measurement 3 Follow-up	Measurement 4 Follow-up

Notes:

1. References should be marked on large stationary objects or with stakes.
2. Number reference points in sequence in the direction of work.
3. In "Description," note the TS, SC, CS, ST, and fixed objects with reference marks.
4. Reference stakes must be clear of maintenance activities, walking areas, and the reference track and any adjacent track.

DOCUMENT A00901

MASS COASTAL RAILROAD ON TRACK SAFETY MANUAL

THIS PAGE IS INTENTIONALLY LEFT BLANK

On-Track Safety Manual

Roadway Worker Protection

Bridge Worker Safety

On-Track Maintenance Machines and Hyrail Vehicles



Mass Coastal Railroad

January 2018 Edition

Table of Contents

Safety Statement
Railroad Contact Persons
Definitions
1.0 Roadway Worker Protection Act
1.1 Purpose of the Roadway Protection Act
1.2 Training
1.2.1 All Roadway Workers
1.2.2 Rules Qualified Employees
1.2.3 Contractors
1.3 Job Briefings
1.3.1 Job Briefing for Roadway Work Group
1.3.2 Job Briefing for Lone Workers
1.3.3 Contractor/Employee Responsibilities
1.3.4 Communication Requirements
1.4 On-Track Safety Procedures
1.4.1 Exclusive Track Occupancy
1.4.2 Inaccessible Track
1.4.3 Individual Train Detection (ITD)
1.4.4 Train Approach Warning (TAW)
1.4.5 Foul Time
1.4.6 Adjacent Track Protection on Non-Controlled Track
1.4.7 Adjacent Track Protection on Controlled Track
1.4.7.1 Occupying a Track with an Adjacent Controlled Track
1.4.7.2 Passing of Trains on Adjacent Controlled Tracks
1.5 Audible Warning from Trains
1.6 Operating and Working Near Roadway Machines
1.6.1 Purpose
1.6.2 On-Track Equipment Operator Training and Qualifications
1.6.2.1 General Training Requirements
1.6.2.2 Machine Specific Training Requirements
1.6.2.3 Qualifications
1.6.3 Working with On-Track Equipment
1.6.3.1 Work Zones around Machines
1.6.3.2 Safe Working Distances between Machines
1.6.3.3 Safe Traveling Distance between Machines
1.6.3.4 Stopping On-Track Equipment
1.6.3.5 Tying Up Equipment
1.7 Right to Challenge On-Track Safety
1.7.1 Responsibilities of the Railroad
1.7.2 Responsibilities of the Roadway Worker

1.7.3 Good Faith Challenges and Resolution of Those Challenges

2.0 Bridge Worker Safety

2.1 General Requirements

2.1.1 General Fall Protection Requirements

2.1.2 Fall Protection System Standards

2.2 Safety Net Systems

2.3 Working Over or Adjacent to Water

2.4 Inspecting Equipment and System

2.5 Cleaning and Storing Equipment

2.6 Scaffolding

2.7 Bridge Worker Rescue Plan

2.8 Personal Protective Equipment (PPE) for Bridge Workers

3.0 On-Track Maintenance Machines and Hy-Rail Vehicles

3.1 General Prestart Checks

3.2 On-Track Roadway Maintenance Machine Safety Requirements

3.2.1 Repairs

3.2.2 Towing

3.3 On-Track Roadway Maintenance Machine Safety Requirements (General)

3.4 On-Track Roadway Maintenance Machine Safety Requirements prior 1/1/91

3.5 On-Track Roadway Maintenance Machine Safety Requirements after 9/27/04

3.6 Hy-Rail Safety Inspection Checklist

3.6.1 Repairs

Appendix A Safety Tips for Roadway Workers

Appendix B Form D

Appendix C Good Faith Challenge Form

Appendix D Railroad Matrix

MASSACHUSETTS COASTAL RAILROAD, LLC

SAFETY STATEMENT

The On-Track Safety Program outlined in this manual contains Mass Coastal' s interpretation of the minimum rules established by the Federal Railroad Administration in an effort to promote and ensure Roadway Worker Protection. The program requires the whole-hearted commitment of both the Mass Coastal management and its employees and contractors. Responsibilities fall to both the railroad and the individual. Safety of all employees, including roadway workers, is our primary concern at Mass Coastal Railroad.

This Program Manual is provided to each affected employee as required by FRA Regulations and is intended to be utilized for that purpose. The Program Manual remains the property of Massachusetts Coastal Railroad, LLC.

The Program Manual is adapted from the On-Track Safety Program developed by the American Short Line and regional Railroad Association, Updated April 2017.

The On-Track Safety Program is effective on January 6, 2008.

P. Christopher Podgurski

President

RAILROAD CONTACT PERSONS
RAILROAD PROFILE

RAILROAD INFORMATION:

Massachusetts Coastal Railroad, LLC
Operations Office
12 Harding St, Suite 201
Lakeville, MA 02347
Telephone: 508-291-2116
Mass Coastal Railroad operates solely in the Commonwealth of Massachusetts.

RAILROAD CONTACT PERSONS for RWP:

Mark Renker	Manager Engineering, Track & Bridges	508-989-6856
Jamie Conlon	Mass Coastal Railroad Project Manager	508-441-8890

Network Operations Center (Dispatch) 608-352-6001 or (888) 783-4316

OPERATING AUTHORITIES IN EFFECT:

NORAC Operating Rules 11th Edition
Mass Coastal RWP Manual
Mass Coastal Timetable #7 and all related Bulletin & General Orders

ON-TRACK SAFETY (OTS) PROCEDURES IN EFFECT:

For Controlled Track:
Exclusive Track Occupancy
Train Approach Warning (TAW)
Individual Train Detection (ITD)
Foul Time

For Non-Controlled Track:
Inaccessible Track
Train Approach Warning (TAW)
Individual Train Detection (ITD)

DEFINITIONS

Adjacent Track

A controlled or non-controlled track whose track center is spaced less than 25 feet from the track center of the occupied track

Competent Person

A person who is capable of identifying existing and predictable hazards in the workplace and who is authorized to take prompt corrective measures to eliminate them.

Controlled Tracks

Tracks upon which the rules require that all movements of trains must be authorized by a train dispatcher or a control operator/train dispatcher

Effective Securing Device

When used in relation to a manually operated switch or derail, one that is:

- Vandal resistant
- Tamper resistant
- Designed to be applied, secured, uniquely tagged and removed only by the class, craft or group of employees for whom protection is being provided.

Employee

An individual who is engaged or compensated by a railroad or by a contractor to perform any of the duties defined in this part.

Employer

A railroad or a contractor to a railroad, that directly engages or compensates individuals to perform any of the duties defined in this part.

Exclusive Track Occupancy (ETO)

A method of establishing working limits on controlled track.

Form D Control System (DCS)

A block system as defined by the NORAC Operating Rules, signaled or non-signaled, in which the movement of trains and or other mobile on rail equipment including hyrails and track cars operating outside of yard limits is authorized by Form D.

DCS in the context of Roadway Worker Protection is also used to authorize working limits established through “exclusive track occupancy”.

Foul Time

Method of establishing working limits on controlled track in which a roadway worker is notified by the train dispatcher or the control operator/train dispatcher that no trains will operate within a specific segment of controlled track until the roadway worker reports clear of the track.

Fouling

Placement of an individual or a piece of equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment, or in any case is within **4 feet** of the field side of the rail.

Hyrail Vehicle

A roadway maintenance machine that is manufactured to meet Federal Vehicle Motor Safety Standards and is equipped with retractable flanged wheels so that the vehicle may travel over the highway or on railroad tracks.

Inaccessible Track

Method of establishing working limits on non-controlled track by physically preventing entry and movement of trains and equipment.

Individual Train Detection (ITD)

Procedure by which **a Lone Worker** acquires On-Track Safety by seeing approaching trains and leaving the track before they arrive.

Interlocking Limits

The tracks between the opposing home signals of an interlocking

Lone Worker

An individual roadway worker who is not receiving On-track Safety by another roadway worker, who is not a member of a roadway work group and who is not engaged in a common task with another roadway worker.

Minor Correction

Minor correction means one or more repairs of a minor nature, including but not limited to welding, spiking, anchoring, hand tamping, and joint bolt replacement that are accomplished with hand tools or handheld, hand supported or hand-guided power tools. The term does not include machine spiking, machine tamping, or any similarly distracting repair.

Non-Controlled Track

Track upon which trains are permitted by railroad rule or special instruction to move without receiving authorization from a train dispatcher or a control operator/train dispatcher. NORAC Rule 96 and 98.

NORAC (Northeast Operating Rules Advisory Committee)

Rules that govern the operation of the Mass Coastal Railroad

Occupied Track

Occupied track means a track on which on-track self-propelled equipment or coupled equipment is authorized or permitted to be located while engaged in a common task with a roadway work group with at least one of the roadway workers on the ground.

On-Track Roadway Maintenance Machine

A self-propelled, rail mounted, non-highway maintenance machine whose light weight is in excess of 7500 pounds, and whose purpose is not for the inspection of railroad track

On-Track Safety (OTS)

A state of freedom from the danger of being struck by a moving train or other railroad equipment, provided by operating or safety rules that govern track occupancy by personnel, trains and on-track equipment

Qualified Employee

A Mass Coastal Railroad employee who has successfully completed all required training, demonstrated proficiency in and been authorized to perform duties of a particular position or function.

Railroad Bridge

A structure that supports one or more railroad tracks above land or water and has a **span length of 10 feet or more**, as measured along the track centerline. The term **railroad bridge** applies to the entire structure between the faces of the back walls of abutments or equivalent components, regardless of the number of spans.

Railroad Bridge Worker or Bridge Worker

Any employee of a contractor and/or of a railroad owning or responsible for the construction, inspection, testing, or maintenance of a bridge whose assigned duties, if performed on a bridge. In general, any employee working on or about a bridge structure 12' above ground or water is subject to the requirements of 214 sub Part B, section 214.105.

Restricted Speed

When required to move at restricted speed, movement must be made at a speed that allows stopping within half the range of vision short of train, engine, railroad car, men or equipment fouling the track, stop signal or derail or switch lined against movement.
When a train or engine is required to move at restricted speed, the crew must keep a lookout for broken rail and not exceed 20 MPH.
Comply with these requirements until the leading wheels reach a point where movement at restricted speed is no longer required.

Roadway Machine

A machine used on or near the track for maintenance, repair, construction or inspection of track, bridges, roadway, signal and communications systems. Roadway Machines may be on-track, off-track or both. The machines include hi- rails, motor cars, Roadway Machines, work equipment and other forms of track cars.

Roadway Maintenance Work Train

A train which is being operated within working limits in conjunction with roadway maintenance, construction or repairs under the direction of a designated roadway worker

Roadway Worker in Charge (RWIC)/Employee in Charge (EIC)

A Mass Coastal Railroad qualified employee designated to provide On-Track Safety for one or more roadway work groups.

Roadway Work Group

Two or more roadway workers organized to work together on a common task.

Roadway Worker

Any employee of a railroad, or of a contractor to a railroad, whose duties include inspection, construction, maintenance or repair of railroad track, bridges, roadway, signal and communication systems, roadway facilities or roadway machines on or near the track or with the potential of fouling a track and flagmen and watchmen/lookouts as defined in this program.

Track

Term designating the area between rails and an area that extends to **4 feet** outside of each rail

Track Car

Equipment (other than trains) operated on track for inspection or maintenance

Track Center

Distance from the center of one track to the center of an adjacent track

Train

A locomotive with or without cars, with the rear piece of equipment displaying a marker

Train Approach Warning (TAW)

A method of establishing On-Track Safety by warning roadway workers of the approach of trains in ample time to move to, or remain in, a place of safety in accordance with requirements of FRA Roadway Worker Protection Rules

Watchman/Lookout

An employee who has been annually trained, qualified and designated to provide warning to roadway workers of approaching trains or on-track equipment.

Watchmen/Lookouts must be properly equipped to provide visual and auditory warning such as a whistle, air horn, white disk, red flag, lantern, or fusee. A Watchmen/Lookout sole duty is to look out for approaching trains, on-track equipment and provide at least *fifteen (15) seconds* advance warning to employees before arrival of trains and on-track equipment

Working Limits

A segment of track with definite boundaries upon which trains, engines and roadway machines may move only as authorized by the roadway worker designated as the RWIC/EIC

Work Zone

The area around a roadway machine that must not be entered without first communicating with the operator to establish safe work procedures.

1.0 ROADWAY WORKER PROTECTION ACT

1.1 Purpose of the Roadway Protection Act

The purpose of these rules is to define procedures to prevent roadway workers (both company and contractor employees) from being struck by railroad cars, locomotives, track units or other equipment while performing their duties. These rules have been prepared in accordance with Federal Railroad Administration Regulations found in 49 CFR, Part 214.

1.2 Training

1.2.1 All Roadway Workers

On-Track Safety training must be conducted ***ANNUALLY*** for all Roadway Workers.

Each Mass Coastal roadway worker is responsible for:

- Following the Rules governing on-track safety
- Staying clear of any track until the work activity requires fouling the track
- Determining that proper track protection is in fact being provided in accordance with this manual before fouling a track
- Making sure that a job briefing precedes any on-track work
- Wearing the proper Personal Protective Equipment required by Mass Coastal
    - Roadway Worker Employees and/or Contractors including:
        - Reflective Vest
        - Hardhat
        - Safety Glasses
        - Safety Toed Boots
        - Gloves
- All Roadway Workers must have the proper safety vest and their current RWP training card at all times while they are engaged in their RWP related duties.
- RWIC/EIC's and Roadway workers must have access to the On-Track Safety Manual at the work location.

1.2.2 Rules Qualified Employees

Employees whose duties include the inspection, construction, maintenance or repair of track, bridges, roadway, signals, and machinery or provides protection for other employees or themselves must be qualified on these rules and have access to these rules while on duty.

In addition to the training and qualification that all roadway workers receive, every roadway worker who is required to be Rules Qualified must also be trained and qualified annually as an **Employee-In-Charge (EIC) or Roadway Worker-In-Charge (RWIC)**. Employees required to provide protection for themselves or others must be Rules Qualified.

1.2.3 Contractors

Contractors to a railroad who perform work and/or foul of any track must be trained in the On-Track Safety procedures. This training can occur at the work site in the form of an extended job briefing containing applicable railroad on-track safety rules and all elements of 214.345.

Contractors to a railroad must not be allowed to foul a track unless:

- They have been properly trained in the On-Track Safety procedures, and/or
- A railroad employee who is trained and qualified as a lookout, flagman or RWIC/EIC is present at the work site.

1.3 Job Briefings

A Job Briefing *must* be conducted *PRIOR* to any roadway worker fouling any track. A Job Briefing is complete only when each roadway worker acknowledges understanding of the On-Track Safety procedures and instructions.

1.3.1 Job Briefing for Roadway Work Group

The RWIC/EIC must conduct a Job Briefing that includes all information related to On-Track Safety. This Job Briefing is given to every roadway worker ***PRIOR*** to fouling the track.

In addition to other safety issues, the *minimum* On-Track Safety information must include:

- Designated RWIC/EIC; name and telephone number
- Type of On-Track Safety provided
- A general plan and procedures the work will follow
- Additional briefings if on-track protection changes
- Track limits and time limits of track authority
- Track(s) that may be fouled
- Nature and characteristics of the work to be performed, to determine if adjacent track protection is necessary
- Information about any adjacent tracks, on-track safety on adjacent tracks if required or deemed necessary by the RWIC, and identification of any roadway maintenance machines that will foul such tracks.
- Procedure to arrange for On-Track Safety on other tracks, if necessary
- Method of warning when On-Track Safety is provided by a lookout

- Designated place of safety where workers clear for trains
- Designated work zones around machines
- Safe working/traveling distances between machines

Note: When working limits overlap, those roadway workers in charge of the respective working limits must determine who will be the sole RWIC/EIC of the overlapping limits.

The RWIC/EIC must give a follow-up Job Briefing whenever:

- Working conditions or procedures change
- Other workers enter the working limits
- On-Track Safety is changed or extended, or
- The main track has been cleared and On-Track Safety or track authority is to be released

1.3.2 Job Briefing for Lone Workers

A Lone Worker must participate in an On-Track Safety Job Briefing with his supervisor or other designated employee at the beginning of each tour of duty. This briefing must include:

- Planned itinerary, and
- On-Track Safety procedure to be used, and
- Completion of a Statement of On-Track Safety if Individual Train Detection per rule 1.4.3 is to be used.

Exception: **When communication has failed, On-Track Safety Job Briefing must be conducted as soon as possible after communication is restored.**

1.3.3 Contractor/Employee Responsibilities

- Acknowledge Job Briefing
- Be able to provide the following information
    - EIC name and cell phone number
    - Type of On Track Safety (OTS)
        - Form D if appropriate
        - Adjacent Track Protection if appropriate
        - Inaccessible Track Protection if appropriate

1.3.4 Communication Requirements

Each employee designated by the railroad to provide on-track safety for a roadway worker group or groups, must be equipped with a wireless communication device capable of reaching the control center of the railroad. The employee must, where practicable, maintain immediate access to the communication device. When immediate access is not practicable, the employee in charge or lone worker must be equipped with a radio capable of monitoring transmissions from train movements in the vicinity.

1.4 On-Track Safety Procedures

The employee in charge of the roadway work group, or the Lone Worker, determines the type of On-Track Safety to be used. The type of On-Track Safety must comply with these provisions, as well as:

- NORAC Operating Rules
- Timetable
- General Orders
- Special Instructions

On-Track Safety can be provided for roadway workers by the following methods:

- Exclusive Track Occupancy
- Inaccessible Track
- Individual Train Detection (ITD)
- Train Approach Warning (TAW)
- Foul Time

1.4.1 Exclusive Track Occupancy

Exclusive Track Occupancy establishes working limits on **Controlled Tracks**.
Examples of Controlled Track include:

- Form D Control System Territory (DSC)
- Manual Interlocking
- Yard Limits (main line)

Exclusive Track Occupancy on **Controlled Track** can be established by the following four methods:

1. Exclusive Track Occupancy (NORAC Rule 133)
    a. Line 4 or 5
2. Train Approach Warning (TAW)
3. Individual Train Detection (ITD)
4. Foul Time (NORAC Rule 140)

Note: Trains and/or roadway maintenance machines must not enter the limits of the Form D unless verbally authorized by the RWIC/EIC. When so authorized, trains may move as specified by the RWIC/EIC. Restricted speed does apply unless higher speed is authorized by the RWIC/EIC not to exceed 30mph.

1.4.2 Inaccessible Track

Inaccessible Track is a method of establishing working limits on **non-controlled** tracks by making the track physically inaccessible to trains, engines, rolling equipment and on-track equipment.

Trains and roadway maintenance machines within working limits established by means of inaccessible track shall move only under the direction of the RWIC/EIC and must move prepared to stop within one half the range of vision, short of men and equipment. No operable locomotives or other items of on-track equipment except those under the direction of the RWIC/EIC may be located within these limits.

Non-controlled track consists of:

- Yard Tracks (not main line Yard Limits)
- Industrial Leads
- Non-controlled Sidings
- Rule 98 Tracks

The RWIC/EIC or Lone Worker establishes working limits using Inaccessible Track with one of the following methods:

- Line a switch or derail to prevent access to the working limits. Lock, spike and/or clamp switch or derail securely. A MOW lock must be used so train service employees cannot unlock it; or
- Place a portable derail(s) with red flag(s). Derails and red flags should be placed 300' in advance of work area, if possible; or
- Place a flagman with instructions and the capability to hold all trains and equipment from entering the working limits; or
- Establish discontinuity in the rail to prevent movement into the working limits.

1.4.3 Individual Train Detection (ITD)

Individual Train Detection is a form of On-Track Safety that can be used ***only*** by Lone Workers. A Lone Worker has the right to use On-Track Safety procedures other than ITD if the Lone Worker feels the situation requires it. ITD can be used to provide On-Track Safety only if all the following conditions are met:

- The Lone Worker is trained, qualified, and designated to use ITD, and
- Only routine inspection or minor repair is being performed. The Lone Worker may not occupy any position or engage in any activity that would interfere with the ability to detect the approach of train or equipment in either direction, and
- The Lone Worker is not inside the limits of a Manual Interlocking, and
- The Lone Worker can visually detect the approach of trains or equipment moving at maximum speed and can move to a place of safety at least 15 seconds before its arrival.

NOTE: The place of safety must not be on a track unless working limits have been established on that track.

- No power operated tools or machines are in use within hearing range. The Lone Worker's ability to hear and see approaching trains and equipment is not impaired by:
    - Background noise
    - Lights
    - Inclement Weather
    - Passing Trains
    - Other Physical Conditions

- The Lone Worker has completed a written Statement of On-Track Safety. When using ITD, the Lone Worker must produce the completed Statement of On-Track Safety upon request.

1.4.4 Train Approach Warning (TAW)

Members of a roadway work group may foul a track without establishing working limits by using Train Approach Warning to **perform routine inspections or other minor corrections; or to provide warning on adjacent non-controlled tracks for large scale maintenance work.** The RWIC/EIC will establish On-Track Safety by designating one or more Lookouts to provide warning of all approaching movements. Lookouts will provide the warning using:

- A whistle or an air horn

And/or

- Any method agreed upon in Job Briefing

Train Approach Warning may be used to provide On-Track Safety only when all the following conditions are met:

- Each Lookout must be a qualified employee and equipped to provide Train Approach Warning, and
- A Lookout can give a Train Approach Warning in time to allow each roadway worker to move to a previously arranged place of safety at least 15 seconds before the arrival of a train, engine or other equipment, and
- Each roadway worker is in a position to receive a Train Approach Warning

Lookouts must devote their entire attention to detecting approaching trains and engines and warning the roadway workers. Lookouts must:

- Not be assigned other duties while functioning as a lookout.
- Remain at their duties until the RWIC/EIC either determines that protection is no longer necessary or sends another Lookout to relieve them.

Note: **The RWIC/EIC may provide Train Approach Warning by acting as the Lookout as long as the RWIC/EIC is not performing other duties.**

The Lookout's method of communicating a Train Approach Warning must be distinctive and clearly understood, regardless of noise or work distraction and regardless of the direction that the warned worker is looking and agreed upon during the Job Briefing.

The method that a Lookout will use to warn roadway workers will consist of:

- Blowing a whistle and/or sounding an air horn
- Verbal Communication
- Visual aid (ex. Paddle, flag, etc.)

Note: Touching a roadway worker can be utilized to replace the above aids when only two roadway workers are present. The two roadway workers must always remain within arm's length of each other when fouling the track.

The following chart identifies the minimum distance required for the maximum authorized speed **to provide employees the minimum 15 seconds necessary to clear the track prior to the arrival of a train or engine. Time requirements to distribute or receive warning, removing tool/materials, etc. must be added to the 15 seconds.**

Speed (Mph)	Distance (Ft)	Speed (Mph)	Distance (Ft)
5	110	35	770
10	220	40	880
15	330	45	990
20	440	50	1,100
25	550	55	1,210
30	660	60	1,320

1.4.5 Foul Time

Use Foul Time to establish working limits on **controlled track** in:

- DCS Territory
- Manual interlocking's

To establish working limits using Foul Time:

- Obtain Foul Time from the control operator/train dispatcher.
- Copy and repeat the Foul Time back to the control operator/train dispatcher.
- When protection is no longer required, report clear of the limits to the control operator/train dispatcher. The control operator/train dispatcher then releases the Foul Time.

1.4.6 Adjacent Track Protection on Non-Controlled Track

Inaccessible Track per rule 1.4.2 can be used to establish working limits when it is necessary to foul adjacent **non-controlled tracks**.

If working limits are not established on an adjacent non-controlled track, Train Approach Warning per rule 1.4.4 may be used to protect roadway workers fouling that track.

1.4.7 Adjacent Track Protection on Controlled Track

Protection for roadway workers and roadway work groups performing minor or major track maintenance with or without roadway maintenance machines will be established for adjacent controlled tracks within 25' of ongoing work.

Note: The RWIC/EIC may establish protection on any adjacent track (s), even when not specifically required by this rule, at any time as deemed necessary by the RWIC/EIC to ensure the safety of the roadway work group

1.4.7.1 Occupying a Track with an Adjacent Controlled Track (s)

Exclusive track occupancy per rule 1.4.1 or train approach warning per rule 1.4.4 must be utilized to provide protection for roadway workers on an adjacent controlled track(s) (adjacent controlled track(s) spaced 25ft or less center to center).

NOTE: Train approach warning must not be utilized to provide protection on an adjacent controlled track if any component of the on track equipment such as a boom, arm or crane will foul the adjacent protected track. If any component of the equipment will foul the adjacent protected track, the RWIC/EIC must establish exclusive track occupancy per rule 1.4.1 for protection and not permit movements on the adjacent track. RWIC/EIC must not permit movements on the adjacent track until all men and equipment are clear.

1.4.7.2 Passing of Trains on Adjacent Controlled Tracks

When the RWIC/EIC permits the passing of trains or other on-track equipment on the controlled adjacent track(s), roadway workers must stop work and move to a pre-determined place of safety upon receiving a watchman/lookout warning, or notification that the RWIC/EIC intends to permit one or more trains or on track equipment movements within the working limits of the adjacent controlled track. The pre-determined place of safety must not be fouling any track unless working limits have been established for that track and no movements on that track within those limits are permitted by the RWIC/EIC. Machine operators must stop the operation of their equipment, and when practicable, persons using them must remove themselves to a pre-determined place of safety. Prior to authorizing movements through working limits on an

adjacent track, the RWIC/EIC must notify roadways workers and receive verification that personnel and equipment are clear of the adjacent track(s).

1.5 Audible Warning from Trains

Trains must sound their locomotive whistle and ring their bell per the railroad operating rules when approaching roadway workers on or near the track, regardless of local whistle prohibitions.

To give trains advance notice of roadway workers on or near the track, each roadway worker fouling the track must wear company-approved work wear with reflectorized striping.

1.6 Operating and Working Near Roadway Machines

1.6.1 Purpose

The purpose of this section is to prevent accidents and casualties caused by the lawful operation of on-track roadway maintenance machines and hi-rail vehicles**.** This section prescribes minimum safety standards for on-track roadway maintenance machines and hi-rail vehicles.

1.6.2 On-Track Equipment Operator Training and Qualifications

1.6.2.1 General Training Requirements

No employee may operate a roadway machine without first:

- Having been trained in accordance with the rules;
- Having been informed of the safety procedures applicable to persons working near the machine; and
- Acknowledging full understanding of those safety procedures

1.6.2.2 Machine Specific Training Requirements

The operator's manual, which includes instructions for safe operation, shall be provided and maintained with each machine large enough to carry the document. A machine operator must have a clear understanding of the information contained in the associated manual prior to operating a roadway machine.

1.6.2.3 Qualifications

An employee will not be considered qualified to operate a unit of on-track equipment without having been trained to be competent in the operation of

that machine. This training may be accomplished on-the-job through peer instruction or through a combination of classroom training and peer training.

1.6.3 Working with On-Track Equipment

When Working with On-Track Equipment, spacing guidelines must be adhered to in order to prevent contact between machines and to prevent machines from contacting workers. When work or travel conditions dictate that the machine spacing must be less than the guidelines require, the machine operators and the RWIC/EIC must have a thorough understanding of the specific task, the conditions under which the task is to be done and how the task is to proceed. In addition, the operator of a machine approaching workers who are to foul the track must communicate with the workers before getting closer than 15 feet to them.

Before a reverse move is made, the operator must ascertain that a backup alarm is activated and/or the appropriate horn or signal is provided. In addition, the operator must observe that the track is clear of men and machines before the reverse movement is made.

1.6.3.1 Work Zones around Machines

When roadway workers' tasks require that they occupy the center of the track, they must not enter a machine's Work Zone without first communicating with the operator to establish safe work procedures. Unless a different understanding is established through a job briefing, *this Work Zone extends from a point 15 feet in front of the machine to a point 15 feet behind the machine.*

1.6.3.2 Safe Working Distance between Machines

Unless a different understanding is established through a job briefing, the *minimum distance between machines while working is 40 feet.*

1.6.3.3 Safe Traveling Distance between Machines

On-track equipment must maintain a *minimum distance of 200 feet* between each other, except when traveling through a crossing, In addition to the 200 feet, on-track equipment must operate at a speed which will allow stopping within half the range of vision.

Note: Adverse weather and/or rail conditions may require greater separation distances.

1.6.3.4 Stopping On-Track Equipment

When necessary to slow or stop on-track equipment during travel, the operator must signal following equipment operators either by radio or hand signal and be understood.

1.6.3.5 Tying Up Equipment

All equipment must be properly secured by the following procedures when left unattended to ensure safety:

- Secure all brakes, booms, locks, and hooks.
- Dismount the machine on the field side of the track, away from live traffic.

EXCEPTION: If the track is between live tracks, dismount on the side designated in the job briefing

1.7 Right to Challenge On-Track Safety

The railroad and each roadway worker share joint responsibility for ensuring that On-Track Safety is provided.

1.7.1 Responsibilities of the Railroad

The Railroad must:

- Provide proper training of every roadway worker as outlined in 1.2.
- Guarantee each employee and/or operator the absolute right to challenge, in good faith, whether the On-Track Safety procedures to be applied at the job site comply with the Railroad Rules. Each employee has the right to remain clear of the track until the challenge is resolved.
- Follow the procedures outlined in 1.7.3 to resolve challenges promptly and equitably.

1.7.2 Responsibilities of the Roadway Worker

Each roadway worker has the following responsibilities:

- Follow the Railroad's On-Track Safety procedures.
- Avoid fouling a track except when necessary to perform your duties.
- Before fouling a track, determine that On-Track Safety is being provided.

Note: A roadway worker or roadway machine is considered to be fouling a track when within 4 feet of the nearest rail.

- Refuse any directive to violate an On-Track Safety or machine/hyrail rule and promptly notify a supervisor when the safety provisions to be applied at the job site do not comply with the railroad rules.

1.7.3 Good Faith Challenges and Resolution of Those Challenges

A roadway worker may make a Good Faith Challenge to on-track safety procedures and conditions of roadway maintenance machines and hyrail vehicles. Follow these steps when resolving a challenge:

1. The roadway worker informs the RWIC/EIC that he or she does not believe that the procedure and/or condition complies with the railroad's rules.

   Note: Employees may not be subject to any retribution or punishment for making a good faith challenge.

2. The RWIC/EIC will review procedure and/or condition with the employee to verify that the procedure and/or condition complies with the railroad's rules.
3. If the employee is still not satisfied that the procedure or condition complies with the railroad's rules, the RWIC/EIC will contact the Manager of Engineering, Track & Bridges and complete the "Good Faith Challenge Form."
4. Upon the review:
   - If the Manager determines that the procedure and/or condition is not in compliance with the railroad rules, the RWIC/EIC will correct procedure and/or condition to ensure compliance.
   - If the Manager of Engineering, Track & Bridges determines that procedure and/or condition is in compliance with the railroad rules, the challenging employee must perform the assigned task.

2.0 Bridge Worker Safety

2.1 General Requirements

2.1.1 General Fall Protection Requirements

When working on a railroad bridge at a height of **12 feet** or more above the ground or creek bed, use personal fall arrest equipment. If fall protection is required to perform bridge repairs and proper equipment is not available for a rescue plan, the supervisor should be contacted prior to making repairs.

Note: If rescue equipment is unavailable, the work cannot be attempted until equipment is available and all involved workers are properly trained.

Where there is no deck openings through which an employee can fall, the use of personal fall arrest equipment is not required when:

- Walking within the gage of the rails.
- Performing minor inspections or repairs exclusively between the outside rails.
- Working on a bridge that has walkways or railings that meet the requirements of the American Railway Engineering & Maintenance of Way Association Manual for Railway Engineering.
- Conducting bridge inspections when:
    - A written program in place that requires training in, adherence to, and use of safe procedures associated with climbing techniques and procedures to be used
    - The inspector has been trained and qualified according to that program
    - The inspector has been previously and voluntarily designated to perform inspection under the provisions of that program and has accepted the designation
    - The inspector is familiar with the appropriate climbing techniques associated with bridge structures
    - The inspector is engaged solely in moving on or about the bridge or observing, measuring and recording the dimensions and condition of the bridge
    - The inspector is provided all equipment necessary to meet the needs of safety, including any specialized alternative systems required
    - The installation or use of fall arrest equipment poses a greater exposure to risk than the work to be performed

Note: Minor repairs include, but are not limited to, routine welding, spiking, anchoring, spot surfacing and joint bolt replacement. Replacing bridge ties or rail is *NOT* considered minor repairs.

2.1.2 Fall Protection System Standards

Fall protections systems utilized must be compliant with *49CFR Part 214.105.*

Note: Body belts shall not be utilized.

2.2 Safety Net Systems

Safety net systems must be compliant with *49CFR Part 214.105*.

2.3 Working Over or Adjacent to Water

When working over or adjacent to water 4' feet or greater in depth or where the potential of drowning exists utilize a:

- Personal fall protection system. (Fall protection is require if 12 or more feet above the water.) or life vest
- Ring buoy with a minimum of 90 feet of line and no more than 200 feet between buoys; and inflatable boat, manned if necessary.

2.4 Inspecting Equipment and System

- Prior to use, Inspect fall protection equipment and systems according to the manufacturers' instructions and as reviewed in training sessions.
- A fall protection system or component involved in a fall shall be immediately and permanently removed from service until fully inspected and determined by a competent person to be undamaged and suitable for reuse.

2.5 Cleaning and Storing Equipment

- Clean fall protection equipment components according to the manufacturers' instructions provided with the equipment, and as reviewed in training sessions.
- Store fall protection equipment components where they cannot be accessed by unauthorized personnel. Protect from adverse weather conditions, chemical exposure and open flames and sparks.

2.6 Scaffolding

Scaffolding systems utilized must be compliant with 49CFR Part 214.109.

2.7 Bridge Worker Rescue Plan

Prior to utilizing fall protection equipment, a job briefing should be conducted to identify and prepare for implementation of emergency rescue needs.

2.8 Personal Protective Equipment (PPE) for Bridge Workers

- Hard hats, conforming to the ANSI standards, must be utilized by bridge workers when on or under a bridge.
- Steel-toed boots, conforming to the ASTM standards, must be utilized by bridge workers when on or under a bridge.
- Safety glasses, conforming to ANSI standards, must be utilized by bridge workers when on or under a bridge.
- Face shield should be utilized when safety glasses will not provide adequate protection.
- All PPE will be kept clean and in good repair with no structural or optical damage.

Hard hats, face shields, non-prescription safety glasses and googles (cover-all type for workers wearing prescription glasses) shall be provided to the bridge workers.

3.0 ON-TRACK MAINTENANCE MACHINES AND HI-RAIL VEHICLES

3.1 General Prestart Checks

Prior to starting work equipment, check the following levels:

- Engine oil
- Radiator coolant
- Transmission fluid
- Hydraulic fluid
- Hydraulic brake fluid
- Fuel
- Other parts that use any type of fluid

3.2 Equipment Inspection and Condition

- Machine Operators must maintain work equipment in a safe condition
- Machine Operators should have the necessary tools to perform daily maintenance and basic repairs
- Machine Operators must inspect work equipment before and periodically during use
- Any non-compliant FRA condition must be red tagged, dated and reported to the Supervisor.

  Non-compliant conditions are as follows:
  - Headlights/work light: Machine can be operated for 7 days during daylight hours
  - Horn: Portable horn can be utilized for 7 days
  - Fire extinguisher: Portable fire extinguisher can be utilized for 7 days
  - Back-up alarm/strobe light: Must be repaired within 7 days
  - Operator's seat: Must be repaired within 24 hours
  - Braking system: Move machine to clearance point and place out of service if unable to couple to other machine to provide braking or no secondary braking system.

3.2.1 Repairs

- If parts are available, repairs must be completed immediately. If repairs cannot be made immediately, contact Supervisor
- If parts have been ordered within 24 hours of defect notification (excluding brake system and operator seat failure), the machine can be operated for 30 days
- Repairs must be made within the 30 days
- If equipment is not repaired after 30 days, it must be removed from service

3.2.2 Towing

- Must be equipped with towing bar or coupler
- Must not exceed braking system capabilities

3.3 On-Track Roadway Maintenance Machine Safety Requirements (General)

- Secure position (e.g., handhold, handrails, or seat) for each operator and transported roadway worker
- Rider position must be clearly identified
- Functional horn with triggering device easily identifiable and within reach of operator
- Headlights capable of lighting 300ft ahead of equipment
- Overhead covers at the operator(s) position if previously equipped
- Floors, decks stairs, and ladders must provide secure access and free of obstructions, grease and oil
- Flagging kit, if operated alone or lead/trailing machine in gang
- Operator's manual

3.4 On-Track Roadway Maintenance Machines Safety Requirements (Built on or after January 1, 1991)

In addition to the general requirements the following also apply:

- Back-up alarm or rearward viewing mirror if feasible
- Operative heater when operated below 50 degrees or equipped or has been equipped by manufacturer
- Light weight of machine clearly displayed, if more than 7,500 pounds
- Reflective material/device or operable brake lights
- Safety glass
- Turntable lock or warning light

3.5New On-Track Roadway Maintenance Machine Safety Requirements (Built after September 27, 2004)

In addition to the general requirements the following also apply:

- Tampers, regulators, mechanical brooms, rotary scarifiers, undercutters or mechanical equivalent must have operational heater, AC and pressurized ventilation system.
- Operator's seat, unless designed to travel by standing, then equipped with handholds or handrails to a safe and secure position
- Locking turntable (e.g., hooks latches, pins, etc.)
- Windshield with safety glass if designed with windshield. Power windshield wipers or suitable equivalent if wipers or incompatible with windshield
- Capable braking system

- First-aid kit
- Fire extinguisher (5BC rating or higher)
- Display as-built light weight in a conspicuous location
- Headlights capable of lighting 300ft ahead of equipment
- Work lights if operated at night, unless equivalent light is provided
- Operational 360-degree strobe light, unless designed without roof and light weight is less than 17,500
- Brake light activated by application of braking system and visible at 300ft
- Functional horn with triggering device clearly identifiable
- Back-up alarm with review mirror
- Speed indicator, if light weight exceed 32,500 pounds and is operated at speeds in excess of 20 mph

3.6 Hi-rail Safety Inspection Checklist

Tram, wheel wear and gage must be inspected annually with no more than 14 months between inspections. Inspection must be documented and retained by Supervisor unit next required annual inspection. Prior to use, the operator must ensure the following:

- The annual inspection is current.
- Any non-compliant FRA condition must be red tagged and reported to your Supervisor.

  Non-compliant conditions are as follows:
  - Functional strobe light
  - Back-up Alarm
  - Flagging kit

3.6.1 Repairs

- If parts are available, repairs must be completed immediately. If repairs cannot be made immediately, contact Supervisor
- If parts have been ordered within 24 hours of defect notification (excluding brake system and operator seat failure), the hi-rail can be operated for 30 days
- Repairs must be made within the 30 days.
- If equipment is not repaired after 30 days, it must be removed from service

Appendix A

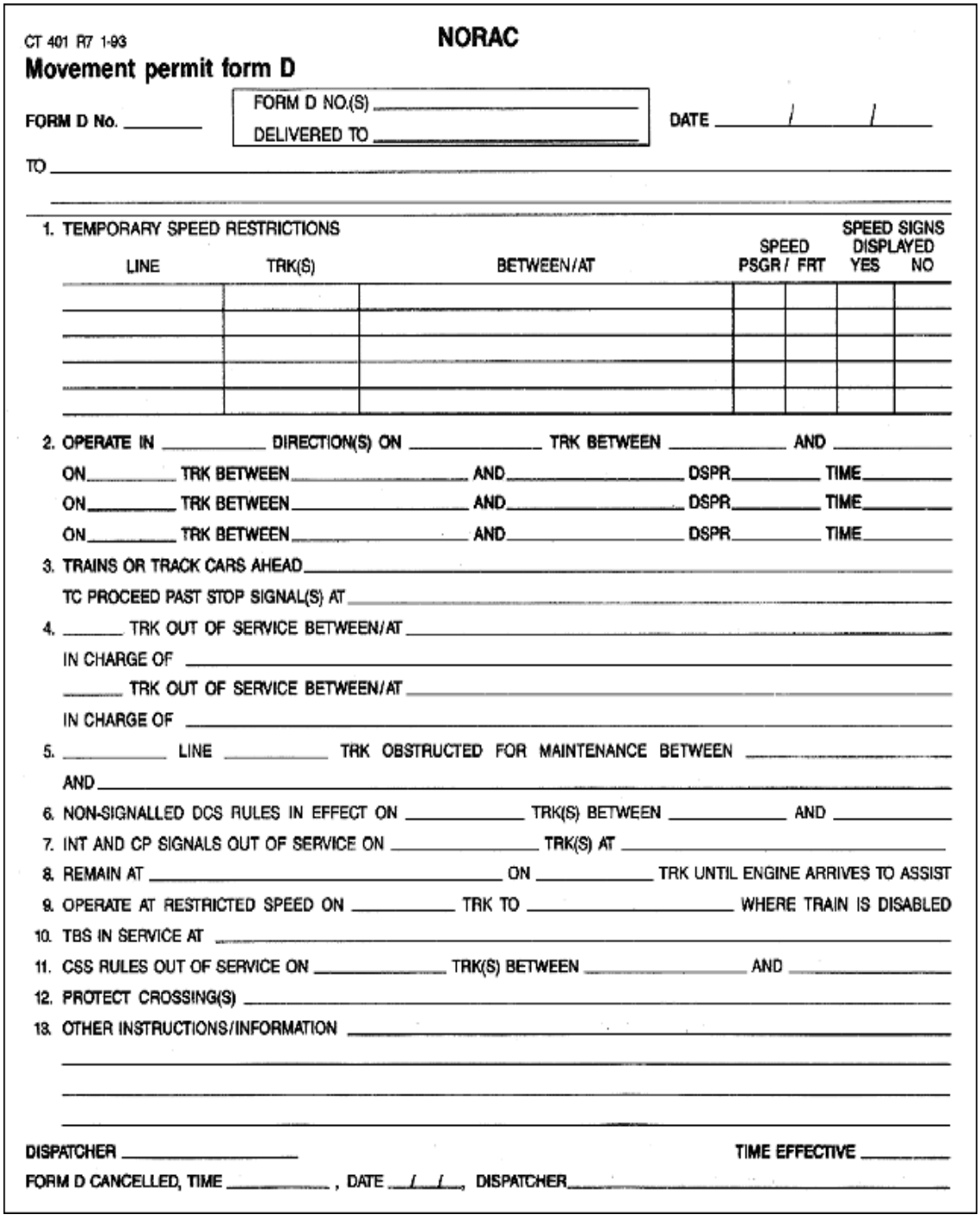
SAFETY TIPS FOR ROADWAY WORKERS

1. Never foul a track unless your work requires you to do so.
2. Never foul a track until you are absolutely certain that on-track safety has been established and that the OTS is appropriate for the work to be performed.
3. You have the right to challenge the on-track safety procedures to be applied at the job location if you believe that they do not comply with the rules of the railroad. You should remain clear of the track until the challenge is resolved.
4. An on-track safety job briefing must be conducted before fouling the track, and you should understand all aspects of your on-track safety to ensure that you are adequately protected. You must acknowledge that you understand the briefing and the on-track safety must be appropriate for the work that you are performing.
5. Remind the person providing you the on-track safety job briefing that you must be notified of any changes that may occur throughout the day.
6. You must know the identity and cell phone number of the EIC.
7. It is critical to know the type of on-track safety for all of the track(s) you are to foul.
8. When train approach warning is to be provided, the designated place of safety must be known and established in the job briefing. It is imperative that you are able to be clear of the track before any train is not less than 15 seconds from your work location.
9. If the work activity is on a track with adjacent track(s), you must know what type of on-track safety is provided on those adjacent track(s).

10. If you are a lone worker using individual train detection:
    a. The on-track safety statement must be completed. (continued on next page)
    b. You have the right to use an alternative form of on-track safety other than individual train detection.
    c. You cannot be working where there is noise (e.g., environmental, power tools, machines, etc.) or other impairments interfering with your ability to detect approaching trains.
    d. You must be outside a manual interlocking, controlled point, or remote hump yard facility.
    e. You must have the ability to clear to a protected area.
    f. The required sight distance must be available in order for you to be in the clear before any train is not less than 15 seconds away from your work location.
    g. Only minor repairs, inspection, or correction work may be performed as long as they do not interfere with your ability to detect approaching trains.
11. If the task involves Roadway Maintenance Machines (RMM), you must know the RMM procedures to ensure your safety.
12. Before fouling any track be sure to be wearing the proper high-visibility clothing/PPE.
13. The specific Working Limits boundaries must be clearly defined by mile posts and/or other physical characteristics such as stations found in the time table.
14. **Stop, look, and listen before crossing any track, regardless of the on-track safety status of the track(s).**

You can expect the movement of trains, engines, cars, or other moveable equipment at any time, on any track, in either direction.

Appendix B



CT 401 R7 1-93

NORAC

Movement permit form D

FORM D No. _____

FORM D NO.(S) _____

DELIVERED TO _____

DATE ____/____/____

TO _____

_____

1. TEMPORARY SPEED RESTRICTIONS

LINE	TRK(S)	BETWEEN/AT	SPEED PSGR / FRT		SPEED SIGNS DISPLAYED YES	NO

2. OPERATE IN _____ DIRECTION(S) ON _____ TRK BETWEEN _____ AND _____

ON_____ TRK BETWEEN_____ AND_____ DSPR_____ TIME_____

ON_____ TRK BETWEEN_____ AND_____ DSPR_____ TIME_____

ON_____ TRK BETWEEN_____ AND_____ DSPR_____ TIME_____

3. TRAINS OR TRACK CARS AHEAD_____

TC PROCEED PAST STOP SIGNAL(S) AT _____

4. _____ TRK OUT OF SERVICE BETWEEN/AT _____

IN CHARGE OF _____

_____ TRK OUT OF SERVICE BETWEEN/AT _____

IN CHARGE OF _____

5. _____ LINE _____ TRK OBSTRUCTED FOR MAINTENANCE BETWEEN _____

AND _____

6. NON-SIGNALLED DCS RULES IN EFFECT ON _____ TRK(S) BETWEEN _____ AND _____

7. INT AND CP SIGNALS OUT OF SERVICE ON _____ TRK(S) AT _____

8. REMAIN AT _____ ON _____ TRK UNTIL ENGINE ARRIVES TO ASSIST

9. OPERATE AT RESTRICTED SPEED ON _____ TRK TO _____ WHERE TRAIN IS DISABLED

10. TBS IN SERVICE AT _____

11. CSS RULES OUT OF SERVICE ON _____ TRK(S) BETWEEN _____ AND _____

12. PROTECT CROSSING(S) _____

13. OTHER INSTRUCTIONS/INFORMATION _____

_____

_____

_____

DISPATCHER _____ TIME EFFECTIVE _____

FORM D CANCELLED, TIME _____ , DATE __/__/__, DISPATCHER_____

Appendix C

Massachusetts Coastal Railroad

GOOD FAITH CHALLENGE FORM

Name: _____

Job Position: _____

Job Location: _____

Supervisor's Name: _____ Supervisor's Title: _____

Date and Time of Occurrence: _____

Work Location: _____

Track and Mile Post: _____

Nearest City/Town: _____

On-Track Safety Procedure applied (or lacking) at working location:

_____

_____

_____

Railroad Safety or Operating Rule not being complied with:

_____

_____

_____

Reason for this Challenge:

_____

_____

_____

Other Employees with information regarding this situation:

_____

_____

_____

Signature: _____ Date: _____

Determination by Supervisor:

_____

_____

_____

Supervisor Signature: _____ Date: _____

INSTRUCTIONS: The employee making challenge shall complete this form, sign and date it, and give it to his Supervisor who shall document his determination, sign and forward to the Roadmaster.

Appendix D

Railroad Matrix

The following Matrix will assist the Railroad Supervisor, or the RWIC/EIC and any Roadway Worker responsible for establishing working limits in the determination of On-Track Safety Protection. To determine the protection available, the RWIC/EIC or Lone Worker decides what track is to be occupied and the appropriate type of protection to be used.

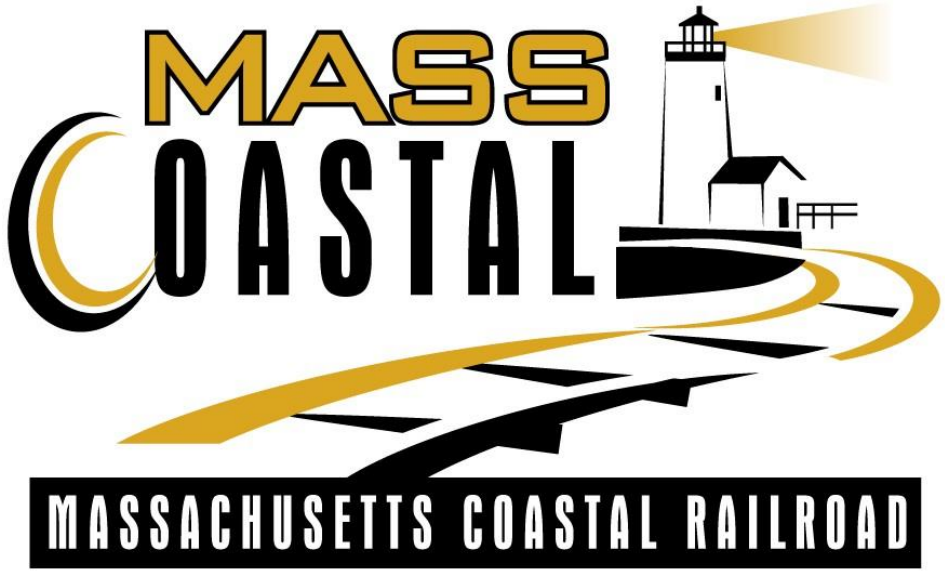
TYPE OF ON-TRACK SAFETY (OTS)	NORAC	CONTROLLED TRACK		NON-CONTROLLED TRACK		MANUAL INTERLOCK OR CP	
		GANG	LONE	GANG	LONE	GANG	LONE
EXCLUSIVE TRACK OCCUPANCY (ETO) (1)	Rule 133	•	•			•	•
FOUL TIME (1)	Rule 140	•	•			•	•
INACCESSIBLE TRACK (1)	Rule 141			•	•		
TRAIN APPROACH WARNING (TAW)		•		•			
INDIVIDUAL TRAIN DETECTION (ITD)			•		•		

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00902

MASSACHUSETTS COASTAL RAILROAD TIMETABLE AND OPERATIONS SCHEDULE

THIS PAGE IS INTENTIONALLY LEFT BLANK



Timetable
and
Special Instructions
No. 8

Effective at 12:01 AM
DECEMBER 1, 2021

WITH REVISED PAGES INSERTED AS IMPLEMENTED BY GENERAL ORDER MAY 22, 2025.

President and Chief Operating Officer

P.C. PODGURSKI

Vice President of Engineering

M.C. RENKER

Emergency Services Phone List		
Town/Village	**Police**	**Fire**
Acushnet	508-998-0240	508-998-0250/911
Assonet	508-763-4017	508-763-4017
Attleboro	508-222-1212	508-222-1212
Barnstable	508-775-0812	508-362-3312
Berkley	508-822-7040	508-822-6354
Bourne	508-759-4453	508-759-4411
Dartmouth	508-910-1734	508-994-6761
Falmouth	508-548-1212	508-548-2323
Fall River	508-676-8511	508-324-2741
Foxboro	508-543-4343	508-543-1230
Framingham	508-872-1212	508-532-5930
Freetown	508-763-4017	508-763-4017
Hyannis	508-775-0812	508-775-1300
Lakeville	508-947-4422	508-947-4121
Mansfield	508-261-7300	508-261-7320
Medfield	508-359-2315	508-359-2325
Middleboro	508-947-1212	508-946-2461
New Bedford	508-991-6300	508-991-6105 ex 8
Norton	508-285-3300	508-285-0240
Onset Fire		508-295-2121
Otis ANG	508-968-5997	508-968-7900
Raynham	508-824-2716	508-824-2713
Rochester	508-763-5112	508-763-2611
Sandwich	508-888-1212	508-888-0525
Somerset	508-679-2138	508-646-2810
Sherborn	508-653-2424	508-653-3270
Taunton	508-823-5000	508-824-4024
Wareham	508-295-1212	508-295-2323
West Barnstable	508-775-0812	508-362-3241
Yarmouth	508-775-0445	508-398-2211
Walpole	508-668-1212	508-668-2323
CHEMTREC	800-262-8200	
State Police - Bourne	508-759-4488	
State Police – Foxboro	508-543-8550	
State Police - Middleboro	508-947-2222	
State Police - Yarmouth	508-398-2323	
Barnstable Sheriff's Office	508-563-4200	
MBTA Police	617-222-1212	

IMPORTANT RAILROAD NUMBERS	Phone	Fax
Cape Cod Hospital (Hyannis)	508-771-1800	
Falmouth Hospital (Falmouth)	508-548-5300	
Tobey Hospital (Wareham)	508-295-0880	
BIDM Hospital (Plymouth)	508-746-2000	
St. Luke's Hospital (New Bedford)	508-997-1515	
Charleton Memorial Hospital (Fall River)	508-679-3131	
Morton Hospital (Taunton)	508-828-7000	
Mass Coastal Railroad		
Onset Operations	508-291-2116	508-291-4116
Buzzards Bay Tower	508-291-2116 x140	508-759-0918
Taunton Crew Office		508-823-2911
Hyannis Engine House	508-291-2116 X 141	508-771-3294
Cape Cod Central Depot	508-827-6990	508-771-1335
Bridge Control	978-318-8577	508-759-3209
Canal Control-MTC	978-318-8500	508-294-9314
SEMASS Fuel Control	508-291-4475	
Yarmouth Transfer Station	508-394-1501	
Keolis Branch Line Dispatcher	617-222-8106	
Keolis Old Colony Dispatcher	617-222-8105	617-222-8104
Keolis Chief Dispatcher	617-222-8195	617-222-8104
Keolis Worcester Main	617-222-8199	
CSX Selkirk NA Dispatcher	518-767-6112	518-767-6141 or 6102
CSX Middleboro	508-947-1061	508-947-7378
Canal Fuel	508-888-1469	
Lamparelli Oil	781-828-2477	
Noonan Fuel	508-509-7027	
TSA 30-minute response emails:	TSA.49CFR1580@TSA.DHS.GOV	703-563-3154
	Michael.A.Mcdonough@DHS.GOV	
Mass Coastal Dispatcher	608-352-6001	
Emergency Hotline	888-783-4316	
Email	dispatcher@railrcs.com	
Fax	608-208-9020	

Table of Contents

Authorized Abbreviations	Page 7
Station Pages	
Cape Main	Pages 8-9
Dean Street Industrial Track	Page 10
Falmouth Line	Page 11
South Dennis Line	Page 12
New Bedford Subdivision	Page 13
Fall River Subdivision	Page 14
Framingham Secondary	Pages 15-16
Middleboro Subdivision	Page 17
Watuppa Line	Page 18
Grade Crossings	
Cape Main	Pages 19-20
Dean Street Industrial Track	Page 21
Falmouth Line	Page 21
South Dennis Line	Page 21
New Bedford Subdivision	Page 22
Fall River Subdivision	Page 22
Framingham Secondary	Page 23
Middleboro Subdivision	Page 24
Watuppa Line	Page 24
Grade Crossing Notes	Pages 25-27
Special Instructions	
Mass Coastal / Foreign Railroad Operations	Page 28
Operating Rules Qualification	Page 28
Physical Characteristics Qualification	Page 28
Medical Examinations	Page 28
Possession of Firearms	Page 28
Reporting Unusual Occurrences	Page 29
Drugs and Alcohol	Page 29
Persons Allowed in Locomotive Cabs	Page 29
Hours of Service	Pages 28-29
Injuries on Railroad Property	Page 30
Policy Statement and Complaint Procedures	Pages 30-31
Reporting For Duty	Page 31
Bulletin Board Locations	Page 31
Daily Operating Bulletins (DOBs)	Pages 31-32
Miscellaneous Signals	Page 33
Movement of Trains	Pages 34-35

Table of Contents

Protection of Trains	Page 36
Movement Permit Form D	Page 37
Form D Control System	Pages 37-38
Interlockings and Control Points	Pages 39-41
Radios and Telephones	Pages 42-43
Train & Engine Service Employees	Page 44
Location Information and Restrictions	Pages 45-51
Track Charts	
Cape Main	Pages 52-55
Dean Street Industrial Track	Page 56
Falmouth Line	Page 57
Otis Industrial Track	Page 58
South Dennis Line	Page 59
New Bedford Subdivision	Pages 60-61
Fall River Subdivision	Pages 62-63
Framingham Secondary	Pages 64-65
Middleboro Subdivision	Pages 66-67
Watuppa Line	Page 68
Yard Maps	
Buzzards Bay Yard	Page 69
Hyannis Yard	Page 70
Rochester Yard/SEMASS	Page 71
New Bedford Yard	Page 72
MC-Cotley Interchange	Page 73
Keolis– Bay to MID-Middleboro Yard	Page 74
Wharf Yard	Page 75
Walpole Yard	Page 76
Mansfield Yard	Page 77
Employee Qualifications	Pages 78-80

Authorized Abbreviations

The following is a list of Authorized Abbreviations that supplements or supersedes those listed in the Terminology, Definitions and Authorized Abbreviations section of the NORAC Operating Rules Eleventh Edition. These abbreviations are only authorized for use in documents generated on Mass Coastal territory and they are not for use in documents generated on CSXT or Keolis territory.

APTX	Aptucxet
BUTTER	Buttermilk
BUZ	Buzzards Bay
CJ	Canal Junction
CM	Cape Main
CAT	Cataumet
CST	Coast
XING	Crossing
XOVER	Crossover
DS	Dean Street
E	East
EWARE	East Wareham
FAL	Falmouth
FALRIV	Fall River
FARM	Farm
FIELD	Field
FOX	Foxboro
FRAM	Framingham
HYN	Hyannis
BEACH	Monument Beach
MANS	Mansfield
MID	Mid
MYR	Myricks
NEWBED	New Bedford
NEWYL	NE Walpole Yard Limits
N	North
NE	North End

OT	Otis Transfer
O/S	Out of Service
POC	Pocasset
PORT	Airport
REST	Restricted Speed
RD	Road
ROCVILL	Rock Village
ROCH	Rochester
SAG	Sagamore
SAND	Sandwich
S	South
SD	South Dennis
SE	South End
SY	South Yarmouth
SPD	Speed
SWP	Swamp
TAYLOR	Taylors Point
TEMP	Temporary
TRE	Tremont
VENT	Ventura
W	West
WARE	Wareham
WB	West Barnstable
WRF	Wharf
YL	Yard Limits
YJ	Yarmouth Junction
YT	Yarmouth Transfer

CAPE MAIN SUBDIVISION

The direction from Bay to Hyannis is South.

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH (50' cars)
	BAY	Bay (*Beginning Mass Coastal Territory*)	36.30	
	ROCVILL	Rock Village	41.00	
	ROCH	Rochester	44.00	
	TRE	Tremont	45.60	52
	WARE	Wareham	49.30	
	EWARE	East Wareham	50.30	13
	ONSET	Onset	52.50	
	BUTTER	Buttermilk	53.70	28
	TAYLOR	Taylors Point	54.20	
X	BUZ	Buzzards Bay	54.72	
X	CJ	Canal Junction *(Falmouth Line)*	54.90	
	APTX	Aptucxet	55.50	
	SAG	Sagamore	59.70	41
	SAND	Sandwich	62.20	17
	WB	West Barnstable	69.40	12
	YJ	Yarmouth Junction *(South Dennis Line)*	75.50	3
	PORT	Airport	78.00	
	HYN	Hyannis	79.00	

Method of Operation

Bay to Buzzards Bay…….…….....	DCS
Buzzards Bay to Canal Junction……	INT
Canal Junction to Airport…..……	DCS
Airport to Hyannis ……..…….....	DCS, Rule 93

CAPE MAIN SUBDIVISION (*continued)*

The direction from Bay to Hyannis is South.

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
Bay to MP 47.00	55	30
MP 47.00 to MP 48.00	50	30
MP 48.00 to MP 49.00	40	30
MP 49.00 to MP 50.00	30	30
MP 50.00 to Buttermilk	55	30
Buttermilk to Taylors Point	30	25
Taylors Point to Buzzards Bay	15	10
Buzzards Bay to Canal Junction	10	5
Canal Junction to Airport	30	25
Airport to Hyannis	20	20

NOTE:

1. All train crews shall exercise caution when using walkways at the Cohasset Narrows Bridge MP 54.31

2. At Hyannis, the following tracks are designated as Locomotive Servicing Tracks and Car Shop Repair Tracks: Track 5, Track 7, Track 9 and Engine House, and RIP Track. Maximum Authorized Speed: 5 MPH.

Dean Street Industrial Track

The direction from Salt to Vent is North.

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
	SALT	Salt ❶	4.03	
	VENT	Ventura *(end of track)* ❷	2.45	

❶ Derail located at MP 4.03
❷ Derail located at MP 2.6

Method of Operation

Salt to Vent …….....	Rule 98

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
SALT TO VENT	EXCEPTED TRACK	10 MPH

NOTE: The Dean Street Industrial Track is FRA EXCEPTED TRACK, governed by NORAC Rule(s) 98 and 99.

(Remainder of this page intentionally left blank)

Falmouth Line

The direction from Canal Junction to Otis is South.

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
X	CJ	Canal Junction *(Cape Main)*	0.41	
	BEACH	Monument Beach	1.90	
	POC	Pocasset	3.70	
	CAT	Cataumet	5.03	
	OTIS	Otis	6.90	24

Method of Operation

Canal Junction to Otis ……..….....	DCS

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
Canal Jct. to Otis	30	25

Permanent Speed Restrictions

LOCATION	SPEED SIGNS	PSGR	FRT
MP 0.82 (Monument Neck Rd) Head End Restriction	NONE	20	20
MP 6.80 (County Rd) to MP 6.90 (Otis Switch)		10	10
Otis Industrial Track (see note)	NONE	EXCEPTED TRACK	10

NOTE:
1. The Otis Switch MP 6.80 to be left lined for the Otis Industrial Track.
2. Otis Industrial Track is FRA EXCEPTED TRACK, governed by NORAC Rule(s) 98 and 99.

South Dennis Line

The direction from Yarmouth to South Yarmouth is South.

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
	YJ	Yarmouth Junction *(Cape Main)*	0.00	
	SY	South Yarmouth *(end of track)*	3.00	

Method of Operation

Yarmouth Jct to South Yarmouth..…….....	Rule 98

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
Yarmouth Junction to South Yarmouth	EXCEPTED TRACK	10

NOTE:

1. The South Dennis Line is FRA Excepted Track, governed by NORAC Rule(s) 98 and 99.
2. The Yarmouth Wye Track beginning at the North and South clearance points on the wye shall be governed by NORAC RULE 98.
3. A barricade is installed at End-Of-Track located 825 feet south of south switch at Yarmouth Transfer Station.

(Remainder of this page intentionally left blank)

New Bedford Main Line

STATIONS	MP
Cotley Junction – Connection with Middleboro Secondary	37.10
East Taunton Station	37.35
Stevens – South end of Cotley Yard Limits	37.68
Myricks Junction – Junction with Fall River Subdivision	40.40
Pierce	41.21
Solar	45.86
Chip	47.78
Dock – North end of New Bedford Yard Limits	51.93
CP-King	51.96
Church Street Station	52.33
Nash – North Wye for Watuppa Line, Sid Wainer Siding	52.95
Glory	53.76
Herman	54.46
New Bedford Station	54.55
CP-Whales	54.63
New Bedford – End of Track	55.58

DELETED

MAIN TRACK DESIGNATION AND METHOD OF OPERATION

Cotley Junction to Stevens, Track 1……DCS, Rule 93 Yard Limits
Stevens to Pierce, Track 2……...DCS
Pierce to Dock……..DCS
Dock to MP 54.87……... DCS, Rule 93 Yard Limits
MP 54.87 to New Bedford (End of Track)……..Out of Service

NON-CONTROLLED TRACKS OTHER THAN MAIN

East Taunton Station Track 2 – This track extends between Cotley Junction and Stevens, a distance of 0.67 miles. Rule 98 applies. Maximum Authorized Speed: 10 MPH for freight trains, 20 MPH for passenger trains.

East Taunton, Track 3, Cotley Yard Connecting Track – Also known as the "Freight Main", this track extends between Weir and the switch at New Bedford Main Line MP 37.57, a distance of 0.58 miles. Rule 98 applies. Maximum Authorized Speed: 10 MPH.

Track 1 – To provide access to the Fall River Subdivision at Myricks Junction, this track extends between the switch at MP 37.77 and Pierce, a distance of 3.46 miles. Rule 98 applies. Maximum Authorized Speed: 20 MPH.

MAXIMUM AUTHORIZED SPEED IN MPH	FREIGHT	PASSENGER
Cotley Jct to Stevens	10	20
Stevens to Myricks Junction	25	30
Myricks Junction to MP 54.87	10	10
All turnouts, when diverging, unless otherwise specified	10	10
Other Than Main Track, unless otherwise specified	10	10

Fall River Subdivision

The direction from Wharf to State Line is South

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
	WRF	Wharf	11.28	
	FALRIV	Fall River	12.29	
	STATE	State Line	14.49	

Method of Operation

Wharf to State Line ……..…….....	DCS, Rule 93

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
Wharf to Fall River	10	10
Fall River to State Line	EXCEPTED TRACK	10

NOTE:

1. Trains and track cars operating between the Central Street OHB MP 11.44 and Wharf Yard shall exercise extreme caution as track mobile may be in use.
2. Fall River to State Line is FRA Excepted Track, governed by NORAC Rule 99.
3. A derail operated with a switch stand is in place on the lead to the Wharf Yard. This derail is under the exclusive control of Massachusetts Coastal Railroad. This derail is in place to ensure equipment being moved by the customer does not leave Wharf Yard and enter Massachusetts Coastal Railroad trackage. This derail is equipped with a Mass Coastal Operating Department switch lock. The derail must be lined and locked in the derailing position, except when it is lined and locked in the non-derailing position to permit switching movements.

Framingham Secondary

The direction from Mansfield to Framingham is North

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
	MANS	Mansfield	0.10	
	MILAZZO	Milazzo	4.36	
		Milazzo to Walpole	**Keolis Territory**	
	WALPOLE	Walpole	8.50	
	NEWYL	North End Walpole Yard Limits	10.00	
	FIELD	Field	12.30	
	FRAM	Framingham	21.04	

Method of Operation

MP 0.00 to Mansfield ……....	Rule 98
Mansfield to Milazzo ……..….	DCS
Milazzo to Walpole …….....	KEOLIS
Walpole to NEWYL ..……	DCS, Rule 93
NEWYL to Framingham …….....	DCS

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
MP 0.00 – MP 1.00	10	10
MP 1.00 – MP 1.89 (ELM ST)	30	25
MP 1.89 – MP 1.89 (ELM ST)	10	10
MP 1.89 (ELM ST) – MP 4.36 (MILAZZO)	30	25
MP 4.36 (MILAZZO) – MP 8.50 (WALPOLE)	KEOLIS	KEOLIS
MP 8.50 (WALPOLE) – MP 10.00 (NEWYL)	10	10
MP 10.00 (NEWYL) – MP 12.37 (MAIN ST)	30	25
MP 12.37 – MP 12.37 (MAIN ST)	10	10
MP 12.37 (MAIN ST) – MP 13.60 (W MILL ST)	30	25
MP 13.60 (MEDFIELD JCT) – MP 14.20 (N. MEDFIELD SIDING SWITCH)	10	10
MP 14.20 (N. MEDFIELD SIDING SWITCH) – MP 15.35 (CHARLES RIVER UG BR)	30	25
MP 15.35 – MP 15.35 (CHARLES RIVER UG BR)	10	10
MP 15.35 (CHARLES RIVER UG BR) – MP 20.75 (JUNK YARD)	30	25
MP 20.75 (JUNK YARD) – MP 21.04 (FRAMINGHAM)	10	10
8.5 (WYE) – 8.5 (WYE)	10	10

Framingham Secondary (*continued)*

The direction from Mansfield to Framingham is North

RAILROAD CROSSINGS AT GRADE

MP	LOCATION	RR	TYPE	RULE
8.5	Walpole	Keolis	Remotely Controlled	NORAC 600-616

HIGHWAY-RAIL GRADE CROSSINGS

MP	LOCATION	INSTRUCTIONS
0.5	Mansfield Yard	Crew switching Mansfield Yard must leave the private crossing at the north end open for traffic before departing Mansfield

(This section intentionally left blank)

Middleboro Subdivision

The direction from Currier to Stevens is South

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
	CURRIER	Currier	0.00	
	CROFT	Croft	2.00	
	WHIT	Whit	6.00	
	DEAN	Dean	10.00	
	WEIR	Weir	13.35	
	STEVENS	Stevens	13.78 (Jct with New Bedford Main Line)	

Method of Operation

Currier to Croft …….……	DCS, Rule 93
Croft to Dean ……...	DCS
Dean to Stevens …..……..	DCS, Rule 93

Maximum Authorized Speed (MPH)

LOCATION	PASSENGER	FREIGHT
Currier to Croft	10	10
Croft to MP 9.50	30	25
MP 9.50 to Dean	20	20
Dean to Stevens	10	10

NOTES:

1. The use of 6-axle locomotives numbered CSXT 8000-8800 is permitted between MP 0.00 CURRIER and MP 13.78 STEVENS and in Cotley Connecting Track.
2. Derails are in place at, but not limited to, the following locations:
   - Croft Yard, at the south end of Track 5
   - At both ends of the auxiliary track located between MP 8.62 and MP 9.30.
3. **Cotley Siding crossover switches** – Two crossovers are located at the south end of the Cotley Siding:
   - One located at MP 13.10 to provide southward movement from the Middleboro Subdivision main track into the siding, allowing access to the Cotley Connecting Track.
   - One located at MP 13.20 to provide northward movement from the Middleboro Subdivision main track into the siding.

   The main track switches for these crossovers may be left lined and locked for the last positioned used, provided the siding switch connected to it is in correspondence with it. All movements must approach these switches prepared to stop until it is determined the crossover is lined for the intended route.
4. **Cotley Connecting Track:** This track extends between the Cotley Siding to Cotley Jct on the New Bedford Main Line, a distance of 0.27 miles.

   Rule 98 applies. Maximum Authorized Speed: 10 MPH

Watuppa Line

The direction from MP 0.00 to MP 10.66 is South

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
		MP 0.00	0.00	
	NASH	Nash	0.19	
	FARM	Farm	6.00	
	MID	Mid	7.75	
		End-of-Track	10.66	

Method of Operation

MP 0.00 to Nash……	Rule 98
Nash to Mid ……	DCS
Mid to MP 10.66 …….....	Rule 98

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
MP 0.00 to MP 10.66	EXCEPTED TRACK	10

NOTE:

1. The Watuppa Line is FRA Excepted Track, governed by NORAC Rule 99.
2. The North Leg and South Leg of New Bedford Wye shall be governed by NORAC RULE 98.
3. The Wye Switch at MP 0.19 may be left lined and locked for the last position used. All movements must approach this switch prepared to stop until it is determined to be lined for the intended route.
4. Close clearance conditions exist at, but are not limited to, the following locations:
   - South leg of New Bedford Wye - Fence
   - Harvey Industries – Building
   - Colonial Beverages Track 1 – Building
   - DBS Siding – Building, Locking Dock
5. Track and Switches Out Of Service
   - MP 5.01 Harvey Industries Switching
   - MP 5.01 Harvey Industries Siding
6. Rusty rail conditions may exist at all signalized highway-rail grade crossings. All trains must approach prepared to stop until it is ascertained that automatic highway warning devices are functioning properly. When devices are not functioning properly, a member of the crew must protect the crossing in advance of each movement.

Millis Line

The direction from MP 0.00 to MP 3.40 is West

INT	ABBREVIATION	STATION NAME	MILEPOST	SIDING LENGTH
		Medfield Junction	0.00	
		End-of-Track	3.40	

Method of Operation

Medfield Jct to MP 3.40 ……..…….……....	Rule 98

Normal Speeds (MPH)

LOCATION	PASSENGER	FREIGHT
Medfield Jct to MP 3.40	EXCEPTED TRACK	10

1. The Millis Line is FRA Excepted Track, governed by NORAC Rule(s) 98 and 99.
2. Close clearance conditions exist at, but are not limited to, the following locations:
   - Millis Yard Tracks 5, 7, 10, 11 - Buildings
   - L2 Dock Track – Loading Dock

Grade Crossings

The following is a list of grade crossings, both public and private, and the methods of operation over each crossing. Grade crossings are listed by Milepost and city locations. Methods of operation are noted under the numbered columns (1, 2, 3 or 4). Special requirements will be noted under the NOTES column (see descriptions on pages 23 and 24).

Column 1: Trains must stop before passing over crossing and a member of the crew must protect the crossing in advance of each movement.

Column 2: Automatic highway warning devices, equipped with motion sensors. Warning devices will deactivate automatically if train stops before entering crossing, and will reactivate when the train resumes movement.

Column 3: Rusty rail conditions may exist. All trains must approach prepared to stop until it is ascertained that automatic highway warning devices are functioning properly. When devices are not functioning properly, a member of the crew must protect the crossing in advance of each movement.

Column 4: Private grade crossing

Cape Main

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
536725K	39.51	Miller Street		X				Middleborough	Plymouth
536727Y	41.65	Spruce Street		X				Middleborough	Plymouth
943108N	43.40	Hells Blazes (Wareham St)				X		Middleborough	Plymouth
536729M	44.87	County Road		X				Wareham	Plymouth
536733C	47.19	Station Street		X				Wareham	Plymouth
536735R	47.79	Hathaway Street		X				Wareham	Plymouth
536737E	48.35	Elm Street		X				Wareham	Plymouth
536738L	49.47	Sandwich Road (Rte. 6)		X			1	Wareham	Plymouth
536739T	49.89	Indian Neck Road		X				Wareham	Plymouth
536740M	51.29	Depot Street		X				Wareham	Plymouth
943109V	51.80	Wal-Mart Access				X		Wareham	Plymouth
536741U	52.68	Main Avenue		X				Wareham	Plymouth
536744P	54.60	Academy Drive		X			1, 2	Bourne	Barnstable
536745W	54.70	Army Corps				X		Bourne	Barnstable
968457V	54.87	Canal Pedestrian					9	Bourne	Barnstable
968458C	54.91	Bell Road				X		Bourne	Barnstable
536676R	56.37	Bourne Bridge Access Pvt.				X		Bourne	Barnstable
536677X	57.80	Army Corps Canal Access Pvt.				X		Bourne	Barnstable
536679L	59.55	Sagamore Bridge Access				X		Bourne	Barnstable
943034Y	60.55	Tank Farm				X		Sandwich	Barnstable
536680F	61.15	Canal Electric				X		Sandwich	Barnstable
536681M	61.26	Freezer Road		X				Sandwich	Barnstable
536682U	61.56	Town Neck Road		X				Sandwich	Barnstable
536683B	62.09	Willow Street		X			8	Sandwich	Barnstable
536684H	62.17	Jarves Street		X				Sandwich	Barnstable

Cape Main (*continued)*

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
536685P	62.28	Liberty Street		X				Sandwich	Barnstable
536686W	62.61	Dewey Avenue		X				Sandwich	Barnstable
943035F	63.10	Ox Pasture Road (Old Dump)				X		Sandwich	Barnstable
943036M	63.37	Great Island Road		X				Sandwich	Barnstable
536688K	63.56	Spring Hill Road		X				Sandwich	Barnstable
928490L	64.05	Lampi's Bog Access				X		Sandwich	Barnstable
536689S	64.35	Quaker Meeting House Road (Spring Hill Road)		X				Sandwich	Barnstable
536690L	64.91	Route 6A (Old Kings Hwy)		X				Sandwich	Barnstable
536691T	65.15	Atkins Road		X				Sandwich	Barnstable
943038B	65.59	Whites Crossing (Cedarville Rd)				X		Sandwich	Barnstable
536693G	65.76	Old County Road		X				Sandwich	Barnstable
943039H	66.24	Game Preserve Road				X		Sandwich	Barnstable
943101R	66.56	Talbots Point Road		X				Sandwich	Barnstable
536699X	68.54	Maple Street		X				Barnstable	Barnstable
536700P	69.10	Willow Street		X				Barnstable	Barnstable
536701W	69.42	Route 149 (Meetinghouse Way)		X				Barnstable	Barnstable
536702D	69.95	Route 6A (Old Kings Hwy)		X				Barnstable	Barnstable
943102X	71.18	Farrington Way				X		Barnstable	Barnstable
943103E	71.25	Pilots Path				X		Barnstable	Barnstable
943104L	71.73	Fergusons Way				X		Barnstable	Barnstable
536710V	72.69	Old Jail Lane		X				Barnstable	Barnstable
536711C	72.92	Pine Lane		X				Barnstable	Barnstable
536712J	72.99	Railroad Avenue				X		Barnstable	Barnstable
536713R	73.25	Hyannis Road		X				Barnstable	Barnstable
536714X	73.57	Braggs Lane		X				Barnstable	Barnstable
943105T	73.90	County Farm Access Road				X		Barnstable	Barnstable
536715E	74.15	Mary Dunn Road		X				Barnstable	Barnstable
536717T	75.28	Marstons Lane		X				Barnstable	Barnstable
928822D	76.85	Oak Ave		X			1	Yarmouth	Barnstable
943106A	77.30	Manning Way (Airport Access)				X		Yarmouth	Barnstable
536871R	78.50	Route 28 (Iyannough Rd)			X		1, 3	Barnstable	Barnstable

Emergency Hotline for all emergencies including Highway-Rail Grade Crossing concerns

888-783-4316

Dean Street Industrial Track

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
546629K	3.16	Dean Street (Route 44)			X		1	Taunton	Bristol
943122J	3.10	Private Drive				X		Taunton	Bristol

Falmouth Line

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
536751A	0.40	Bell Road						Bourne	Barnstable
536752G	0.82	Monument Neck Road			X		5	Bourne	Barnstable
943114S	1.20	Back River Private (Quest Cove)				X		Bourne	Barnstable
943115Y	1.57	Evergreen Hill Road				X		Bourne	Barnstable
536755C	1.79	Worcester Avenue			X		5	Bourne	Barnstable
943116F	2.11	Monument Beach Private		X	X			Bourne	Barnstable
943117M	2.80	Briarwood Lane				X		Bourne	Barnstable
536760Y	3.60	Barlows Landing Road			X		5	Bourne	Barnstable
536765H	4.87	Red Brook Harbor Road			X		5	Bourne	Barnstable
536768D	6.80	County Road			X		5, 8	Falmouth	Barnstable

South Dennis Line

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
536872X	0.08	Willow Street			X		6, 8	Yarmouth	Barnstable
536874L	0.52	Summer Street	X					Yarmouth	Barnstable
536875T	1.35	Pine Street	X					Yarmouth	Barnstable
536876A	1.39	West Yarmouth Road	X					Yarmouth	Barnstable
943121C	2.05	Landfill - Transfer Sta. Access				X		Yarmouth	Barnstable

Emergency Hotline for all emergencies including Highway-Rail Grade Crossing concerns

888-783-4316

New Bedford Yard

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
926389F	54.87	Herman Melville Blvd	X					New Bedford	Bristol

Fall River Subdivision

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
967688A	11.78	Boremco – Water Street		X			7, 10	Fall River	Bristol
967689G	11.78	State Pier – Water Street		X			7, 11	Fall River	Bristol

Emergency Hotline for all emergencies including
Highway-Rail Grade Crossing concerns

888-783-4316

Framingham Secondary

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
937055D	0.11	Mansfield Yard Private				X		Mansfield	Norfolk
918343W	0.50	Private Road				X		Foxborough	Norfolk
546754X	1.07	Spring Street		X				Foxborough	Norfolk
546756L	1.89	Elm Street		X				Foxborough	Norfolk
546757T	2.30	Leonard Street		X				Foxborough	Norfolk
546758A	2.67	Cocasset Street		X				Foxborough	Norfolk
546759G	2.81	Mechanic Street		X				Foxborough	Norfolk
546760B	2.90	Bird Street		X				Foxborough	Norfolk
546762P	3.49	Chestnut Street		X				Foxborough	Norfolk
546763W	4.20	North Street		X				Foxborough	Norfolk
937039U	8.55	Private Crossing - Walpole				X		Walpole	Norfolk
546771N	10.73	Private Crossing				X		Medfield	Norfolk
546772V	11.48	South Street		X				Medfield	Norfolk
546774J	12.37	Main Street		X			1	Medfield	Norfolk
546776X	12.59	Cottage Street		X				Medfield	Norfolk
546778L	12.79	Dale Street		X				Medfield	Norfolk
546779T	13.26	West Street		X				Medfield	Norfolk
546780M	13.60	W Mill Street		X				Medfield	Norfolk
546782B	14.79	Hospital Road		X				Medfield	Norfolk
546783H	15.93	Forest Street		X				Sherborn	Middlesex
546784P	16.49	Goulding Street		X				Sherborn	Middlesex
546785W	17.23	Farm Road		X				Sherborn	Middlesex
546786D	17.55	Elendale Stables				X		Sherborn	Middlesex
546787K	17.70	Main Street - Washington		X				Sherborn	Middlesex
546788S	18.05	Hunting Ln		X				Sherborn	Middlesex
546789Y	18.20	Farm Rd (Private)				X		Sherborn	Middlesex
546790T	18.65	Private Road				X		Sherborn	Middlesex
546791A	18.78	Prospect Street		X				Sherborn	Middlesex
546792G	19.81	Farm Rd (Private)				X		Framingham	Middlesex
546793N	20.34	Leland Street		X				Framingham	Middlesex
546794V	20.75	Junk Yard				X		Framingham	Middlesex
546795C	21.03	Blandin Ave		X			(Keolis)	Framingham	Middlesex

Emergency Hotline for all emergencies including Highway-Rail Grade Crossing concerns

888-783-4316

Middleboro Subdivision

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
537282E	2.83	Union Rd		X				Norton	Bristol
537283L	3.38	John Scott Blvd		X				Norton	Bristol
537285A	4.25	S. Worcester St		X				Norton	Bristol
537286G	5.87	Woodward St		X				Norton	Bristol
537288V	7.16	Harvey St		X				Taunton	Bristol
537289C	7.81	S. Crane Ave		X				Taunton	Bristol
537290W	8.60	Fremont St		X				Taunton	Bristol
537291D	9.40	West Britannia St		X				Taunton	Bristol
537292K	9.77	Danforth St		X				Taunton	Bristol
537293S	10.20	Tremont St		X				Taunton	Bristol
537294Y	10.47	Oak St		X			1	Taunton	Bristol
537295F	10.65	Porter St		X				Taunton	Bristol
537296M	10.75	Cohannet St		X				Taunton	Bristol
537297U	10.84	Winthrop St		X				Taunton	Bristol
537298B	10.97	Harrison Ave		X				Taunton	Bristol
537299H	11.11	Somerset Ave		X				Taunton	Bristol
537300A	11.25	Weir St		X				Taunton	Bristol
537301G	11.67	Ingell St		X			8	Taunton	Bristol
977352F	YARD	Middleboro Yard Access Private Crossing				X		Middleboro	Plymouth

Watuppa Line

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
537332F	0.39	Mount Pleasant St			X			New Bedford	Bristol
537334U	0.72	Shawmut Ave			X			New Bedford	Bristol
537335B	2.83	Faunce Corner Rd			X			New Bedford	Bristol
537336H	3.46	Hixville Rd						Dartmouth	Bristol
537337P	5.26	Reed Rd			X			Dartmouth	Bristol
971650K	5.34	Old Reed Rd						Dartmouth	Bristol
971651S	6.11	Farm Rd (Private)				X		Dartmouth	Bristol
537340X	7.70	Davis Rd						North Westport	Bristol

Millis Line

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
546948D	0.66	Old Bridge St						Medfield	Norfolk
546949K	0.82	Farm Rd (Private)				X		Medfield	Norfolk
546950E	1.60	Island Rd						Medfield	Norfolk
546951L	2.22	Union St						Medfield	Norfolk
546953A	2.76	Exchange St						Medfield	Norfolk
546954G	2.97	Auburn Rd						Medfield	Norfolk
546955N	3.17	Craftsman St (Private)				X		Medfield	Norfolk

Emergency Hotline for all emergencies including
Highway-Rail Grade Crossing concerns

888-783-4316

NOTE 1: High way crossing protection is interconnected with adjacent highway traffic signals.

NOTE 2: Academy Drive, Buzzards Bay - Freight trains must not stop at Buzzards Bay station unless it is known that train will fit between Buzzards Bay Home Signal and Academy Drive. Station can accommodate approximately eight, fifty-foot freight cars and a locomotive. Passenger trains making station stop must clear crossing consistent with safe practices when any emergency vehicles need to use crossing.

(This section intentionally left blank)

NOTE 3: Route 28, MP 78.50 Operating Instructions:
The chart below details the four methods of operation over the Route 28 highway grade crossing, Cape Main MP 78.50. Regardless of the method employed, if train (or other shunting equipment) is occupying the island track circuits between the yellow insulated joints, the warning devices will remain active indefinitely.

Automatic distant indicator signal at MP 77.5 in service for southbound trains, displaying yellow or red aspects. Yellow indicates the crossing activation cycle has automatically started. If signal fails to display yellow, use DTMF **775*** to start crossing operation, or use pushbutton on side of case. (Indicator signal does not convey authority of movement, only indicates crossing operation.)

Automatic indicator signal located on east side of Main Track at Route 28, MP 78.50 applies to movements on all tracks in both directions, displaying green or red aspects. Green indicates trains may proceed – traffic signal preemption is active and grade crossing warning devices have been active for a minimum of 20 seconds. (Indicator signal does not convey authority of movement, only indicates crossing operation.) Trains must not occupy the island circuit, on any track, until the indicator signal is displaying a green aspect.

Manual Control pushbutton box on south side of crossing is located near bumping post on Stub Track 6.

Manual Control pushbutton boxes on north side of crossing are located on the northwest corner of signal bungalow. The top pushbuttons will manually operate the crossing. The bottom pushbuttons will deactivate the crossing in the event that an automatic southbound move is to stop short of the crossing and remain stopped on the approach circuit.

All DTMF codes must be entered on Road Simplex (Channel 2, AAR 021/021). Following successful transmission of the code, three beeps will be heard.

At times when the crossing is out of service, indicator signals may remain red or dark. Proceed in accordance with NORAC Rule 138 C-1.

Method	To Activate	To Deactivate	Notes
Automatic Operation – All Southbound Through Trains	Southbound through trains approaching Hyannis will automatically activate crossing through track circuit detection. (Note, track circuits are not equipped with motion sensing capability.) Distant indicator signal at MP 77.5 will initially display red, then yellow once automatic crossing activation cycle begins. Proceed south to crossing. At crossing, proceed south once indicator signal displays green.	Crossing will automatically deactivate after entire train clears south of the island circuit (any track).	If distant indicator signal remains red or dark, use DTMF code **775*** or pushbutton on side of signal case to initiate crossing operation, and signal will display yellow. If indicator signal at crossing remains red or dark, follow Automatic DTMF, Manual DTMF, or Manual Pushbutton procedures below.
Automatic DTMF (All northbound through trains and northbound or southbound switching moves, all tracks)	**7850*** Proceed once indicator signal displays green.	Crossing will automatically deactivate after entire train clears island circuit (any track). If necessary to deactivate crossing prior to occupying island circuit, **7850#**	Do not pass over yellow insulated joints at island circuit, on any track, until indicator signal displays green.
Manual DTMF	**78501*** Proceed once indicator signal displays green.	**78501#**	Crossing remains active indefinitely until deactivate code is transmitted.
Manual Pushbutton	Press **START** button. Proceed once indicator signal displays green.	Press **STOP** button.	Crossing remains active indefinitely until STOP button is pressed.

NOTE 4: Removed, purposely left blank.

NOTE 5: Automatic highway warning devices without motion sensor capabilities. Entire train must clear crossing before the warning devices will deactivate.

NOTE 6: Willow Street, Yarmouth - Automatic highway warning devices without motion sensor capabilities. All trains must approach the crossing prepared to stop, and must not occupy the crossing until the gates are fully lowered and the crossing is seen to be clear. Gates will remain lowered until the entire train clears the opposing "CC" sign.

NOTE 7: Crossings Equipped with Island Circuits Only. Yellow Painted Joint Bars indicate beginning of Circuits, approximately within 50 feet of each side of crossing.

NOTE 8: Crossing protect ion for siding is equipped with Island Circuits Only. Yellow Painted Joint Bars indicate beginning of Circuits, approximately within 50 feet of each side of crossing. Rusty rail conditions may exist. All trains must approach prepared to stop until it is ascertained that automatic highway warning devices are functioning properly. When devices are not functioning properly, a member of the crew must protect the crossing in advance of each movement.

NOTE 9: Canal Pedestrian, MP 54.87 Activation Instructions:

At least 30 seconds prior to occupying the crossing, all train movements must transmit the following DTMF code on Channel 2 (Road Simplex, AAR 021/021) to initiate activation: 5487 * The warning devices will activate immediately and a confirmation message will be heard via radio. Once the movement clears the crossing, warning devices will deactivate automatically and a deactivation message will be heard.

Signs listing the activation code have been erected along the Cape Main and Falmouth lines at the appropriate distance from the crossing to enter this DTMF code and provide the minimum 30 second warning time for 10 MPH movements.

NOTE 10: Boremco, MP 11.49 Activation Instructions:

At least 30 seconds prior to occupying the crossing, all train movements must transmit the following DTMF code on Channel 2 (Road Simplex, AAR 021/021) to initiate activation: 11491 * The warning devices will activate immediately and a confirmation message will be heard via radio. Once the movement clears the crossing, to deactivate the crossing enter the DTMF code on: 11491 # Following a 10-second delay, the warning devices will deactivate.

NOTE 11: State Pier, MP 11.49 Activation Instructions:
At least 30 seconds prior to occupying the crossing, all train movements must transmit the following DTMF code on Channel 2 (Road Simplex, AAR 021/021) to initiate activation: 114934 * The warning devices will activate immediately and a confirmation message will be heard via radio. Once the movement clears the crossing, to deactivate the crossing enter the DTMF code on: 114934 # Following a 10-second delay, the warning devices will deactivate.

SPECIAL INSTRUCTIONS

A-S1 MASS COASTAL TRAINS OPERATING OVER FOREIGN RAILROADS

Mass Coastal employees who are qualified over foreign railroad's territory must have in their possession the current Timetables, Operating Rule Book, General Orders, Bulletin Orders, Summary Bulletin Orders and Daily Operating Bulletins (DOB) when operating on the respective railroad(s).

A-S2 FOREIGN RAILROADS OPERATING OVER MASS COASTAL

Foreign Railroads employees operating over Mass Coastal Territory shall carry the current Mass Coastal Timetable, General Orders, Bulletin Orders, and DOBs.
It shall be permissible for these foreign railroads to be governed by their own Safety, Air Brake and Train Handling Rule Publications.

C-S1 OPERATING RULES QUALIFICATION

Employees in the following categories must be initially qualified on the Operating Rules, and must be re-qualified every three years:

- Dispatchers and Operators
- Train and Engine Service Employees
- Employees who move or assist in the movement of trains or engines
- Employees who request foul time or take tracks out of service for maintenance
- Any employee who is to copy a Form D
- C&S Maintainers

C-S2 PHYSICAL CHARACTERISTICS QUALIFICATION

Track Foreman, Flaggers, Conductors and Engineers must be qualified on the physical characteristics of the territory over which they are to operate. To initially qualify on a portion of the railroad, an employee must make at least one trip over the line to familiarize themselves with the physical characteristics. The Employee must also be tested by a written test requiring a Passing Grade.

To remain qualified, an employee must have been over the portion of the railroad at least one time in the previous 12 months. Employees who exceed 12 months must be re-qualified prior to performing service as Track Foreman, Conductor or Engineer over the territory involved.

C-S3 MEDICAL EXAMINATIONS

The following employees are required to have periodic medical examinations:

- Train and Engine Service Employees
- Track Car Operators
- C&S Maintainers

a) **FREQUENCY** - For the above employees, periodic physical examinations are required once every three years. Examinations must be completed in the month of the employee's birthday or as prescribed by any Mass Coastal supervisor. It is the responsibility of Federally Certified Persons to provide 90 Days Prior notice to their Supervisor that their Certification(s) are approaching Expiration.
b) **RECORDING INFORMATION –** Employees must record the prescribed information concerning physical examinations in the appropriate section of the Employee Qualification Pages of the Timetable.

E-S1 POSSESSION OF FIREARMS

Employees are prohibited from having firearms or any other weapons in their possession while on duty or on company property.

F-S1 REPORTING UNUSUAL OCCURRENCES

FORM 100 – EMPLOYEE REPORT OF ACCIDENT/INCIDENT
This form is to be used by a train crew member or other employee to provide a written report of an accident/incident such as a derailment, collision, or vehicle accident. This form must be submitted by the employee to the dispatcher and local manager prior to the completion of the tour-of-duty.

FORM 101 – MANAGER REPORT OF ACCIDENT/INCIDENT
This form is to be used by a local manager to provide details related to an accident/incident.

G-S1 DRUGS AND ALCOHOL

Mass Coastal employees and employees of other railroads who operate over Mass Coastal controlled territory are prohibited from using controlled substances at any time, whether on duty or off duty, except as permitted by 49CFR 219.103.

L-S1 PERSONS PERMITTED TO RIDE IN LOCOMOTIVE CABS

a) Employees must remain vigilant at all times for signals and conditions ahead, and must not interfere with vigilance of the operating Engineer. The following persons will be permitted to ride engines on freight trains and the front and rear ends of passenger trains:
   - Mass Coastal Staff Officers and their Assistants
   - Mass Coastal Dispatchers and Operators
   - Mass Coastal Supervisors, Inspectors and Foremen
   - Other persons holding the proper authority or Head End Transportation Permit complete with release.

b) Maximum Number in Cab - Under no circumstances are more than four persons to be permitted to ride in the operating cab of an engine, including the operating crew.

c) Only persons in the following categories may occupy the operating cab of a locomotive while a Student Engineer is operating the train:
   1. The assigned Instructing Engineer
   2. The Road Foreman of Engines
   3. A DSLE evaluating the Student Engineer or assigned Engineer
   4. An FRA/State Inspector performing an on-board inspection
   5. That train's Conductor, when performing his duties

If a person not listed in one of the above categories is to ride in an operating cab while a Student Engineer is in training, the Student Engineer must not be permitted to operate the train.

Q-S1 HOURS OF SERVICE

Records pertaining to Hours of Service compliance shall be maintained on a daily basis and submitted and/or maintained at locations designated by the railroad.
A Train Employee is an individual engaged in or connected with the movement of a train, including a hostler. Each employee must maintain personal records documenting Hours of Service. These records must be current and must be available to any company officer or FRA inspector for inspection upon request.

A Train Employee working in train service, including a student, is restricted as follows:

- An employee must not exceed 12 hours of On-Duty service in a single tour of duty without proper authority.
- An employee must not exceed 30 hours of Limbo Time, in excess of 12 hours of Total Time On Duty, in a calendar month.
- An employee must not exceed 276 hours of total service to the company in a calendar month. Total service includes all hours worked for any purpose at the behest of the railroad, including any time spent working for any other railroad. Rules classes not attached to covered service are counted as limbo time and are included in the Total Monthly Hours.

- An employee who initiates 6 consecutive days/starts without a period of at least of 24 hours rest must have 48 consecutive hours off duty following the release time of the 6th day. EXCEPTION: An employee may work a 7th consecutive day/start only if reporting at an "away from home" terminal to return to their home terminal. An employee working a 7th consecutive day/start must have 72 hours consecutive hours off duty following the release time of the 7th day.
- A train employee that works in covered service and limbo time up to 12 hours requires 10 hours of undisturbed rest prior to returning to perform any service at the behest of the railroad.
- If any limbo time is accrued beyond 12 hours in a tour of duty, the same amount of time must be added to the 10 hours of rest required. For example, an employee engaged in covered service who has been On Duty for 12 hours and then incurs 30 minutes of deadhead, has been at the behest of the railroad for 12 hours and 30 minutes, requiring undisturbed rest of 10 hours and 30 minutes prior to returning to perform any service at the behest of the railroad.

An employee must notify their supervisor and the dispatcher following completion of the tour of duty in which they pass any of the following thresholds:

- 250 hours of total service to the company in the calendar month.
- 25 hours of Limbo time in excess of 12 hours of Total Time On Duty in a calendar month.
- 5 Consecutive Days/Starts in covered service as a Train Employee.

R-S1 INJURIES ON RAILROAD PROPERTY

FORM 105 – EMPLOYEE REPORT OF EMPLOYEE INJURY/ILLNESS
This form is to be used by an employee to report an injury/illness that they have incurred at work. This form must be submitted by the employee to the dispatcher and local manager prior to the completion of the tour-of-duty. Note: As shown at the bottom of this form, an employee that has incurred a work-related injury/illness has a right to review the file containing the federal documentation of their injury/illness.

FORM 106 – MANAGER REPORT OF EMPLOYEE INJURY/ILLNESS
This form is to be used by the local manager to provide details related to an employee injury/illness.

FORM 107 – REPORT OF NON-EMPLOYEE INJURY/INCIDENT
This form is to be used by an employee or supervisor to provide information pertaining to an injury/incident involving a Passenger, Visitor, Contractor, or Trespasser. This form must be submitted by the employee to the dispatcher and local manager prior to the completion of the tour-of-duty.

POLICY STATEMENT AND COMPLAINT PROCEDURES

(1) POLICY STATEMENT PROHIBITING HARASSMENT OR INTIMIDATION
Massachusetts Coastal Railroad is committed to providing complete, timely and accurate reporting of all accidents, incidents, injuries, and occupational illnesses arising from the operation of the railroad. We strive to fully comply with both the letter and spirit of the FRA's accident reporting regulation. Massachusetts Coastal Railroad does not tolerate harassment or intimidation that is intended to discourage or prevent employees from receiving proper medical treatment or reporting accidents, injuries or occupational illnesses. Any employee who violates this policy is subject to disciplinary action up to and including termination.

Medical Transportation and Treatment
If transportation to a hospital is requested by an employee who is injured during the course of employment, the railroad shall promptly arrange to have the injured employee transported to the nearest hospital where the employee can receive safe and appropriate medical care.

(2) COMPLAINT PROCEDURES
Any Employee, Supervisor, Manager or Officer who feels he/she has been harassed or intimidated so as not to report an accident, incident, injury or illness may submit a written complaint to Human Resources using the

humanresources@masscoastal.com email address. "Whistleblower" protection will be provided to any person subject to this policy. Massachusetts Coastal Railroad will investigate all complaints covered by this policy. It is requested that all complaints be submitted in writing to help facilitate the investigation process. The complaint will be handled in as confidential manner as is possible.

Individuals responsible for conducting the investigation will meet with the employee making the allegation to obtain further information pertaining to the nature of claim being made. Employees who make complaints or who participate in a company investigation of such report will be expected to fully cooperate with the Company by providing complete and accurate information as requested. An employee who makes a complaint under this policy should be prepared to provide the person investigating the complaint with as much detailed information as possible of the alleged behavior or conduct in question, including names of any witnesses, in order to facilitate the investigation. If the investigation determines that a violation has occurred, appropriate disciplinary action, up to and including termination will be assessed. The employee making the complaint will be advised of the results to the extent appropriate and reasonable.

Retaliation Prohibition
Retaliation against an individual for making a complaint under this policy is strictly prohibited. If an employee believes he/she is being retaliated against, he/she should immediately report this in writing to Human Resources using the humanresources@masscoastal.com email address.

Dissemination of the Policy Statement and Complaint Procedures
The above "POLICY STATEMENT PROHIBITING HARASSMENT OR INTIMIDATION" and "COMPLAINT PROCEDURES" will be disseminated to all employees, supervisory personnel, and management by posting this at reporting locations and at the railroad headquarters.

T-S1 NORAC RULE T

Please review NORAC Rule T with regard to engaging a substitute to cover your work assignment. No substitutions may occur without the permission of a designated officer. In the application of this Rule: informing a designated officer does not constitute receiving permission.

Designated Officers: President, VP Operations and/or Trainmaster

Reporting for Duty

1-S1 BULLETIN BOARD LOCATIONS

The following are Bulletin Board locations where applicable Mass Coastal Bulletin Orders and General Orders are posted:

- Hyannis Engine House
- Onset Operations Office
- Taunton Crew Office
- Dispatcher Office

1-S2 NORAC RULE 1

Daily Operating Bulletin (DOB):

Mass Coastal DOB will govern movements operating on entire system.

DOB Effective Times:

The DOB is generated once per day at 12:01AM containing track conditions and remains in effect until the following day's DOB is issued.

DOB Usage and Delivery:

All speed restrictions will be issued by DOB, except when it is more efficient to issue a restriction by Form D. DOB's will also be used to indicate which General Order and Bulletin Order that is in effect. Employees whose duties are affected must obtain a copy of the applicable DOB when reporting for duty, and must have it with them while on duty. DOB will be electronically transmitted to all sign-up locations. Crews must examine DOB to ensure that it is current, complete and legible. If a train originates at a location where DOB is not available, the crew must contact the Dispatcher for instructions.

Use of Speed Signs:
Speed restrictions must be listed in sequential order. The limits of the restriction must be designated by timetable location or milepost location. When speed signs cannot be displayed immediately, the Dispatcher must not use portions of a mile on the DOB, unless used in conjunction with a physical characteristic location.

Trains Enroute at Effective Time:
Conductors and Engineers of trains enroute at the time a new DOB becomes effective will be governed by the DOB in their possession, until they receive a copy of the current DOB. If the Dispatcher directs the crew to obtain the new DOB at a location enroute, the crew must verify receipt with the Dispatcher.

Adding or Cancelling Restrictions:
Temporary speed restrictions will be added or cancelled on the DOB, except when it is more efficient to add or cancel restrictions by Form D. Additions and cancellations to DOB must not be copied by an employee operating the controls of a moving train. When dictating or repeating changes to DOB, employees must pronounce numerals digit by digit. Only authorized abbreviations may be used in DOB. When a restriction is to be added, the Dispatcher must dictate the restriction to the Conductor, Engineer or other qualified employee on the affected train. The receiving employee must copy the additional restriction in the space provided on the DOB. (Additional restrictions may be written on the reverse side of the DOB, if all space provided on the DOB has been filled.)

When a restriction is to be cancelled, the Dispatcher will advise the Conductor, Engineer or other qualified employee on affected trains as to which restriction(s) must be deleted. Additional restriction(s) or cancellation information must be correctly repeated to the Dispatcher before “time effective” or “time cancelled” is given. When giving the “time effective” or “time cancelled”, the Dispatcher must state his initials. The receiving employee must copy the time and initials in the space provided on the DOB, then repeat the “time effective” or “time cancelled” and the Dispatcher’s initials. The Dispatcher must acknowledge that the time and the initials were repeated correctly before the addition or cancellation may be acted upon. After the cancellation time and initials have been acknowledged, the receiving employee must draw a line through the affected restriction(s). If communication fails before “time effective” is received, the train must not proceed until communication has been reestablished. When a speed restriction addition or cancellation is given to more than one train, the “time effective” or “time cancelled” will be the same for all trains, and will be the time of the original addition or cancellation.

Effective Period of Added Restrictions:
All restrictions added to DOB remain in effect until cancelled.

Dictation to Other Affected Employees:
The receiving employee must dictate addition or cancellation information to affected crew members before that information must be acted upon. When addition or cancellation information is relayed between employees, the dictating employee must follow the procedure outlined above for Dispatchers.

Relieved Enroute, or Tour of Duty Ends at Outlying Point:
When a Conductor or Engineer is relieved enroute, or their tour of duty ends at an outlying point, the DOB must be delivered to and discussed with the relieving Conductor or Engineer. When physical delivery is impractical, the Conductor or Engineer must leave a copy of the DOB in the operating compartment of the controlling engine. When the Conductor or Engineer of the relieving crew is unable to communicate with the crew they are to relieve, a member of the relieving crew must contact the Dispatcher to ensure they have received all current information before proceeding.

Retention of DOB:
Upon completion of their tour of duty at other than an outlying point, Conductors and Engineers may discard their copy of the DOB. Exception: When restrictions have been added or cancelled enroute, the last employee to possess the modified DOB must retain it for 7 days

Corrections to DOB:
When errors are discovered in the DOB after the faxing process has begun, the error must be corrected by Form D, or DOB addition or cancellation. When two or more DOB’s with conflicting restrictions are faxed to recipients, the Dispatcher must advise personnel of the correct DOB in effect and the errors that were discovered.

2-S1 STANDARD TIME

Eastern Standard Time applies. Employees must obtain Standard Time from the Dispatcher.

Effective 2:00am on the second Sunday in March, Eastern Standard Time must be advanced one hour to 3:00am.

Effective 2:00am on the first Sunday of November, Eastern Standard Time must be set back one hour to 1:00am.

2-S2 TIME FORMAT

When time of day is written or verbally given, including for purposes of Form D issuance and cancellation, it shall be in the 12-hour format, followed by AM or PM as appropriate.

Miscellaneous Signals

16-S1 BLUE SIGNAL PROTECTION

Train and Engine Service Employees are prohibited from operating any electrical, mechanical or pneumatic apparatus (including performing power checks on locomotives, releasing hand brakes or removing wheel chocks, or performing brake tests) on equipment that has blue signal protection applied, unless specifically authorized by the person in charge of the workmen. Such authority must not be accepted unless the person giving it had clearly identified himself as the person in charge of the workmen.

20-S1 ENGINE BELL—SOUNDING

Engine Bell shall be rung continuously while passing station platforms and other locations where pedestrians may be expected to be present near the track.

(This section intentionally left blank)

Movement of Trains

93-S1 MOVEMENT WITHIN YARD LIMITS

Verbal permission to use a main track within Yard Limits shall not be given when a Form D Line 2 is in effect for that portion of the track, except to the train, locomotive, or track car holding the Line 2 authority, when cancelling or fulfilling that Form D.

Verbal permission to occupy Main Track in Yard Limits may be issued to more than one locomotive, train and/or track car when no Line 2 authority is in effect on that portion of track. In the application of this instruction, the Dispatcher shall inform each additional locomotive, train and/or track car that it will be sharing Yard Limits.

Verbal Permission shall be recorded by the Dispatcher on the Record of Train Movements DCS Sheet.

Verbal Permission shall remain in effect until released by the train crew or until a Form D Line 2 for that portion of track has been issued to the single train or other equipment holding the Verbal Permission.

All Crews receiving Verbal Permission to occupy Main Track in Yard Limits shall keep a written record of that permission. Information shall include dispatcher's initials, name of Yard Limits, date and time permission was received, and date and time released, when applicable.

RULE 93-S2-RELEASE OF YARD LIMIT AUTHORITY

In observance of these special instructions and NORAC Rule 93, the Conductor or person in charge of any train, track car or track equipment movement, shall communicate directly with the MC dispatcher immediately after clearing Yard Limits. Prior to releasing yard limit authority, the Conductor or person in charge of any train, track car or track equipment must report any cars and/or equipment left on the main track within yard limits to the MC Dispatcher and the MC Dispatcher will protect this standing equipment on a Form D Line 13. Unless otherwise instructed by the Dispatcher, Yard Limit Authority shall be relinquished and the release time shall be recorded on the appropriate Conductors Form.

94-S1 CALLING SIGNALS AND RESTRICTIONS

Mass Coastal employees qualified on the operating rules and located on the leading engine or car must be on the lookout for signals affecting the movement of their train, and they must communicate to each other the name of each signal as soon as it becomes clearly visible. The following types of signals shall be communicated:

- Block and Interlocking Signals
- Proper function of Grade Crossing Warning Devices
- Proper position of switches and derails

94-S2 CALLING CLEAR OF STATIONS

All trains, track cars and MOW Equipment operating on Mass Coastal DCS controlled territory are to call clear of each station passed, as soon as practical. This information is to be transmitted via radio channel 2(Road Simplex) in the following format: *"(railroad) extra (number) clear Northbound/Southbound by (station name), (number) out."* (example: "Mass Coastal extra 2007 clear northbound by Onset, 2007 out.").

The Dispatcher on duty shall acknowledge the call and the time recorded in the DCS Sheet.

96-S1 MOVEMENT ON A SIDING

In addition to Restricted Speed, trains are restricted to 10 MPH over all Mass Coastal sidings.

104-S1 DERAILS

The normal position of Derails on the following listed sidings is secured in the non-derailing position. If at any time cars or equipment is stored on these sidings, then the Derail shall be secured in the derailing position. All other hand-operated derails shall be locked in the derailing position.

- West Barnstable
- Sandwich
- Sagamore
- Buttermilk (south stub track derail)
- North Falmouth
- Yarmouth Wye Track

104-S2 Cape Main

All in-service hand-operated mainline switches on the Cape Main track are now equipped with switch point locks. Upon restoring a switch to the normal position, Train Crews and MOW personnel shall ensure that both switch stand and switch point locks are applied and secured.

109-S1 HAND BRAKES

1. The following is the standard minimum number of handbrakes required to be applied to cars or drafts of cars left standing.
2. Employees shall inspect and verify that application of Brake Shoes on the "B" end is against the wheel and that the brake chain is tight and not caught on any part of the equipment.

Number of railcars in the string	Number of Hand Brakes Required
1 Car	1 Hand Brake
2-19 Cars	2 Hand Brakes
20 – 29 Cars	3 Hand Brakes
30 – 39 Cars	4 Hand Brakes

124-S1 MAXIMUM AUTHORIZED SPEED

Any movement controlled by a locomotive not equipped with a functioning speedometer must not exceed 20 MPH.

Any movement controlled by a locomotive not equipped with a functioning alerter must not exceed 25 MPH.

Any movement controlled by a locomotive not equipped with a functioning event recorder must not exceed 30 MPH.

Protection of Trains

133-S1 REMOVING A TRACK FROM SERVICE
The EXCEPTION shown in NORAC rule 133.D. is changed to read:

EXCEPTION: In territory where non-signaled DCS rules are in effect in both directions, the employee in charge of the out-of-service limits may authorize a train or single track car to operate within the out-of-service limits at Normal Speed not exceeding 20 MPH, when the following conditions are met:

1. The track to be used must be clear and safe for the speed to be authorized.
2. All affected switches must be secured in normal position.
3. All affected Roadway Workers must be notified.
4. Permission to operate at Normal Speed must be given in the following manner:
   "Extra 453 (or TC 1234) may proceed__DIRECTION__ through my out-of-service limits at Normal Speed (not exceeding 20 MPH) from A to B."
5. The train or single track car must not reverse direction without permission of the employee in charge. If permission is received, the movement must be made at Restricted Speed.
6. Any following movements permitted behind the train or single track car given this authority must operate at Restricted Speed.

138-S1 HIGHWAY CROSSING WARNING

NORAC 11th Edition is amended as follows:
I. Power Indicators
If equipped, when the AC power-on indicator light on the exterior of the signal case or bungalow is not lit or is flashing, immediately notify the train dispatcher, even if the signals appear to be working as intended.

139-S1 TRAIN OR CAR(S) LEFT STANDING WITHOUT CREW ON MAIN TRACK OR CONTROLLED SIDING

a) Authorization; Protection

Trains, cars, or equipment must not be left without a crew on a main track or controlled siding except when authorized by the Dispatcher.

Before authorizing a train, car(s) or equipment to be left unattended on a main track or controlled siding, the Train Dispatcher must:

- Issue Form D, Line 13 to the Dispatcher, indicating "BETWEEN (Location) and (Location) CARS/ EQUIPMENT ON THE MAIN, OPERATE AT RESTRICTED SPEED"

- Make a record in red ink on the Dispatcher's Record of Train Movements. This information must include:
  The location where the equipment has been authorized to be left unattended
  The employee authorized to leave the equipment unattended
  The number of the Form D, Line 13, authorizing equipment to be left unattended.

For movements in the direction of the equipment left unattended, the dispatcher must:

- Not authorize movement in the direction of the unattended equipment until the movement has been issued a Form D, Line 13 stating, "BETWEEN (Location) and (Location) CARS/EQUIPMENT ON THE MAIN, OPERATE AT RESTRICTED SPEED"

Crews must notify the Dispatcher when the equipment has been picked up and is no longer unattended.

b) Leaving Equipment on Sidings or Yarmouth Wye Track

Train crews or Track Foreman shall immediately notify the Dispatcher of any equipment left on any in-service siding or the Yarmouth Wye Track. The Dispatcher must record the information on the Dispatcher's Record of Train Movements in **RED INK.**

Movement Permit Form D

160-S1 ISSUING A FORM D

All Form D numbers will be prefixed by the letters **MC**. The first Form D issued in a given day will begin with "100", and will be consecutively numbered thereafter.

160-S2 CONTACTING THE DISPATCHER FOR FORM D

The Massachusetts Coastal Railroad (MC) Dispatcher is to be contacted VIA RADIO using Road Simplex (Channel 2, AAR 021/021), however if radio communication is not available the MC Dispatcher may be reached at 608-352-6001.

161-S1 COMPLETING FORM D PROPERLY

Additional Authorized Abbreviations permitted for use only on Mass Coastal generated Form D's are listed at the beginning of this Timetable & Special Instructions. These are in addition to, or instead of, NORAC Authorized Abbreviations.

161-S2 LOCOMOTIVES NAMED IN FORM D

All locomotive units named in a Form D Address must be present in the train consist. A unit dead-in-tow or trailing in consist in a specified-direction line 2 need not be named in the Form D address.

165-S1 DICTATING AND REPEATING FORM D's BY RADIO, TELEPHONE OR IN PERSON

Any employee dictating a Form D which is to be copied by another employee must take the following actions after dictating the contents of the entire Form D, and before the receiving employee repeats the Form D:

1. Re-examine the office copy of the Form D
2. State the total number of lines circled and the individual line numbers (ex. "There are two lines circled. They are line numbers 2 and 3.")

The employee receiving the Form D must take the following actions after repeating the Form D to the dictating employee:

1. Re-examine their field copy of the Form D
2. State the total number of lines circled and the individual line numbers (ex. "There are two lines circled. They are line numbers 2 and 3.")

Before the dictating employee transmits the "Time Effective," they must once again confirm the total number of lines circled and identify the individual line numbers (ex. "Form D number ___ correctly repeated with two lines circled. They are line numbers 2 and 3.").

Form D Control System

400-S1 FORM D's AND INTERLOCKINGS

When a Form D is issued, either in a specified or both directions, and there is an interlocking located within the limits of the line 2 authority, trains will not have permission through the interlocking without proper interlocking signals. All movements will be made in accordance with Interlocking Rules.

400-S2 AUTHORITY ENDING AT A PASSENGER STATION

When a Form D Line 2 Authority ends at a passenger station, Dispatchers shall include on the Form D a Line 13 indicating the point to which the train may occupy the Main Track at that station. Such occupancy shall be designed so as to allow for the efficient meeting and passing of trains and not to foul the clearance points of Main Line switches unless absolutely necessary.

551-S1 CAB SIGNAL RULE

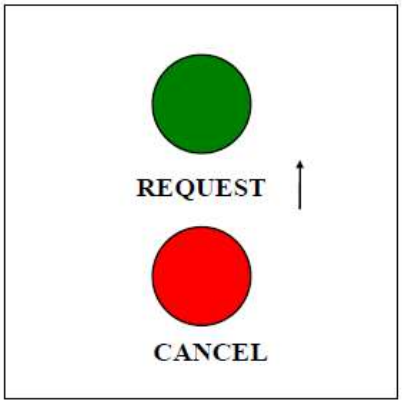
In the observance of NORAC Rule 551 (a) Locomotive Engineers shall communicate to the MC Dispatcher the results of the operational test of cab signal equipment. Dispatchers shall record this information on the DCS Sheet. This is in addition to the written test results which must be recorded on the proper form and remain in the locomotive cab for 7 days.

(Remainder of this page left blank intentionally)

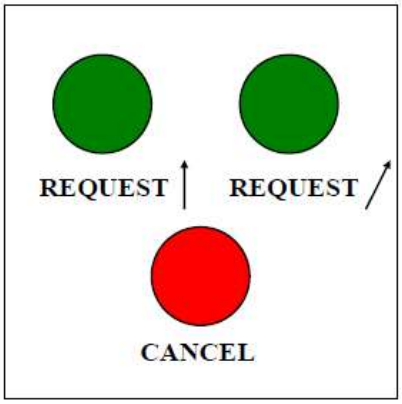
601-S1 BUZZARDS BAY INTERLOCKING PROCEDURES

Under normal circumstances the Operator on duty retains control of the interlocking from the Buzzards Bay Tower. However, when there is no Operator on duty at Buzzards Bay, the "Route Request Pushbutton System" (RRPB) enables train crews to request a route through the interlocking themselves.

There are a total of four (4) RRPB control boxes, one located at each signal in the interlocking (2R – the northbound Home Signal on the Falmouth Line; 4R – the northbound Home Signal on the Cape Main at Canal Jct.; 4L – the southbound Interlocking Signal at Canal Jct.; 5L – the southbound dwarf Home Signal at Buzzards Bay). See below for examples of the two types of control boxes.



Example of control boxes at 2R and 4R northbound signals.



Example of control boxes at 4L and 5L southbound signals
Note the angled arrow represents the Falmouth Line, while the straight arrow indicates movement is for the Cape Main.

The following steps illustrate how the RRPB system is to be used:

- The train crew calls Bridge Control to request a bridge move.
- Once the bridge is down, Bridge Control will call the train and report that the bridge is "Down and Locked, and the Request for Power is off." The train crew will acknowledge this information.
- At the control box, press the appropriate pushbutton to request a route. The affected switches and derails will be lined, and a signal will be displayed.
- If the wrong route was accidentally requested, the Cancel pushbutton may be pressed. The signals will promptly be set to Stop, and after a three-minute time delay has elapsed a new route may be requested by pressing the appropriate pushbutton.
- Once the entire movement is clear of the Interlocking, the train crew must radio Bridge Control and inform them that they are clear of the Interlocking and that it is okay to lift the bridge. When the Bridge Control operator requests power to lift the bridge, all signals will be set to Stop, and all switches and derails will automatically be lined for the proper position before the bridge can be raised.

Note, all Wye movements must observe a 10 second delay prior to requesting a route from the bridge span, in the southerly direction onto either the Cape Main or the Falmouth Line. The delay countdown begins after the last set of wheels has cleared onto the bridge span.

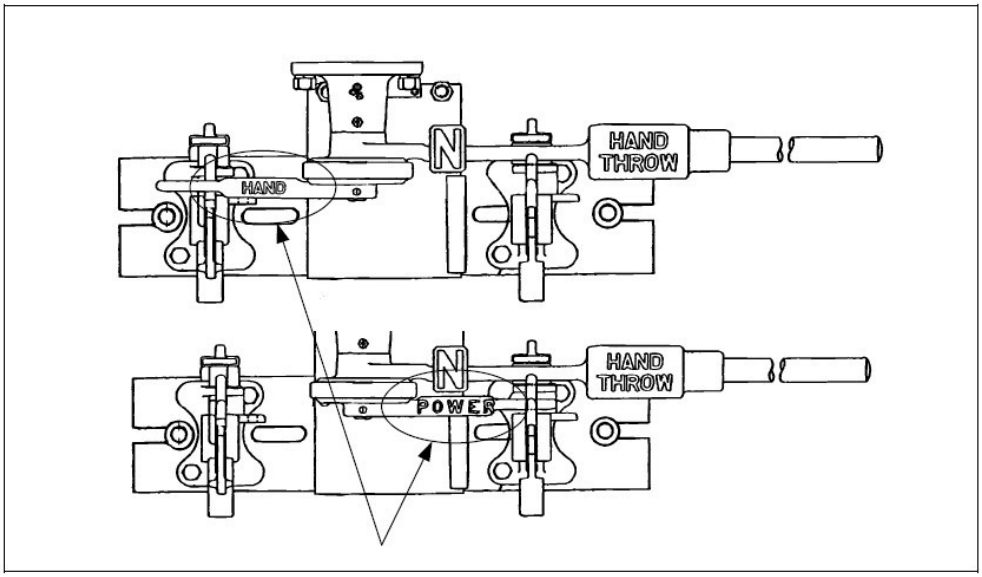
601-S2 DUAL CONTROL SWITCH MACHINES

The Buzzards Bay Interlocking is equipped with model 5F (switch machine model) that control the movement of Derails and the No. 10 Switch.

Under normal circumstances, Switch Machines are operated under power mode. In case of an emergency, Switch Machines may be operated manually by Train and Engine Crew. This must only be done if directed by Dispatcher, Operator, or Signal Maintainer.

Instructions for hand operating these machines are as follows:

After unlocking the operating levers, rotate the Hand Throw Selector Lever to the HAND position to remove energy to the motor. Then, rotate the HAND THROW lever 180 degrees to move the switch points. Switch and Derail Points shall be visually inspected for fit, and confirmed to the Dispatcher prior to allowing train movement. Upon completion of train movements, the Switch or Derail shall be returned to the normal position by reversing these steps.



WARNING

Always move the hand throw selector to the hand position before moving the hand throw lever. Attempting to move the hand throw lever while the lever is in the power position could result in injury.

601-S3 REQUESTING USE OF CANAL BRIDGE

The train or track car movement shall call the Railroad Bridge Control Operator via radio on Road Simplex (Channel 2, AAR 021/021), approximately 15 minutes prior to arrival at the bridge.

The (Army Corps) Bridge Operator will in turn notify the canal Marine Traffic Controller (MTC) that use of the bridge has been requested.

Upon receiving permission from MTC the Bridge Operator will proceed to lower the bridge.

Once the bridge has been lowered, and the Bridge Operator announces “Ok to lock up” either the Train Crew will operate the Route Request Pushbuttons (See Rule 601 S-1) or when the Buzzards Bay Tower is manned by an Operator, the Interlocking will be controlled remotely by the Operator.

Once the movement has cleared the Interlocking the train or track car shall report “Clear of Interlocking Limits”, at which time the Interlocking appliances shall be restored to the derailing position and the bridge will be allowed to lift.

609-S1 INTERLOCKING OR CONTROL POINT SIGNAL CHANGES TO STOP

1. Stop Signal - Southward trains at the Buzzards Bay Interlocking shall operate prepared to stop short of entering onto the movable span of the bridge until the Interlocking Signal on the south side of the bridge is observed to display a permissive aspect. If the signal remains at Stop Signal, the train crew should immediately communicate with the Dispatcher or Operator to obtain further instructions. If advised by Dispatcher or Operator to continue southward across the bridge, the movement may continue and will be governed by Rule 241 upon reaching the Interlocking Signal.

2. Signal Changes to Stop - When an interlocking signal at the Cape Cod Canal Bridge changes from a more permissive aspect to a Stop Signal, every effort must be made within safe operating practices to stop short of the signal. Immediate communication with the dispatcher or operator must commence and further instructions must be received before moving train.

3. Stopping on Moveable Span - Stopping a train movement on the movable span shall be avoided unless absolutely necessary, and shall be made using the least brake pipe reduction necessary for a safe and timely stop.

(Remainder of this page left blank intentionally)

Radios and Telephones

701-S1 RADIO REQUIREMENTS FOR TRAINS

All Conductors and Qualified personnel other than Locomotive Engineers shall have a portable railroad radio in their possession and in good working order. Train Crews that have been issued a railroad supplied cell phone shall monitor that device and in doing so be in strict observance of NORAC Rule 716.

706-S1 RADIO CHANNELS

The following radio channels are in use on the Massachusetts Coastal Railroad:

All communications between train crews and the Dispatcher should be made on Channel 2 Road Local (Simplex): AAR Channel 21/21). All locomotive radios must monitor this channel while operating on main tracks under DCS Authority.

All communications between members of the same train crew (for example, while performing switching operations and/or crews on passenger trains) should be made on Channel 2 Road Local (Simplex): AAR Channel 21/21).

In order to avoid interference with other radio transmissions, the following exceptions are permitted:

1. Train crews performing switching and tipping operations in the SEMASS Yard may use Channel 4 (MOW Simplex) or Channel 5 (Cape Cod Central).
2. Train crews operating on the Dean Street Industrial Track may use Channel 4 (MOW Simplex).
3. Cape Cod Central Train Crews and Depot Staff may use Channel 5 (Cape Cod Central) for local station communications while in the Hyannis Yard. Train crews must return to Channel 2 prior to departing Hyannis.
4. Mass Coastal Train Crews must use Channel 12 (Keolis Old Colony) while operating on Keolis territory.
5. Train Crews must use Channel 2 Road Local (Simplex): AAR Channel 21/21) while performing switching operations in Middleboro Yard Limits and while occupying Middleboro Main Track.

Channel/Use	TX Mhz	AAR	RX Mhz	AAR	TX PL
1 Road Repeater	161.385	85	160.425	21	
2 Road Local (Simplex)	160.425	21	160.425	21	
3 MOW Repeater	161.550	96	160.560	30	71.9 Hz
4 MOW Local (Simplex)	160.560	30	160.560	30	
5 Cape Cod Central	160.245	09	160.245	09	
6 CSX Road	160.800	46	160.800	46	
7 CSX Yard	160.860	50	160.860	50	
8 CSX Dispatcher	160.680	38	160.680	38	
9 Bay Colony (Simplex)	160.305	13	160.305	13	
Keolis Old Colony	160.725	41	160.725	41	

Rule 706-S2

All trains operating on Mass Coastal DCS controlled territory shall announce their intent to switch to any of the alternate channels allowed in Rule 706-S1 in the Timetable using the following format: example "*Mass Coastal Extra 2008 is going over to the Keolis channel*". No response or acknowledgement to this transmission is necessary.

Train & Engine Service Employees

941-S1 CONDUCTORS: FREIGHT INTERCHANGE

It is the conductor's responsibility to inspect all inbound cars from connecting carriers at interchange points to determine if there is any damage to car or lading. If there is any damage to car or if seal is broken, conductor must communicate this immediately to the Customer Service for instructions. Car must not be re- moved or from interchange point or coupled to, without receiving instructions.

941-S2 CONDUCTORS AUTHORITY AND RESPONSIBILITIES

A. All Mass Coastal Conductors shall transmit via fax the completed conductors report particular to their train assignment, prior to marking off for the day. MC-3 Crews shall use the fax machine. Exception: MC-2 Crews are permitted to leave Conductor report for the next day's MC-1 SB movement. Should fax communications fail, crews shall call MC Customer Service for verbal conveyance or voicemail.

B. All Conductors shall communicate with Customer Service or Dispatcher before departing each Customer location to confirm completion of Work Orders, or to report unusual circumstances that prohibit completion.

C. All Conductors shall communicate with Customer Service or Dispatcher to confirm the specific times and car numbers of equipment placed at customers or for outbound interchange.

941-S3 SPECIAL INSTRUCTIONS-REFRIGERATED CARS

Upon receipt at Interchange, all Refrigerated cars shall be inspected for signs of tampering, doors are closed, and seals intact. The Refrigeration shall be inspected for operation and the temperature and conditions shall be recorded on the Conductor's Report for that line segment. The train crew shall communicate with Customer Service the conditions found, and to verify that the requirements of that Car's Bill of Lading are met relevant to temperature.

950-S1 ENGINEERS: SPEEDOMETER CHECKING/MEASURED MILES

White marker posts denoting measured miles are installed at the following locations. These posts are on the opposite side of the track from the Mile Posts. Engineers must check speedometer accuracy once each day on each locomotive to which they are assigned by maintaining a constant speed and keeping accurate time between measured miles and referencing the speed table below. Inaccuracies must be reported to the Mechanical Department as soon as possible.

Measured Mile Locations:

Cape Main
MP 37 to MP 38
MP 51 to MP 52
MP 76 to MP 77

Falmouth Line
MP 4 to MP 5

Framingham Secondary
MP 19 to MP 20

Speed Table

Minutes	Seconds	MPH
1	00	60
1	05	55
1	12	50
1	20	45
1	30	40
1	43	35
2	00	30
2	24	25
3	00	20
4	00	15
5	00	12
6	00	10
7	30	8
12	00	5

953-S1 DAILY LOCOMOTIVE INSPECTION

All Locomotive Engineers shall complete the Daily Locomotive Inspection form and shall be emailed to the Mechanical department.

Location Information and Restrictions

LOC-1 CAPE MAIN TRACKS & SWITCHES OUT-OF-SERVICE

SWITCH	LOCATION
Track # 12	Rochester/ SEMASS Yard
Marion Pit Track	MP 45.6
S. Xover	MP 54.35
Army Corp Siding Switch	MP 54.62
Gallo Siding Switch	MP 59.57
Coal Man	MP 59.90
Stencil Company	MP 69.30

LOC-2 CLOSE CLEARANCE SIGNS

Employees are prohibited from riding on the side of car or engine where close clearance signs are displayed and at all other locations where close clearance conditions exist. Extreme caution and constant alertness must be exercised at all times to avoid personal injury.

LOC-3 CLOSE CLEARANCE LOCATIONS

Close clearance conditions exist at, but are not limited to, the following locations:

Cape Main:

- SEMASS Tipper Track - Building
- SEMASS Tipper Track – Gate
- SEMASS Non Ferrous Track – Gate
- SEMASS Non Ferrous Track – Building
- Tail Race Creek Bridge - East side Jersey barriers
- Cohasset Narrows Bridge - West Side
- Gallo Siding - Building and platform
- Canal Electric Sidings - Wall and Fences
- Sandwich Siding – Building
- MP 78.00 (Port) to MP 79.00 (Hyannis) – All Switch Stand Targets
- Hyannis Engine House Doors - North and South
- Hyannis Yard - Platform on track 9; Engine House

Dean Street Industrial Track:

- Fences and Building

Falmouth Line:

- Back River Bridge
- Monument Beach Station/Canopy
- North Falmouth Siding - Tie wall
- North Falmouth - Bike path wall/fence, between County Road Rd and Otis
- Northwest corner Access gate at County Rd
- Otis Transfer Station - Building

South Dennis Line:

- Yarmouth Transfer Station – Building
- MP 2.05 to MP 3.00 – South Lead Track into Yarmouth Transfer Station

New Bedford Subdivision

- Quad Graphics at car spots
- Gate at Millis Industries

Fall River Subdivision

- Gates into the former One Tree Facility
- North Polaroid Gate
- Cashman Siding - Gate
- Wharf Yard - Gate
- Borden Remington - Yard Tracks foul on curve
- State Pier on outside track
- Retaining walls from Anawan OH to Firestone Pond

Framingham Secondary

- Advanced warehouse, CTX, Hub Folding Box, Milton Distributors, Smurfit Stone Container, Tighe Warehouse - All loading docks
- MP 13.70 (Medfield Jct) to MP 13.76 (Sawmill Brook UG Bridge) – Bay Colony Turnout at Bridge Railing
- Lewis Wye - Employees prohibited from riding East/South side between South switch and Main St. Undergrade bridge
- Certaineed - Loading dock

LOC-4 PLATFORM CANOPIES

The following close clearance conditions exist due to overhead platform canopies:

- Middleboro/Lakeville MBTA Station
- Wareham Station
- Sandwich Station
- Hyannis Station

LOC-5 HIGH-LEVEL PLATFORMS

The following close clearance conditions exist due to high-level platforms:

- Middleboro/Lakeville MBTA Station
- Wareham Station
- Buzzards Bay Station
- Bourne Station
- Sandwich Station
- West Barnstable Station
- Hyannis Station
- Sid Wainer Platform

LOC-6 SEMASS TIPPER RESTRICTIONS

Any incident that occurs which will cause disruption or adversely impact service to our transfer station customers requires that the train crew on duty notify Dispatcher. All Train Crews arriving SEMASS for Tipper operations shall confer with Fuel Control (508) 291-4475 for special instructions at the beginning of operations for that day.

No car shall be moved onto or removed from the Tipper until such time as the green indicator lamp on the exterior of the building is illuminated, and that the Conductor has observed by visual inspection that all four clamps are in their fully-retracted position. All movements while cars are being placed on or removed from the Tipper shall be made at walking speed, and shall be prepared to Stop before Conductor or Authorized personnel have indicated that the movement has cleared the car-clamps via radio.

The sides and platforms of all Energy Cars will be cleaned of residual waste materials immediately after being moved from the building. The lid of the railcar must be observed to be in place and secure before movement of the railcar off the tipper track.

No car shall be coupled-to or removed until such time as the Conductor or Authorized personnel have verified that all wheels are seated on the rail, and that all car-clamps are clear of car pockets so as to avoid striking of car. No trainmen shall ride the sidesteps of cars anywhere in the Covanta yard.

All defects or abnormalities shall be reported to Fuel Control and duly recorded in the Conductor Report. All accidents or injuries shall be reported Fuel Control at (508) 291-4475 or via Gaitronix system on line 1.

PPE to be worn on Covanta property shall consist of: safety glasses with side shields, hard hat, safety vest, long sleeve shirt and pants, and gloves. Locomotive Engineers shall not be required to wear Hard Hats and Gloves while at the controls of locomotive.

Recording of “tip times” shall be based on the following. “Time On” shall be the time that the car has been placed on the tipper. “Time off” shall be when the door has been opened and the green light is illuminated allowing the car to be pulled.

The cleaning of sides and end platforms of energy cars must be effected on the asphalt/concrete apron directly outside the tipper door. The brush used in the cleaning of the cars must be stored against the wall of the tipper building when not in use. Absence of or damage to the brush must be reported to your immediate supervisor immediately upon discovery.

LOC-7 YARMOUTH and OTIS TRANSFER STATION RESTRICTIONS

Locomotives must have all window awnings retracted before entering.

Train Crew must ensure they are pulling loaded railcars the customer has released for movement. The railcar to be pulled must be confirmed before leaving the transfer station.

Train Crew must not leave the Transfer Station without Work Assignment in hand, or have verified the contents of same with the Dispatcher on duty. Train crew must use all available means, including communication with transfer station workers, to ensure that all necessary cars are in the consist before departing the transfer station.

LOC-8 GALLO CONSTRUCTION BUILDING - SAGAMORE

Locomotives must have all window awnings retracted before entering

LOC-9 SAGAMORE SIDING

Trains shall not be stopped with any Locomotive or on-train generator within 150 feet of the abandoned bridge abutment, nor so spotted during an engine run-around, except in the event of an emergency.

Trains stopping at Sagamore in either direction of travel shall stop with the south end of the south car opposite the derail at the south end of the Sagamore Siding.

LOC-10 DIMENSIONAL AND WEIGHT CLEARANCE INFORMATION

Weight and dimensional restrictions for each subdivision are shown in the chart below. Weight restrictions apply to standard four axle cars (42 feet or longer outside length). Dimensional restrictions are expressed in terms of standard AAR Plate diagrams.

Cars and lading with one or more of the following characteristics require clearance from email: clearances@masscoastal.com and telephone: 508-291-2116.

1. Exceeds maximum weight or dimensions specified for the subdivision.
2. Short cars measuring less than 42 feet outside length.
3. Cars with more than four axles.
4. Lading overhangs the end(s) of a car or is bolstered on two or more cars.
5. Locomotives, cranes, work equipment, passenger cars, track inspection cars, or similar types of rolling stock moving on their own wheels.

LINE	AAR PLATE CLEARANCE-MAX	GROSS WEIGHT-MAX
Cape Main-BAY to BUTTERMILK	F	286,000 Lbs
Capeway Rail Terminal	Plate F Cars will not clear past loading conveyor	
Cape Main-BUTTERMILK to HYN	F	286,000 Lbs
Falmouth Track	F	286,000 Lbs
South Dennis	F	286,000 Lbs
Dean Street Industrial	F	286,000 Lbs
High Street OHD MP 3.81	Restricted to Plate C from MP 3.81 to end of track MP 2.85	
Otis Industrial Track	C	286,000 Lbs
New Bedford Sub.	F	286,000 Lbs
Fall River Sub. MP 0.0 to 4.5	F	286,000 Lbs
Fall River Sub. MP 4.5 to END	C	286,000 Lbs
Framingham Secondary Framingham to Medfield JCT	F	315,000 Lbs
Framingham Secondary Medfield JCT to Mansfield MP .10	F	286,000 Lbs
Middleboro Subdivision	F	286,000 Lbs

LOC-11 OPERATING OVER MC TERRITORIES

Train Designations– The following information pertains to train movement designations for trains to operate over MC territories. Train Crews shall refer to these numbers when communicating with MC Dispatcher.

MC Train No.	CSX Train Number	On Duty Time	Reporting Location	Days Operating (possible)	Parameters
MC-1		7:00 AM	Rochester	Mon-Fri	Rochester to Yarmouth Transfer, Rochester to Middleboro & return
MC-2		1:00PM	Rochester	Mon-Fri	Yarmouth Transfer to Rochester
MC-3		7:00 AM	Taunton	Mon-Fri	Dean St to Cotley & Return
MC-4		7:00 AM	Taunton	Mon-Fri	Cotley to Fall River and return
MC-5		7:00 AM	Taunton	Mon-Fri	Cotley to New Bedford and return
MC-6		6:00 AM	Taunton	Mon-Fri	Dean St to Middleboro directional
MC-7		7:00 AM	Rochester	Mon-Fri	Middleboro to Dean St directional
	CSX B725	9:30PM	Framingham	Sun-Thurs	Framingham to Croft and return
	CSX B726	8:20PM	Middleboro	Sun-Thurs	Middleboro to Croft and return
	CSX B727	8:25AM	Middleboro	Sun-Thurs	Middleboro to Croft and return
	CSX B729	7:00PM	Middleboro	Sun-Thurs	Alden Yard
	CSX B731	8:00AM	Readville	Mon-Fri	Walpole to Framingham and return
	CSX B733	6:30AM	Walpole	Mon-Fri	Walpole to Mansfield

LOC-12 NEW BEDFORD SUBDIVISION SWITCH AT MYRICKS AND MOVEMENT CLARIFICATION

The Switch at “Myricks” on the New Bedford Subdivision located at MP 16.9 may be left lined in either the Normal or Reversed Position. All movements must approach the Switch at “Myricks” MP 16.9 prepared to Stop until it is determined that the Switch is lined for the movement. If the Switch is not lined for the movement, the movement must be stopped until such time as the Switch is lined properly. In the application of this special instruction, trains and track cars shall notify the Dispatcher of the final position of the “Myricks” Switch prior to giving up their Form D Authority. Dispatchers shall make note on the DCS Sheet of said position.

LOC-13 HAZMAT TRAIN JOB BRIEFINGS, REPORTING AND SECUREMENT
Detailed Job Briefings covering Hazmat Train operations and securement are required.

These Job Briefings will cover, at a minimum, the following subjects:
A. shipping papers
B. ground level inspections;
C. hazmat shipment acceptance or rejection;
D. buffer car acquisition and placement
E. presence, proximity of, and isolation from, shiftable loads;
F. position in train;
G. securement during switching operations and prior to leaving the train unattended including:
(i) the personnel responsible for each action and
(ii) number and location of handbrakes to be applied;
H: how the securement effort's effectiveness will be verified in the field (roll or "tug test"); and
I. operating crew member who will be responsible for contacting the MC Dispatcher.

REPORTING TRAIN SECUREMENT

Whenever any train is left unattended outside of any Yard Limit, the Dispatcher must be notified concerning the particulars of locomotive and car securement immediately after securement operations have been completed. Information to be transmitted must include:
A. Precise location (Track Number, Mile Post, nearest public crossing)
B. The number of hand brakes applied and their location in the train
C. Tonnage and length of the train or vehicle
D. Grade and terrain of the track
E. Relevant weather conditions
F. Type of equipment secured

The dispatcher must record the information. The dispatcher or other qualified railroad employee must verify and confirm with the train crew that the securement meets the railroad's requirements.

HAZARDOUS MATERIALS TRAIN IDENTIFICATION AND REPORTING
Prior to departure from an initial terminal, all trains containing hazardous materials loads, empties, or residue cars, or any combination thereof, will be identified as a "Hazmat Train."

During a Duty Tour, the Dispatcher will be notified when a:
Non-Hazmat Train that assumes physical custody of hazardous materials shipments; and
A Train initially carrying hazardous materials ceases to have physical custody of hazardous materials shipments.
Operating Crews will enter on their System Duty Tour & Delay Reports whenever the train's status changes with regards to hazmat cars.

LOC-14 DEFECT DETECTORS AND CLEARANCE DECTECTORS

Defect Detectors can be found at the following locations

- Framingham Secondary - 13.6 Medfield – type 1 HBD and type 2 DED

KEY HBD - Hot Box Detector
DED - Dragging Equipment Detector
HIWI - High or Wide Clearance Detector

If the defect detector is found working improperly, crew members are responsible for notifying the MC Dispatcher. The MC Dispatcher will be responsible for contacting the appropriate C&S Maintainers who control that specified territory to have the detector fixed.

LOC-15 MIDDLEBORO SUBDIVISION ALDEN CROSSOVER SWITCHES

The “Alden Crossover Switches” on the Middleboro Subdivision may be left lined in either the Normal or Reversed Position. All movements must approach the switch prepared to stop until it is determined that the switch is lined for the movement.

LOC-16 FRAMINGHAM SOUTHBOUND MOVEMENT PROCEDURE AT FRAMINGHAM STATION

Blocking Devices located at Framingham DCS Station are controlled by Keolis-Worcester Line Dispatcher. Prior to all movements entering southbound onto the Framingham Secondary, the Mass Coastal Dispatcher will call the Keolis-Worcester Line Dispatcher to verify that southbound train possess a valid Form D & DOB allowing their movement onto the Framingham Secondary.

LOC-17 FRAMINGHAM MANSFIELD YARD POWER SWITCH

MP 1.05 hand operated switch leading to north end of Mansfield Yard changed to Power Operated DTMF (Radio) activated switch. Normal Position is normal for main track moves. Switch will be actuated using Road Simplex (Channel 2, AAR 021/021). Radio Code #107 will throw the switch opposite what position it is in before movement. #107 will throw the switch back. The switch is track circuit locked by the Spring Street Crossing Island Circuit. Trains must not be closer than 50 feet to the north nor 50 feet to the south of the frog of the switch to get the switch to throw. Limits are marked by Orange Paint.

In the event that the radio does not operate the switch, a box on the switch stand marked THROW PB contains a pushbutton to operate the switch in an emergency. Also located on the mast is a lock box marked LOCKOUT BOX. A switch marked inside P for Power and L for Locked indicate the position if the switch must be locked in a specific position. In the event that radio and manual (THROW PB) fail to operate the switch, there is a handle locked on the base of the switch machine. When unlocked the handle is inserted into a slot under a cover that unlocks with the same lock and allows the lever to pump the hydraulic operated switch over to the correct position. Confirm the switch position in accordance with NORAC Operating Rules. Once completed, the rod and lock should be restored.

LOC-18 HYANNIS YARD POWER SWITCH

MP 78.40 Power operated switch in service. Normal position is for main track movement. Switch is actuated using Road Simplex (Channel 2, AAR 021/021) DTMF code **#784** which will operate the switch opposite the position it is in before movement. Switch indicator will light green for switch lined normal, yellow for switch lined reverse and red for switch obstructed/not locked. Trains must not be closer than 50 feet north or south of the frog of the switch to get the switch to operate. Limits are marked by yellow paint.

In the event that the radio does not operate the switch, a box on the switch stand marked THROW PB contains a pushbutton to operate the switch. Also located on the switch stand is a box marked LOCKOUT BOX. A switch marked inside P for Power and L for Locked indicate the position if the switch must be locked in a specific position. In the event that radio and manual (THROW PB) fail to operate the switch, there is a handle locked on the base of the switch machine. When unlocked the handle is inserted into a slot under a cover that unlocks with the same lock and allows the lever to manually pump the hydraulic operated switch over to the correct position. Confirm the switch position in accordance with NORAC Operating Rules. Once completed, the rod and lock should be re-secured.

Cape Main

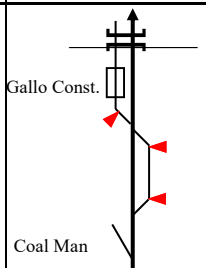
The direction from Bay to Hyannis is South.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
				(Keolis)	(See Note 1)	(562)	
55	30	**36.30**	**BAY**			DCS	
		37.18			Cherry St. OH Br		
		39.51			Miller St F, G		
		41.00	**ROCVILL**				
		41.65			Spruce St F, G		
		43.40		Capeway Rail Terminal	Hells Blazes Pvt.	DCS *Middleboro*	
						Rochester	
		44.00	**ROCHESTER**	SEMASS, MBTA Facility			
						Rochester	
		44.87			County Rd F, G	DCS *Wareham*	
		45.60	**TREMONT**		Pierceville Rd OH Br		52 cars
		45.38		Marion Pit Trk.			
		45.72			Tail Race Creek UG Br		
55	30	46.24			Main St. OH Br		
50	30	47.09	**MP 47.00**		Main St. UG Br		
		47.19			Station St F, G		
		47.50			N Interstate 195 OH Br		
		47.54			S Interstate 195 OH Br		
50	30	47.79			Hathaway St F, G		
40	30	48.26	**MP 48.00**		Main St. OH Br		
		48.35			Elm St F, G		
40	30		**MP 49.00**				
30	30			Hi-Level Platform			
		49.30	**WAREHAM**				
		49.44			Wankinco River UG Br		
		49.47			Sandwich Rd/Route 6 F, G		
30	30	49.89			Indian Neck Rd F, G		
55	30		**(MP 50.00)**			DCS	

NOTE 1: Mass Coastal controlled CM track ends at Bay. Trains must not pass "Entering Signaled Territory" sign at Bay without authorization from the Keolis Old Colony Dispatcher.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
55	**30**					**DCS**	
		50.30	**E WAREHAM**				13 cars
		51.29			Depot St **F, G**		
		51.80			Walmart Pvt.		
		52.50	**ONSET**				
55	**30**	52.68			Main Ave **F, G**	**DCS**	
30	**25**	53.70	**BUTTERMILK**	*Distant Signal*		**DCS**	
		53.98			Onset Ave OH Br		28 cars
30	**25**	54.20	**TAYLOR**	Middle XOVER			
15	**10**	54.31		S XOVER	Cohasset Narrows UG Br		
		54.60			Academy Dr **F,G**		
		54.62			Army Corp Track		
		54.70			Army Corps Pvt		
15	**10**	54.72	**BUZZARDS BAY**	Hi-Level Platform		**DCS**	
				Home Signal			
10	**5**					**INT**	
10	**5**	54.84			Cape Cod Canal Movable Br		
				INT Signal			
				Falmouth Line			
		54.87			Canal Pedestrian **F**		
10	**5**	**54.90**	**CANAL JCT**	*Home Signal*		**INT**	
30	**25**	54.91			Bell Rd Pvt.	**DCS**	
		55.43			Aptucxet Rd UG Br		
		55.50	**APTUCXET**				
		55.73		*Distant Signal*	Old State Rd OH Br		
		56.36			Bourne OH Br		
		56.36			Bourne Bridge Access Pvt.		
		56.38		Hi-Level Platform			
		57.80			Army Corps Pvt.		
30	**25**	59.54			Sagamore OH Br	**DCS**	

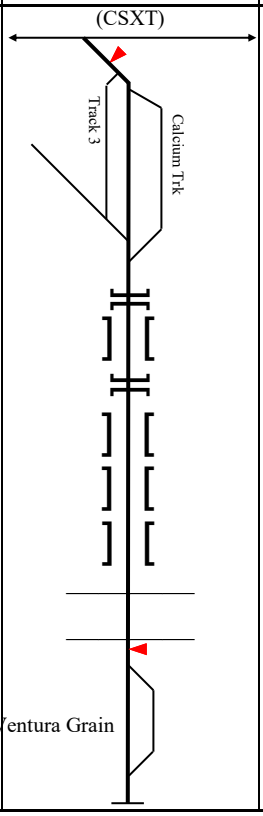
Wareham
Bourne

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
30	**25**	59.55			Sagamore Br. Access Pvt.	**DCS**	
		59.70	**SAGAMORE**				41 cars
							Bourne
		60.55			Tank Farm Pvt.		*Sandwich*
		61.15			Canal Electric Pvt		
		61.26			Canal Electric Freezer Rd **F, G**		
		61.56			Town Neck Rd **F, G**		
		61.95			Mill Creek UG Br		
		62.09			Willow St **F**		
		62.17			Jarves St **F, G**		
		62.20	**SANDWICH**	Hi-Level Platform			17 cars
		62.28			Liberty St **F**		
		62.61			Dewey Ave **F, G**		
		63.10			Ox Pasture Rd (Old Dump)		
		63.37			Great Island Rd Pvt. **F, G**		
		63.56			Spring Hill Rd **F**		
		64.05			Lampi's Bog Access Pvt.		
		64.35			Quaker Meetinghouse Rd **F, G**		
		64.91			Route 6A **F, G**		
		65.15			Atkins Rd **F**		
		65.59			Whites Crossing Pvt.		
		65.76			Old County Rd **F, G**		
		66.24			Game Preserve Pvt.		
		66.56			Talbots Point Pvt. **F, G**		
		66.95			Old County Rd OH Br.		*Sandwich*
							Barnstable
		68.54			Maple St **F, G**		
		69.10			Willow St **F**		
30	**25**					**DCS**	

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
30	**25**					**DCS**	
		69.40	**WEST BARNSTABLE**	Stencil Co. Hi-Level Platform			12 cars
		69.42			Route 149 **F, G**		
		69.95			Route 6A **F, G**		
		71.18			Farrington Way Pvt.		
		71.25			Pilots Path Pvt.		
		71.73			Fergusons Way Pvt.		
		72.00			Route 6A UG Br		
		72.10			Hinckley's Cowpass UG Br		
		72.69			Old Jail Lane **F,G**		
		72.92			Pine Lane **F**		
		72.99			Railroad Ave Pvt.		
		73.25			Hyannis Rd **F, G**		
		73.57			Braggs Lane **F, G**		
		73.90			County Farm Pvt.		
		74.15			Mary Dunn Rd **F,G**		
		75.28			Marstons Lane **F, G**		
							Barnstable *Yarmouth*
		75.50	**YARMOUTH JUNCTION**	S. Dennis Switch, S. Dennis Line, S. Dennis Wye Switch, CM Wye Switch, Yarmouth Wye Track			Wye: 3
		76.35			Route 6 OH Br		
		76.85			Oak Ave **F, G**		
		77.30			Manning Way Pvt. (Airport Access)		
30	**25**					**DCS**	*Yarmouth* *Barnstable*
20	**20**	**78.00**	**PORT**	YL		**DCS/93**	
		78.50			Route 28 **F, G**		
				Loading Platform			
				Hi-Level Platform, Low-Level Platform			
20	**20**	**79.0**	**HYANNIS**			**DCS/93**	

Dean Street Industrial Track

The direction from Salt to Vent is North.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
EXCEPTED TRACK	**10/R**	**4.03**	**SALT**			**98, 99**	
			N.E. Refrigerated		Gallo Const.		
		3.81			High Street OH Br		
	5	3.72			Mill River UG Br		
		3.61			Summer Street OH Br		
	5	3.55			Taunton River UG Br		
	5	3.44			Taunton River UG Br		
	5	3.19			Taunton River UG Br		
		3.16			Dean Street/Route 44 **F,G**		
		3.10			Private Drive		
	10/R	**2.45**	**VENTURA**			**98, 99**	

(Remainder of this page left blank intentionally)

Falmouth Line

The direction from Canal Jct. to Otis is South.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
10	**10**				Cape Main Trk	**INT**	
		0.40			Bell Rd Pvt.		
10	**10**	**0.41**	**CANAL JCT**		*Home Signal*	**INT**	
30	**25**	0.82			Monument Neck Rd **F**	**DCS**	
		1.18			Back River UG Br		
		1.20			Back River Pvt.		
					Distant Signal		
		1.57			Evergreen Hill Rd Pvt		
		1.79			Worcester Ave **F**		
		1.90	**MONUMENT BEACH**				
		2.11			Monument Beach Pvt. **F, G**		
		2.29			Emmons Rd UG Br		
		2.36			Gardeners Rd OH Br		
		2.80			Briarwood Lane Pvt.		
		2.86			Ram Island UG Br		
		3.10			Shore Rd OH Br		
		3.30			Barlow River UG Br		
		3.60			Barlows Landing Rd **F**		
		3.70	**POCASSET**				
		4.58			Shore Rd UG Br		
		4.87			Red Brook Harbor Rd **F**		
		5.03	**CATAUMET**				
		5.51			Scraggy Neck Rd UG Br		*Bourne*
		6.26			West Main St UG Br		*Falmouth*
30	**25**						24 cars
		6.80			County Rd **F, G**		
10	**10**	**6.90**	**OTIS**		Otis Industrial Track	**DCS**	

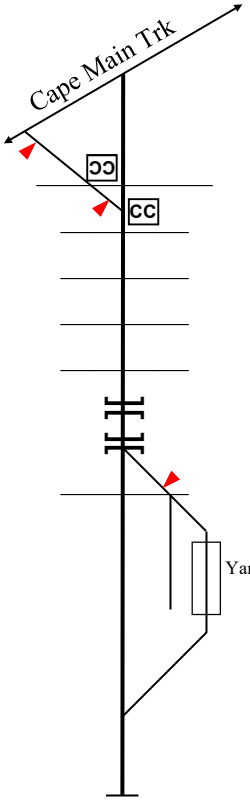
Otis Industrial Track

The direction from Otis to Otis Transfer is South.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
30	**25**	**6.90**	**OTIS**			**DCS**	
	10/R					**98, 99**	
		7.09			Route 28A OH Br		
		7.56			Route 28 OH Br		
		8.07			Route 151 OH Br		
EXCEPTED TRACK		9.02			*(Private Xing) - Underhill St*		
		9.59			*(Private Xing) - Norstad St.*		
				Transfer Station			
	10/R		**OTIS TRANSFER**			**98, 99**	

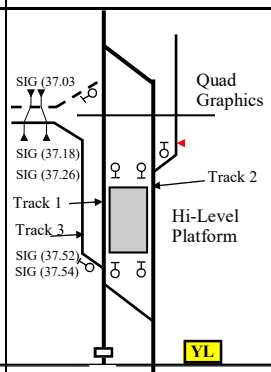
South Dennis Line

The direction from Yarmouth Junction to South Yarmouth is South.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
	10					**98,99**	
		0.0	**YARMOUTH JUNCTION**				Wye: 3
		0.08			Willow Street **F, G**		
		0.35			Private Road		
		0.52			Summer Street		
		1.35			Pine Street		
		1.39			West Yarmouth Rd		
		1.90			N Route 6 OH Br		
		1.95			S Route 6 OH Br		
		2.05			Transfer Station Access Pvt.		
EXCEPTED TRACK							
	10	**3.0**	**SOUTH YARMOUTH**			**98, 99**	

New Bedford Main Line

The direction from Cotley Junction to New Bedford is South.

Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	
37.10	COTLEY JCT			DCS/93	*Taunton*
37.35	EAST TAUNTON STATION				
37.68	STEVENS		*Cotley Yard Limits*	DCS/93	
37.72		SIG (37.87)	Route 24 OH	DCS	*Taunton*
38.36			Cotley Street F G		*Berkley*
38.95		Track 1 Track 2	Cotley River UG		
39.48			Cotley River UG		
39.86		Agway (40.03)	Padelford Street F G		
40.24					
40.40	MYRICKS JCT				
40.53		SIG (40.55) Track 5 MOW Siding	Myricks Street F G		*Berkley*
40.97		To Fall Track 3	Mallone St F G		*Lakeville*
41.21	PIERCE	SIG (41.16) SIG (41.25)			*Lakeville*
42.16			Cedar Swamp River UG		*Freetown*
43.28			Howland Road OH		
45.45			Fall Brook UG		
45.63			Chace Road F G		
45.86	SOLAR	SIG (45.81) SIG (45.91) Millis Industries			
46.39			Costa Crossing Private		
47.25			Braley Road F G		
47.78	CHIP	SIG (47.69)			
47.85		SIG (47.87)	Chipaway Road F G	DCS	*Freetown*

DELETED

Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	
49.03			Samuel Barnet Blvd F G	DCS	*New Bedford*
50.68			Route 140 SB OHB		
50.70			Route 140 NB OHB		
51.18			Pig Farm Rd Private	DCS	
51.93	**DOC**	TL			
51.94			Tarkiln Hill Rd F G	DCS/93	
51.96	**CP-KIN**				
52.33	**CHURCH S STATIO**	Hi-Level Platform			
52.92			Nash Rd F G		
52.95	**NASH**	N. Wye Trk; SIG3(52.90); SIG1(53.04); SIG3(53.04); SIG4(53.96); S1; S2; S3			
		Watuppa Line MCRR			
		S. Wye Trk			
53.33			eane St UG		
53.59			Sawyer St UG		
53.69			Coggeshall St UG		
53.76	**GLORY**	SIG (53.68)			
53.81		SIG (53.81)	Cedar Grove St UG		
53.83			I-195 OHB		
53.96			Weld St - Rt 18 Ramp UG		
54.02			Logan St UG		
54.19			Rt 18 UG		
54.22			Wamsutta St / Achushnet Ave OHB		
54.46	**HERMAN**	SIG1 (54.42); SIG2 (54.47); SIG3 (54.49); S1; S2; S3; Wamsutta Layover Yard			
54.55	**NEW BEDFORD STATION**	Hi-Level Platform; To Freight Yard			
54.63	**CP-WHALES**	SIG (54.63)			
54.87			Herman Melville Blvd	DCS/93	*New Bedford*
55.58	**NEW BEDFORD**				

DELETED

Fall River Subdivision

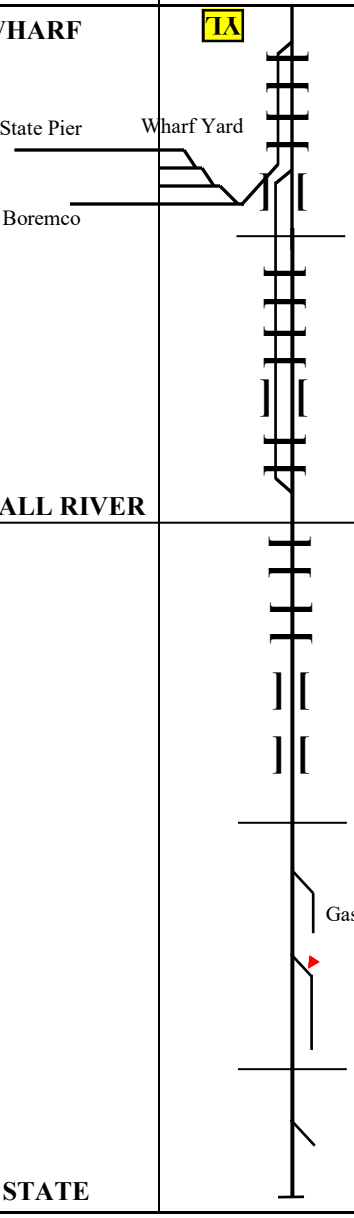
The direction from Myricks to Fall River is South.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
							Berkley
25	**25**	**0.00**	**MYRICKS JCT**	To Cotley Junction; New Bedford; To New Bedford; SIG (0.18)	Myricks St	**DCS**	
		0.17					
		0.38			Mill St		
25	**25**	**0.56**	**SWAMP**	SIG (0.51); SIG (0.62)			
25	**25**	0.84			Adams Ln **F, G**		*Berkley*
		1.16			Assonet River UG Br		*Lakeville*
		1.48			Beechwood Rd **F, G**		*Freetown*
		1.53			Richmond Rd (N) Rte. 79 **F, G**		
		2.58			Forge Rd (N) **F, G**		
		2.63			Richmond Rd (S) Rte. 79 **F, G**		
		2.87			Forge Rd (S) **F, G**		
25	**25**	3.22			Elm St **F, G**		
25	**25**	3.96			High St **F, G**		
		4.72	Weyerhauser				
		4.96			Capicut Rd **F, G**		
		5.23			Route 24 Rattlesnake Brook UG Br		
		5.44	**FREETOWN STATION**	Freetown Hi-Level Platform			1,282
25	**25**						
		5.75			Brighttman Lumber **F, G**		
		5.91			South Main St OH BR		
				Algonquin Gas (6.01); Polaroid (6.10)			
25	**25**	6.19			Farm Rd (N) UG Br	**DCS**	

DELETED

Fall River Subdivision

The direction from Wharf to Fall River is South.

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
10	**10**	**11.28**	**WHARF**			**DCS/93**	
		11.69			Central St. OHB		
		11.73			Braga Bridge OHB		
		11.78			Quiquechan River UG		
		11.78			Boremco // State Pier **F, G**		
		11.90			Anawan OHB		19
		12.00			Rte 79-Western XWay OHB		
		12.09			Firestone Pond UGB		
		12.19			Eagle Street OHB		
		12.29	**FALL RIVER**				
EXCEPTED TRACK	**10**	12.36			Almond Street OHB		
		12.69			Club Street OHB		
		12.89			Printworks Brook UGB		
		12.95			Shaw Street UGB		
		13.29			Condo Crossing (Private)		
		13.69			Private (Gold Medal)		
	10	**14.49**	**STATE**		**END-OF-TRACK**	**DCS/93**	

Framingham Secondary

The direction from Mansfield to Framingham is North

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
			AMTRAK NEC				
10	**10**	0.00		Home Signal			
		0.10	**MANSFIELD**			**98**	
		0.50			Private Rd	**DCS**	
		0.51			Stream UG Br		*Mansfield*
		0.70			Mansfield Yard Xover		*Foxboro*
10	**10**	**1.00**	**MP 1.00**				
30	**25**	1.05			Mansfield Yard North Lead Switch		
		1.07			Spring St **F**		
		1.77			I-95 OH Br North		
30	**25**	1.80		*Distant Signal*	I-95 OH Br South		
10	**10**	1.89			Elm St **F**		
30	**25**	2.30		*MP 1.89*	Leonard St **F**		
		2.67			Cocasset St **F, G**		
		2.81			Mechanic St **F, G**		
		2.90			Bird St **F**		
		3.49			Chesnut St **F**		
		4.20			North St **F**		
		4.33			Neponset River UG Br		
30	**25**	**4.36**	**MILAZZO**		*Begin Mass Coastal Territory*		
					KEOLIS CONTROLLED TERRITORY BETWEEN MILAZZO (MP 4.36) AND WALPOLE (MP 8.50)		
10	**10**	**8.50**	**WALPOLE**		*Begin Mass Coastal Territory*		*Medfield*

Framingham Secondary

The direction from Mansfield to Framingham is North

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges		Rules in Effect	Siding Length 50' cars
10	**10**	8.83			Elm St OH Br			
		8.95		Walpole Yard	Mill Race UG Br			
		9.22			Mine Brook UG			
10	**10**	**10.00**	**NE WALPOLE YL**	*Distant Signal MP 9.8*			**DCS/93**	
		10.73			Private Crossing		**DCS**	
		11.48			South St	**F, G**		
		11.85			Curve St OH Br			
		12.30	**FIELD**					
		12.37			Main St	**F, G**		
		12.50			Frairy St UG Br			
		12.59			Cottage St	**F**		
		12.79		DD	Dale St	**F, G**		
		13.26			West St	**F**		
		13.60		BCLR	West Mill St	**F**		
		13.76	MEDFIELD JCT 13.70	BCLR	Sawmill Brook UG Br			
		14.79			Hospital Rd	**F**		
								Medfield / *Sherborn*
		15.35			Charles River UG Br			
		15.93			Forest St	**F**		
		16.49			Goulding St	**F**		
		17.23			Farm Rd	**F**		
		17.55			Elendale Stables - Private			
		17.70			Main St - Washington	**F**		
		18.05			Hunting Ln	**F**		
		18.20			Farm Rd (Private)			
		18.65			Private Rd			
		18.78			Prospect St	**F**		
		19.00						*Sherborn* / *Framingham*
		19.81			Farm Rd (Private)			
		20.34		*Distant Signal MP 19.9*	Leland St	**F, G**		
		20.75			Junk Yard (Private)			
		21.03			Blandin Ave	**F, G**		
10	**10**	**21.04**	**FRAMINGHAM**					
		WORCESTER MAIN LINE—KEOLIS		*Home Signal*				

Middleboro Subdivision

The direction from Currier to Stevens is South

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram South	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
				AMTRAK NEC		*Attleboro*	
10	10	**0.00**	**CURRIER**	YL 0.0	*Begin Mass Coastal Territory*	**DCS/93**	35
		0.49		*0.03—Pleasant St. UG*	Forest St UG		
				0.7	*Croft Yard Limits*		
				0.8 BOC Gas			
		1.93			Pike Ave OHB		
10	10	**2.00**	**CROFT**	YL *Distant Signal*			
30	25	2.35			Chartley Pond	*Attleboro*	
						Norton	
		2.83			Union Rd **F**		
		3.38			John Scott Blvd **F,G**	**DCS**	
		4.25			S.Worcester Street **F**		
		4.65			Wading River UG		
		5.75			Freezer Switch OOS		
		5.87			Woodward Street **F,G**		
		6.00	**WHIT**				
		6.64			Taunton Ave OH		
		6.69			Meadow Brook UG		
		6.84			Three Mile River UG	*Norton*	
		7.16			Harvey Street **F**	*Taunton*	
		7.81			S. Crane Ave **F**		
				8.5	*Miles Standish I.T.*		
		8.60			Fremont Street **F**		
				8.62			
				9.30			
30	25			9.4	West Britannia Street **F**		
		9.50					
20	20			9.77	Danforth Street **F,G**		12
20	20	**10.00**	**DEAN**	9.79 YL	*Taunton Siding*	**DCS**	
10	10	10.20	*Cotley Yard Limits*		Tremont Street **F,G**	**DCS/93**	
		10.47			Oak Street **F,G**		
		10.65			Porter Street **F,G**		
		10.75			Cohannet Street **F,G**		
		10.84			Winthrop Street **F,G**		
		10.97			Harrison Ave **F,G**		
		11.11			Somerset Ave **F,G**		
		11.25			Weir Street **F,G**		
				11.55	*Dean St I.T MCRR*		
		11.67		11.6	Ingell Street **F,G**		
			"Weir Yard"				
		11.80			Taunton River UG		
		12.17		12.00	Bricky Rd UG		
					Hart Street **F,G**		68
				Distant Signal	*Cotley Siding*		
				13.1			
		13.35	**WEIR**	13.2	*Cotley Connecting Track*		
10	10	**13.78**	**STEVENS**		Middleboro Secondary	**DCS/93**	
					New Bedford Main Line	**98**	

Middleboro Secondary

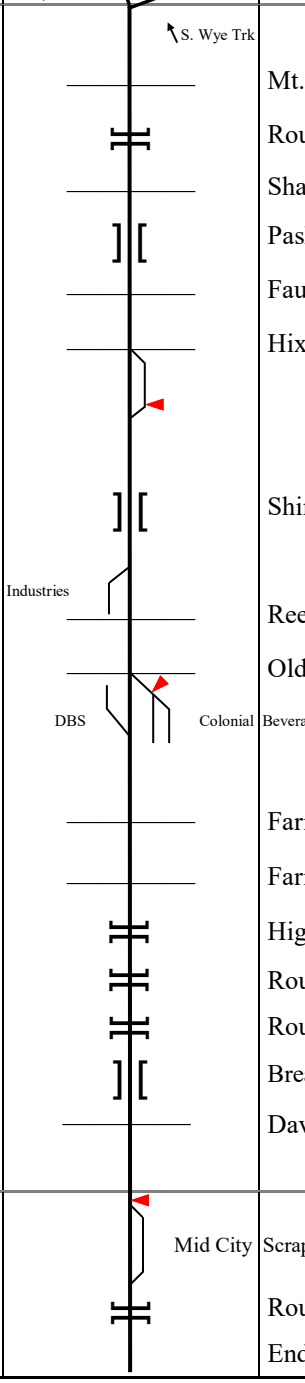
The direction from Pilgrim to Cotley Junction is South

Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram South	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
10	10		*New Bedford Sub* / *MC Middleboro Sub to Attleboro*				
10	10	**42.42**	**COTLEY JCT**	SIG (42.36)			
			Mazzone Switch (42.36)				
		42.16			County St– Rte 140 **F,G**		
		41.94			Rte 24 OH		
10	10	**41.93**	**COTLEY**	YL *Cotley Yard Limits*		**DCS/93**	
25	25	41.82			Deans Pond UG	**DCS**	
		41.37			Stevens St OH		
		41.22			Middleboro Ave **F, G**		
		40.50			Old Colony Ave **F, G**		
		40.30			Taunton River UG		
		39.85			Farm Xing PVT		
		39.53			Farm Xing PVT	*Taunton*	
		39.25			Church St OH		
		39.11			Furnace Brook UG	*Raynham*	
		38.49			Middleboro Ave OH	*Middleboro*	
		37.81			N. Precinct St **F, G**		
		37.07			Leonard ST **F, G**		
			Warren Trask (36.77)				
		36.69			Bedford St / Route 18 OH		
25	25					**DCS**	
20	20	**36.06**	**LAKE**	YL SIG (36.10) SIG (36.01)		**DCS/93**	
				SIG (35.40)			
		35.38		35.38	Rte 495 O[illegible]		
				SIG (35.35)			
		35.29	**ALDEN**	35.29			
			Middleboro Layover	35.23			
					Begin Mass Coastal Territory		
			To Hyannis	SIG(3) (35.12)			
		35.01	**MIDDLEBORO STATION**		Middleboro Station		
20	20	**34.89**	**PILGRIM**	YL	*Begin Mass Coastal Territory*	**DCS/93**	
10	10			SIG (34.89)	See MiddleboroYard Detail Page	**98**	
		34.90	Rte 28 OH Br				
			Pilgrim Junction	Keolis Middleboro Main Line			
						Middleboro	
10	10	34.40		To Boston	Centre St OHB	**98**	

DELETED

Watuppa Line

The direction from MP 0.00 TO MP 10.66 is South

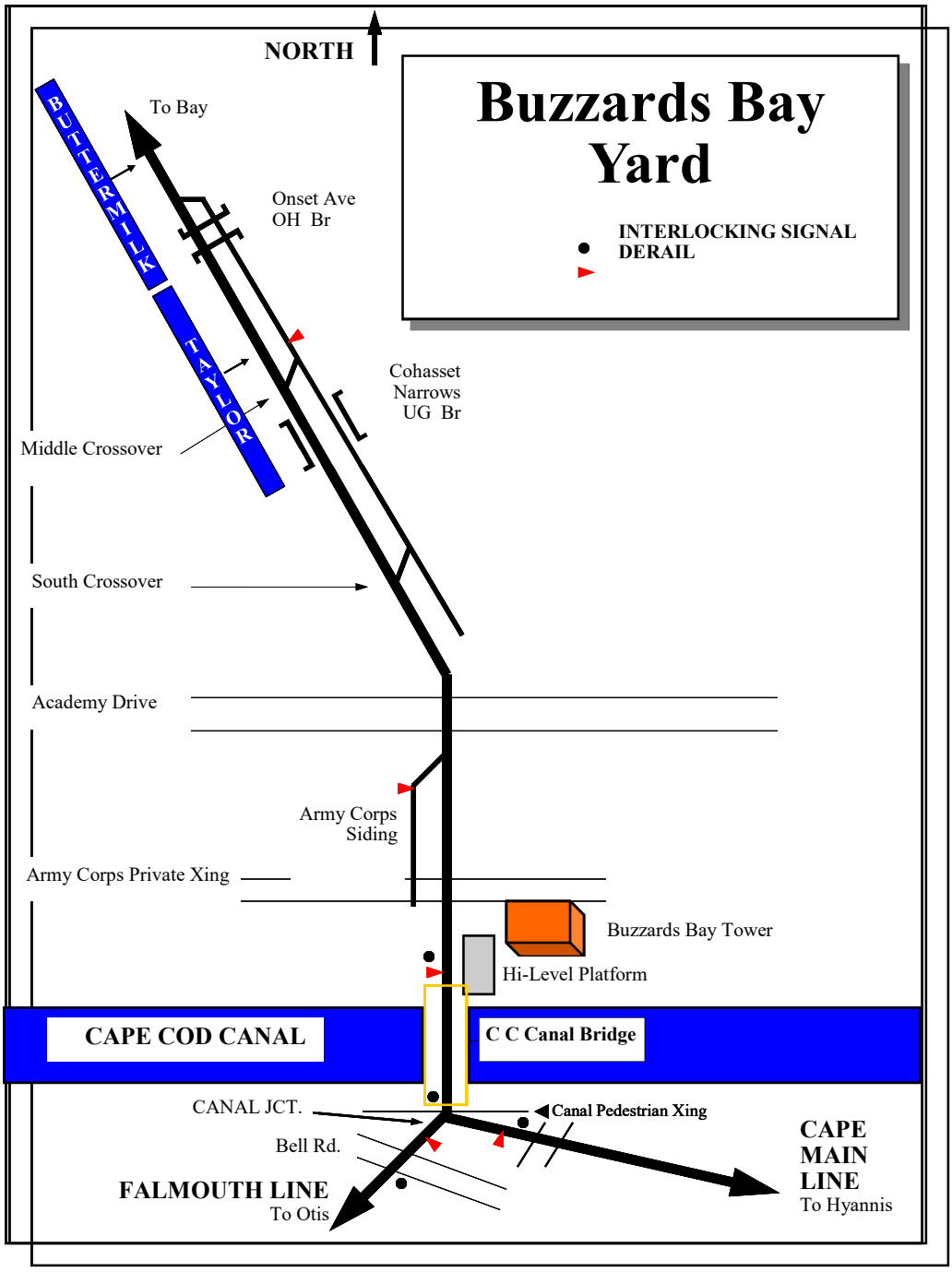
Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
							Bristol
	10	**0.00**				**98, 99**	
	10	**0.19**	**NASH**			**DCS, 99**	
		0.39			Mt. Pleasant St F		
		0.63			Route 140 OH Br		
		0.72			Shawmut Ave F,G		
					Paskemansett River UG Br		
		2.83			Faunce Corner Rd F,G		
		3.46			Hixville Rd		
			Hixville Runaround				
		4.00					
					Shingle Island River UG Br		
		5.00					
		5.26			Reed Rd F,G		
		5.34			Old Reed Rd		
	10	**6.00**	**FARM**				
		6.11			Farm Road Pvt.		
		6.20			Farm Road Pvt.		
		6.48			Highland Ave OH Br		
		6.91			Route I-195 West OH Br		
		6.95			Route I-195 East OH Br		
		7.32			Bread & Cheese Brook UG Br		
		7.70			Davis Rd		
	10	**7.75**	**MID**			**DCS, 99**	
						98, 99	
		8.00					
		8.27			Route 88 OH Br		
		10.66			End-of-Track		

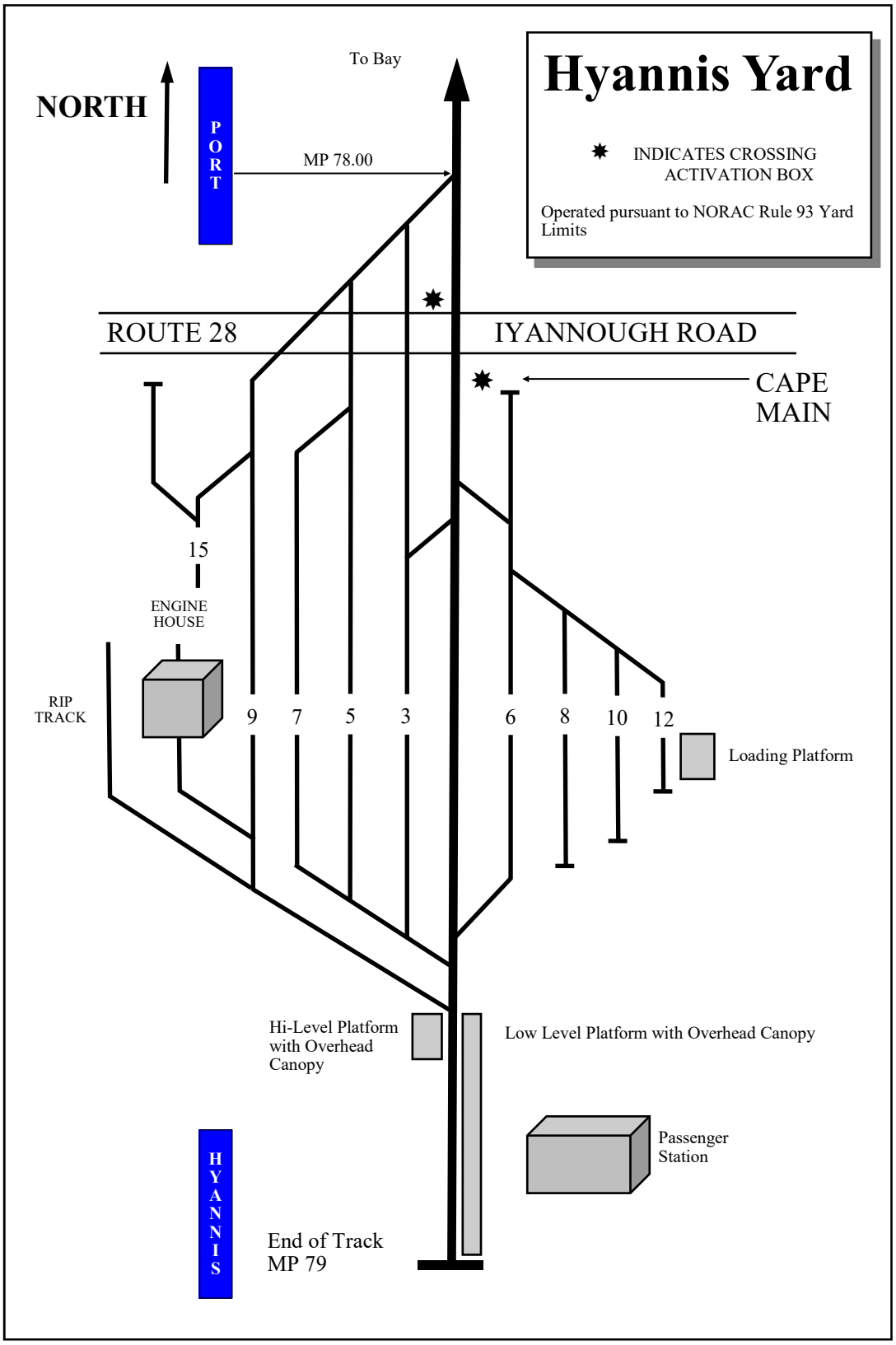
EXCEPTED TRACK

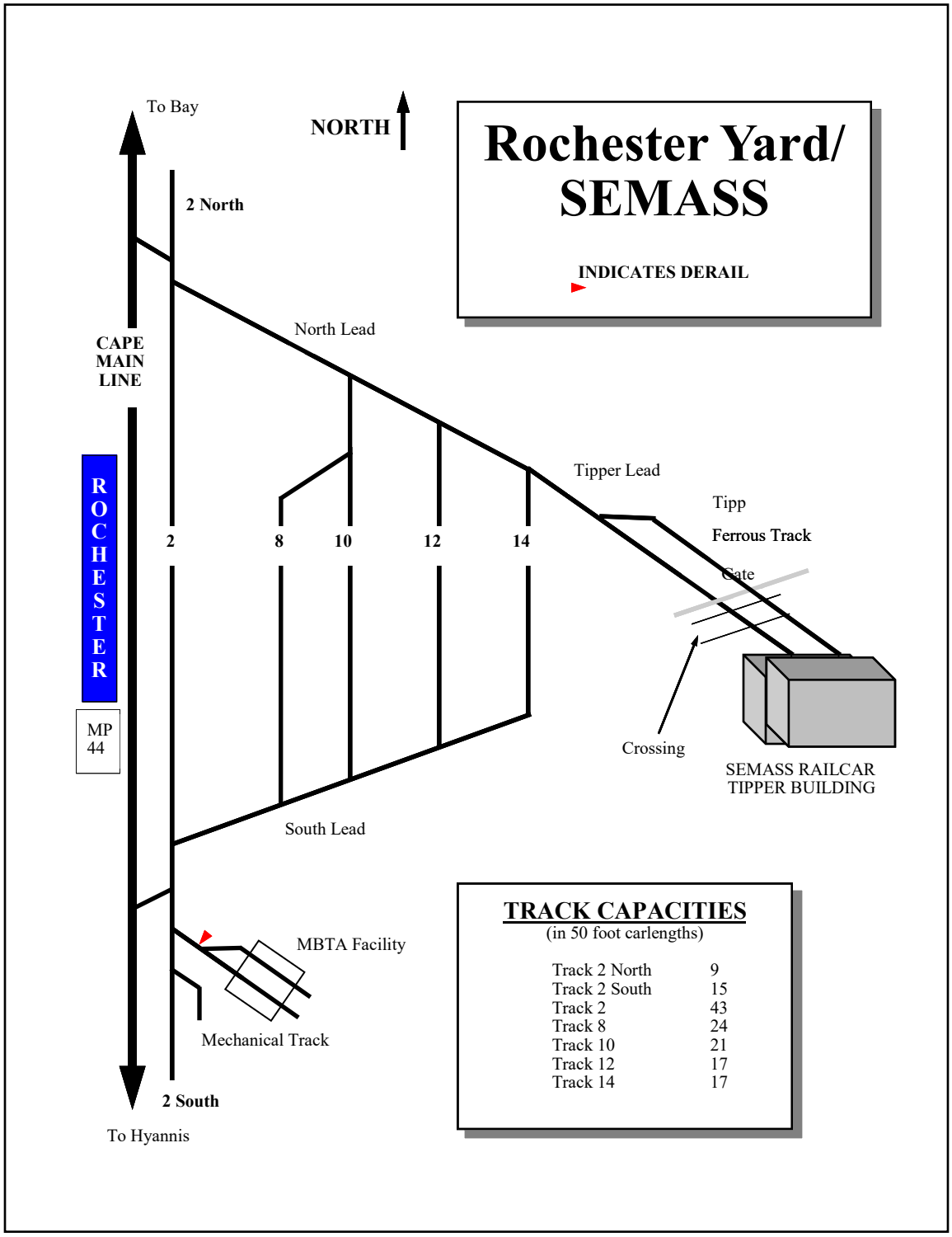
Millis Line

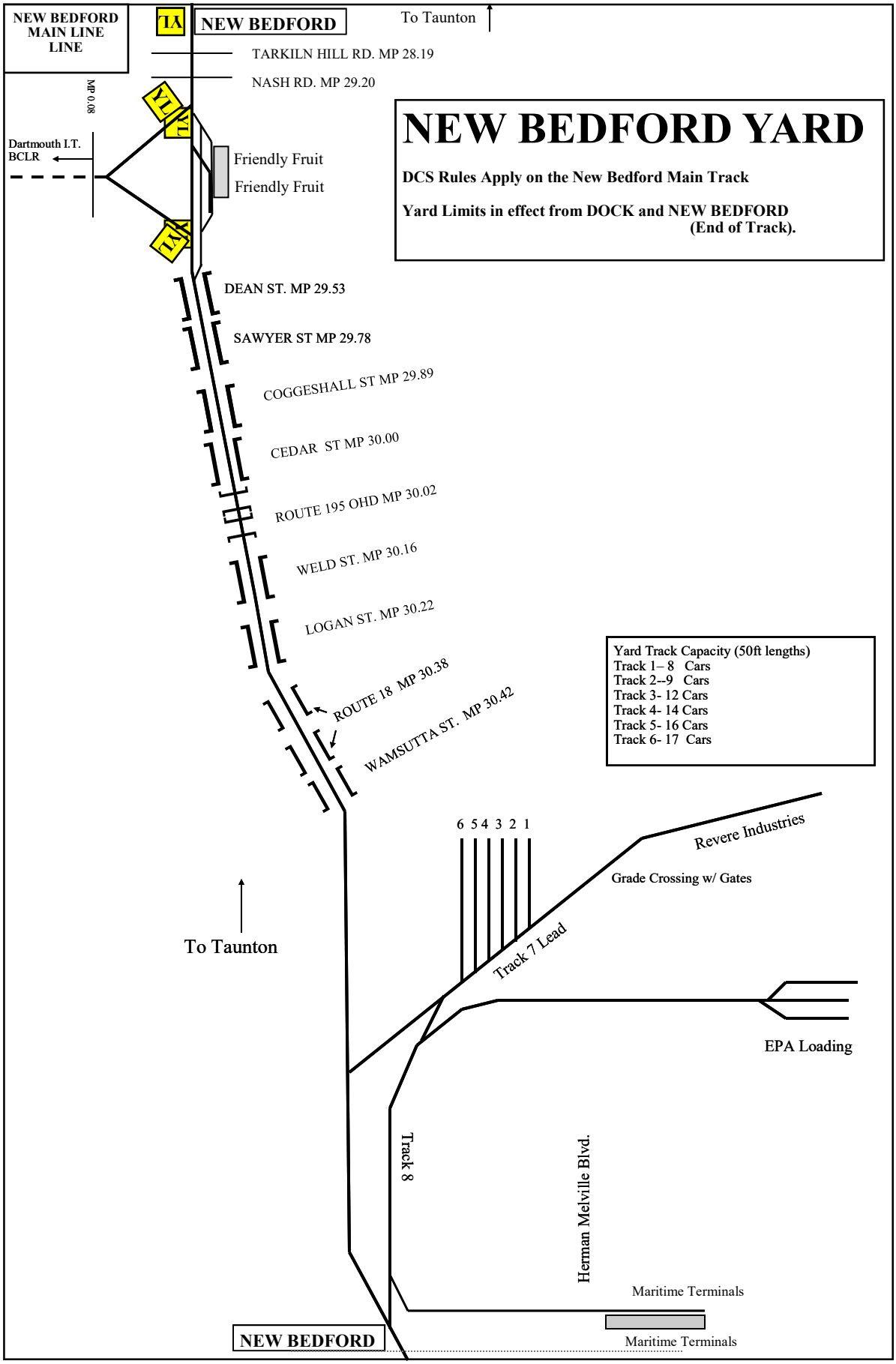
The direction from Medfield Junction to MP 3.40 is West

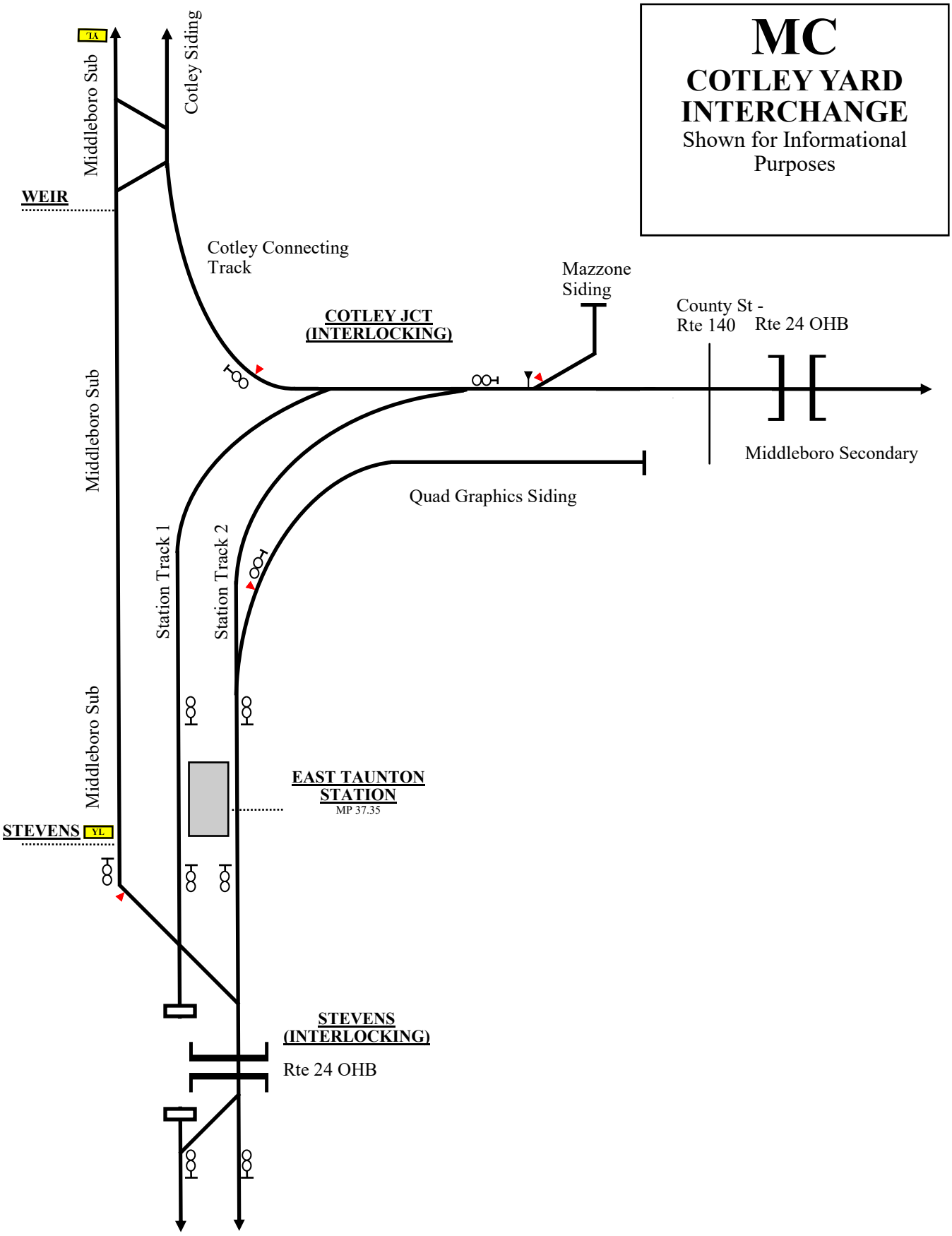
Normal Speed PSGR	Normal Speed FRT	Milepost	Station	Track Diagram	Highway Grade Crossings and Bridges	Rules in Effect	Siding Length 50' cars
				Framingham Secondary			*Norfolk*
	10	**0.00**	**MEDFIELD JCT**			**98, 99**	
		0.45			Route 27 OH Br		
		0.66			Old Bridge St		
					Charles River UG Br		
		0.82			Farm Rd (Private)		
EXCEPTED TRACK		**1.00**					
		1.60			Island Rd		
		2.00					
		2.22	Millis (Cliquot)		Union St		
		2.63			Route 109 OH Br		
		2.76			Exchange St		
		2.97			Auburn Rd		
	10	**3.00**					
		3.17			Craftsman St (Private)		
		3.40			**End of Track**	**98, 99**	


NORTH
Buzzards Bay Yard
INTERLOCKING SIGNAL
DERAIL
To Bay
BUTTERMILK
TAYLOR
Onset Ave
OH Br
Cohasset
Narrows
UG Br
Middle Crossover
South Crossover
Academy Drive
Army Corps
Siding
Army Corps Private Xing
Buzzards Bay Tower
Hi-Level Platform
CAPE COD CANAL
C C Canal Bridge
CANAL JCT.
Canal Pedestrian Xing
Bell Rd.
FALMOUTH LINE
To Otis
CAPE
MAIN
LINE
To Hyannis


Hyannis Yard
INDICATES CROSSING ACTIVATION BOX
Operated pursuant to NORAC Rule 93 Yard Limits
To Bay
NORTH
PORT
MP 78.00
ROUTE 28
IYANNOUGH ROAD
CAPE MAIN
15
ENGINE HOUSE
RIP TRACK
9
7
5
3
6
8
10
12
Loading Platform
Hi-Level Platform with Overhead Canopy
Low Level Platform with Overhead Canopy
Passenger Station
HYANNIS
End of Track MP 79

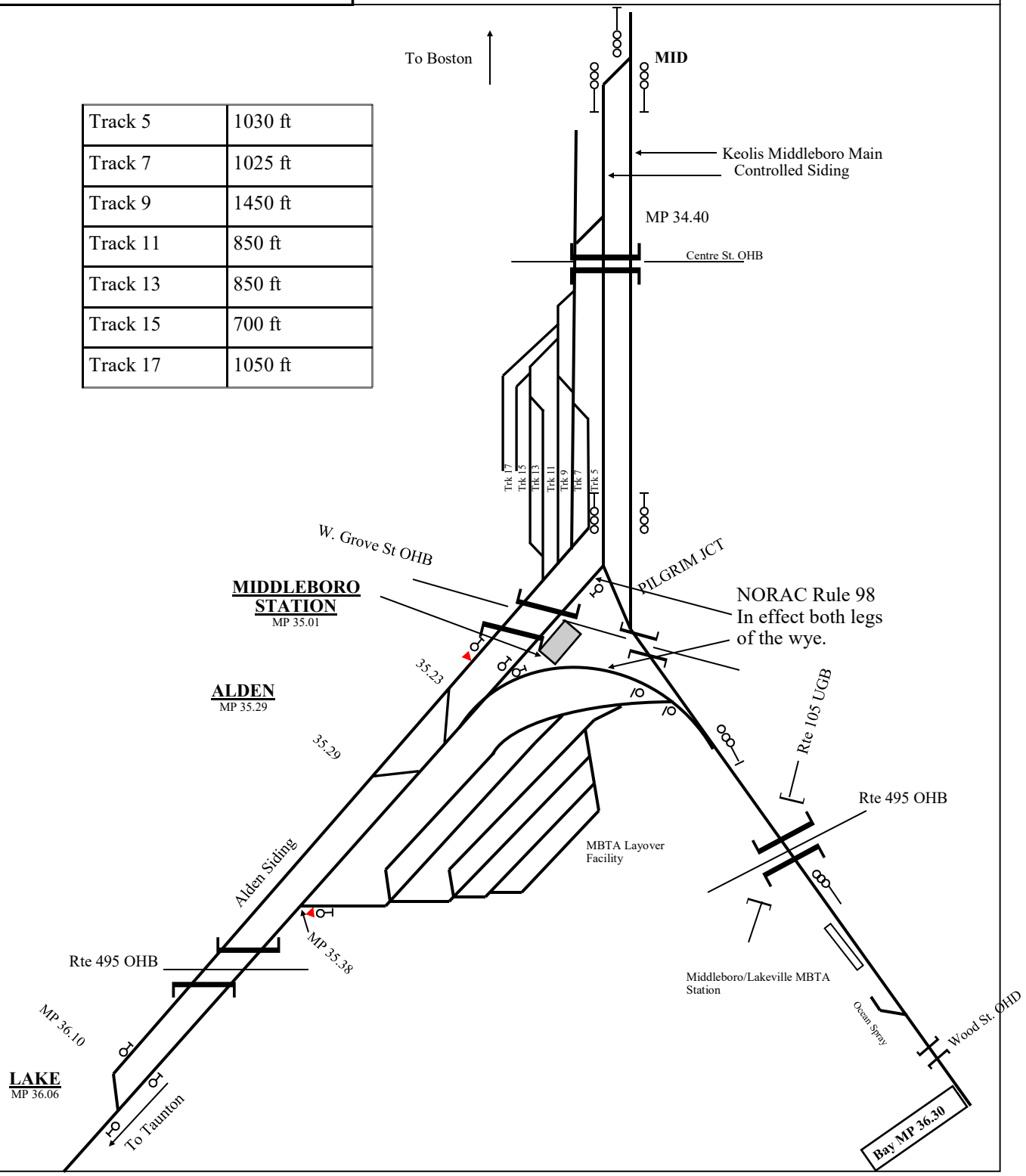

To Bay
NORTH
Rochester Yard/
SEMASS
INDICATES DERAIL
2 North
North Lead
CAPE
MAIN
LINE
Tipper Lead
Tipp
Ferrous Track
Gate
ROCHESTER
2
8
10
12
14
MP
44
Crossing
SEMASS RAILCAR
TIPPER BUILDING
South Lead
MBTA Facility
Mechanical Track
2 South
To Hyannis
TRACK CAPACITIES
(in 50 foot carlengths)
Track 2 North 9
Track 2 South 15
Track 2 43
Track 8 24
Track 10 21
Track 12 17
Track 14 17

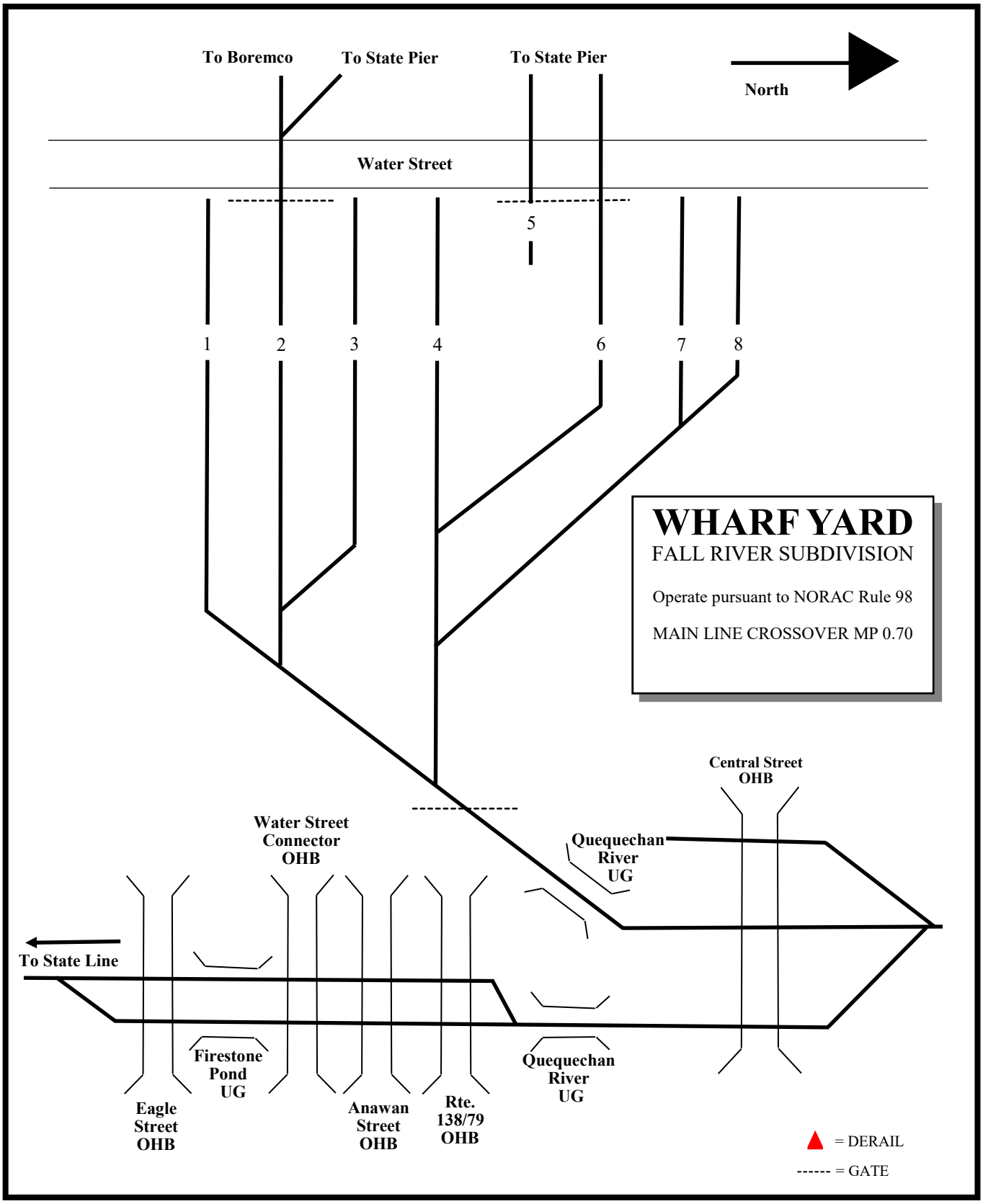

NEW BEDFORD MAIN LINE LINE
YL
NEW BEDFORD
To Taunton
TARKILN HILL RD. MP 28.19
NASH RD. MP 29.20
MP 0.08
YL
YL
YL
Dartmouth I.T.
BCLR
Friendly Fruit
Friendly Fruit
NEW BEDFORD YARD
DCS Rules Apply on the New Bedford Main Track
Yard Limits in effect from DOCK and NEW BEDFORD
(End of Track).
DEAN ST. MP 29.53
SAWYER ST MP 29.78
COGGESHALL ST MP 29.89
CEDAR ST MP 30.00
ROUTE 195 OHD MP 30.02
WELD ST. MP 30.16
LOGAN ST. MP 30.22
ROUTE 18 MP 30.38
WAMSUTTA ST. MP 30.42
Yard Track Capacity (50ft lengths)
Track 1– 8 Cars
Track 2--9 Cars
Track 3- 12 Cars
Track 4- 14 Cars
Track 5- 16 Cars
Track 6- 17 Cars
6 5 4 3 2 1
Revere Industries
Grade Crossing w/ Gates
To Taunton
Track 7 Lead
EPA Loading
Track 8
Herman Melville Blvd.
Maritime Terminals
NEW BEDFORD
Maritime Terminals


MC
COTLEY YARD
INTERCHANGE
Shown for Informational
Purposes
YL
Middleboro Sub
Cotley Siding
WEIR
Cotley Connecting
Track
Mazzone
Siding
COTLEY JCT
(INTERLOCKING)
County St -
Rte 140
Rte 24 OHB
Middleboro Secondary
Quad Graphics Siding
Station Track 1
Station Track 2
EAST TAUNTON
STATION
MP 37.35
STEVENS
YL
STEVENS
(INTERLOCKING)
Rte 24 OHB

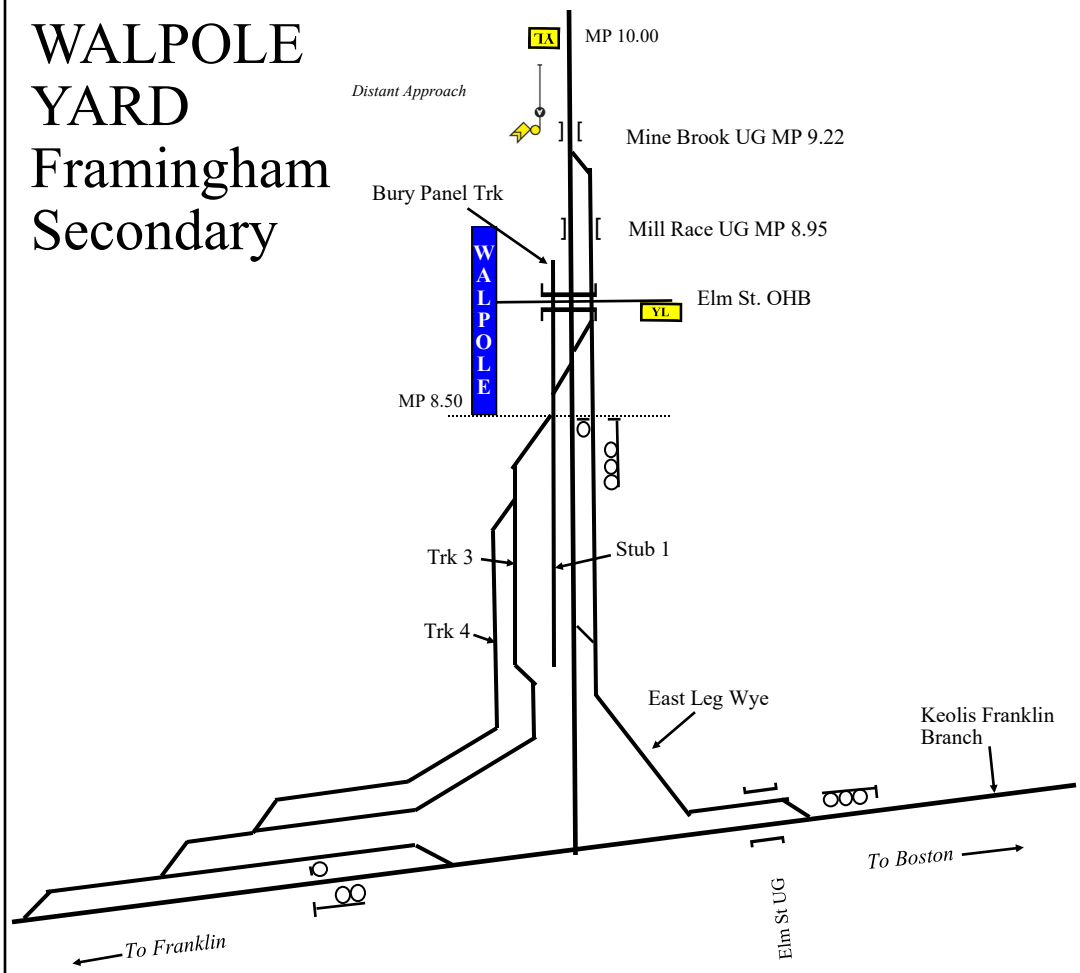
Keolis Territory
BAY to MID including Middleboro Yard

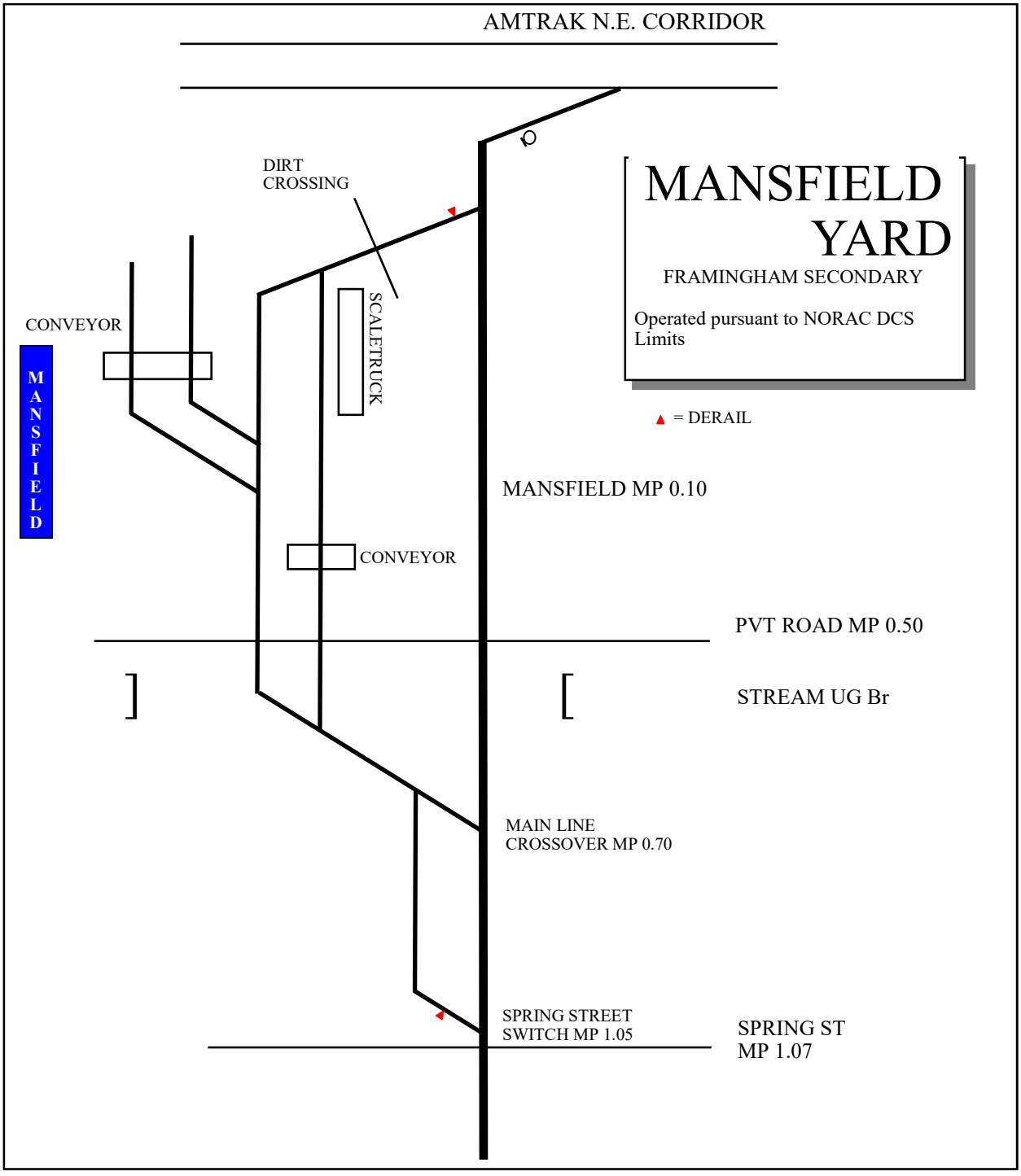
Track 5	1030 ft
Track 7	1025 ft
Track 9	1450 ft
Track 11	850 ft
Track 13	850 ft
Track 15	700 ft
Track 17	1050 ft




To Boremco
To State Pier
To State Pier
North
Water Street
5
1
2
3
4
6
7
8
WHARF YARD
FALL RIVER SUBDIVISION
Operate pursuant to NORAC Rule 98
MAIN LINE CROSSOVER MP 0.70
Central Street OHB
Water Street Connector OHB
Quequechan River UG
To State Line
Firestone Pond UG
Quequechan River UG
Eagle Street OHB
Anawan Street OHB
Rte. 138/79 OHB
= DERAIL
------ = GATE

WALPOLE YARD Framingham Secondary




AMTRAK N.E. CORRIDOR
DIRT CROSSING
SCALETRUCK
CONVEYOR
MANSFIELD
CONVEYOR
MANSFIELD YARD
FRAMINGHAM SECONDARY
Operated pursuant to NORAC DCS Limits
▲ = DERAIL
MANSFIELD MP 0.10
PVT ROAD MP 0.50
STREAM UG Br
MAIN LINE CROSSOVER MP 0.70
SPRING STREET SWITCH MP 1.05
SPRING ST MP 1.07

Employee Qualifications

Emp. #	Name	Occupation	Date of Hire

Examinations

Type	Date	Pass/Fail	Examiner

Medical Examinations

Type	Date	Doctor's Name	Restrictions

Qualifications for Service

Date	Line	Examiner

Engineer's Operating Performance Test Record

Date	Pass/Fail	SLE

Examination of Required Books

Date	Location	Pass/Fail	Examiner

Examination of Hand-Held Air Gauge

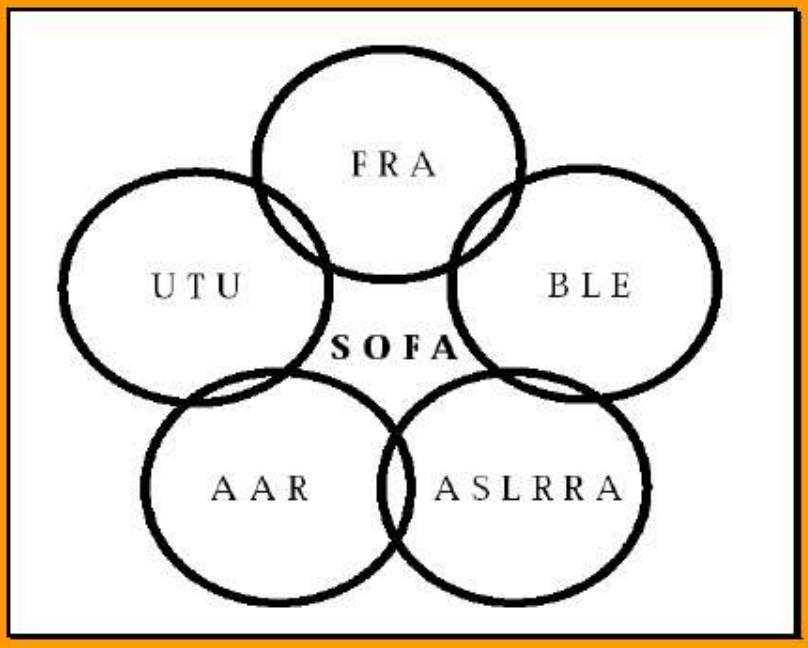
Date	Location	Date	Location

Emergency Hotline for all emergencies including
Highway-Rail Grade Crossing concerns

888-783-4316

PRACTICE THE FIVE S.O.F.A. LIFESAVERS:

1. SECURE EQUIPMENT BEFORE ACTION IS TAKEN.
2. PROTECT EMPLOYEES AGAINST MOVING EQUIPMENT.
3. DISCUSS SAFETY AT THE BEGINNING OF A JOB OR WHENEVER WORK CHANGES.
4. COMMUNICATE <u>BEFORE</u> ACTION IS TAKEN.
5. MENTOR LESS EXPERIENCED EMPLOYEES TO PERFORM SERVICE SAFELY.



SYSTEM GENERAL ORDER 8-A63

EFFECTIVE 12:01 A.M., MAY 22, 2025

++

General Order 8-A36 dated December 19, 2023, is canceled.
General Order 8-A58 dated October 9, 2024, is canceled.

General Orders In Effect In This Series: 8-A2, 8-A7, 8-A11, 8-A57, 8-A61, 8-A62 and 8-A63.

++

SUBJECT: TIMETABLE CHANGES

Massachusetts Coastal Railroad Timetable and Special Instructions No. 8, effective December 1, 2021, is modified as follows. Items not provided for in previous general orders are underlined:

CAPE MAIN SUBDIVISION

Page 8, Cape Main Subdivision, the Milepost location for APTX Aptucxet is changed to 55.83.

Page 8, Cape Main Subdivision, the **Method of Operation** table is changed in its entirety to read:

Bay to Buttermilk……	**DCS**
Buttermilk to Buzzards Bay……	**DCS, Rule 93**
Buzzards Bay to Canal Junction……	**INT**
Canal Junction to Aptucxet……	**DCS, Rule 93**
Aptucxet to Airport……	**DCS**
Airport to Hyannis……	**DCS, Rule 93**

Track diagram on Page 53 modified accordingly.

Page 9, Cape Main Subdivision, add the following under **NOTE:**

3. **Buzzards Bay Bridge** - Between Buzzards Bay and Canal Junction, only equipment equipped with functional rail wheels operating on-track is permitted on any portion of the Cape Cod Canal Movable Bridge, including the fixed approaches.

4. **Cape Main, Rochester, Track 2 -** A derail operated with a switch stand is in place on Track 2, south of the south crossover. This derail is in place to ensure equipment does not leave the MBTA Rochester Repair Facility and enter Massachusetts Coastal Railroad trackage. The derail must be lined and locked in the derailing position, except when it is lined and locked in the non-derailing position to permit switching movements being made by Massachusetts Coastal Railroad. Mass Coastal exclusively maintains the ability to change the position of the derail.

5. **Cape Main, Rochester, Track 2 -** A hinged fixed derail is in place on Track 2, directly adjacent to and south of the above switch-stand derail. This derail is used and controlled by MBTA Rochester Repair Facility employees as needed to prevent Massachusetts Coastal Railroad movements from entering their trackage.

NEW BEDFORD SUBDIVISION

Page 13 – REVISED 06.17.2024 is deleted in its entirety.

FALL RIVER SUBDIVISION

Page 14 of the current timetable is replaced with a page showing
"Page 14 – REVISED 07.28.2024" in the lower left corner of the page.

FRAMINGHAM SECONDARY

Page 16, Framingham Secondary, add the following **NOTE:**

PERMITTED USE OF 6-AXLE LOCOMOTIVES
The use of 6-axle locomotives numbered CSXT 8000-8800 is permitted within the following territories:

- Framingham Secondary between MP 0.00 and MP 4.36 MILAZZO.
- Framingham Secondary between MP 8.50 WALPOLE and MP 21.04 FRAMINGHAM.

MIDDLEBORO SUBDIVISION

Page 17A – REVISED 04.27.2024 is replaced with a page showing
"Page 17 – REVISED 07.28.2024" in the lower left corner of the page.

MIDDLEBORO SECONDARY

Page 17B – REVISED 04.27.2024 is deleted in its entirety.

WATUPPA LINE

Page 18 of the timetable is replaced with a page showing
"Page 18A – REVISED 12.29.2023" in the lower left corner of the page.

Page 18A – REVISED 12.29.2023, the following **NOTE** is added:
7. MP 5.26, Reed Road – Automatic warning devices for this crossing operate with "Island Circuit Only". All trains must stop 20 feet prior to occupying the crossing. The train may proceed after the signals have operated for 20 seconds and crossing gates are fully lowered to the horizontal position. If all gates are not in horizontal position or all lights are not flashing, a crew member must provide on-ground warning at the crossing. Whistle signal 19(b) must be sounded while operating over the crossing.

MILLIS LINE

To provide information for the Millis Line, a new page showing
"Page 18B – REVISED 12.29.2023" in the lower left corner of the page is added to the timetable.

GRADE CROSSINGS

Page 20, the following crossing is added to the crossing list:

Cape Main (*continued)*

DOT #	MILEPOST	CROSSING	1	2	3	4	NOTES	CITY	COUNTY
982923H	76.53	Private Access Crossing				X		Yarmouth	Barnstable

Page 22 of the current timetable is replaced with a page showing
"Page 22 – REVISED 07.28.2024" in the lower left corner of the page.

Page 24 of the current timetable is replaced with a page showing
"Page 24 – REVISED 07.28.2024" in the lower left corner of the page.

Page 25 of the current timetable is replaced with a page showing
"Page 25 – REVISED 12.19.2023" in the lower left corner of the page.

SPECIAL INSTRUCTIONS

Page 45, **LOC-3 CLOSE CLEARANCE LOCATIONS**, the following is added:
Cape Main:
SEMASS Yard Lead, North End – East side adjacent to scale

Page 46, **LOC-3 CLOSE CLEARANCE LOCATIONS**, the following is added:
Middleboro Subdivision
MP 6.84 Three Mile River Undergrade Bridge: Railing.

Page 48, **LOC-10 DIMENSIONAL AND WEIGHT CLEARANCE INFORMATION**, the following is added:

LINE	AAR PLATE CLEARANCE-MAX	GROSS WEIGHT-MAX
Watuppa Line	F	286,000 Lbs
Millis Line	F	286,000 Lbs

Page 50, the following are added to **LOC-14 DEFECT DETECTORS AND CLEARANCE DETECTORS**:

- Framingham Secondary – MP 3.40 – HBD and DED
- Middleboro Subdivision – MP 5.90 – HBD and DED

TRACK CHARTS & YARD MAPS

Page 60 – REVISED 06.17.2024 is deleted in its entirety.

Page 61 – REVISED 06.17.2024 is deleted in its entirety.

Page 62 (original) & 62A – REVISED 04.21.2024 are deleted in their entirety.

Page 63A & 63B – REVISED 04.21.2024 are deleted and replaced with one single page showing **"Page 63 – REVISED 07.28.2024"** in the lower left corner of the page.

Page 66 – REVISED 04.27.2024 is replaced with a page showing **"Page 66 – REVISED 07.28.2024"** in the lower left corner of the page.

Page 67 – REVISED 04.27.2024 is deleted in its entirety.

To provide updated information for the Watuppa Line track chart, Page 68 of the current timetable is replaced with a page showing **"Page 68A – REVISED 12.19.2023"** in the lower left corner of the page.

To provide track chart information for the Millis Line, a new page showing **"Page 68B – REVISED 12.19.2023"** in the lower left corner of the page is added to the timetable.

Page 73 – REVISED 04.27.2024 is replaced with a page showing **"Page 73 – REVISED 07.28.2024"** in the lower left corner of the page.

Page 74 – REVISED 04.27.2024 is replaced with a page showing **"Page 74 – REVISED 07.28.2024"** in the lower left corner of the page.

Be Governed Accordingly.
P. Christopher Podgurski, President & CEO

SYSTEM GENERAL ORDER 8-A65

EFFECTIVE 12:01 A.M., SEPTEMBER 15, 2025

++

General Order 8-A64 dated May 28, 2025, is canceled.

General Orders In Effect In This Series: 8-A2, 8-A7, 8-A11, 8-A57, 8-A61, 8-A62, 8-A63 and 8-A65.

++

SUBJECT: TIMETABLE CHANGES

Massachusetts Coastal Railroad Timetable and Special Instructions No. 8, effective December 1, 2021, is modified as follows. Items not provided for in previous general orders are underlined:

Page 35 – SPECIAL INSTRUCTION 109-S1 HAND BRAKES

Special Instruction **109-S1 HAND BRAKES** is deleted in its entirety.

The deletion of this special instruction allows for railroad employees to achieve compliance by following existing rules and procedures related to the application of hand brakes:

- *Employees of Massachusetts Coastal Railroad will continue to comply with Air Brake and Train Handling* **104.1.3 Determine Number of Handbrakes** *to ensure equipment is secured properly to prevent unintended movement.*
- *Employees of foreign roads will comply with their own Air Brake and Train Handling rules and procedures to ensure equipment is secured properly to prevent unintended movement.*

Page 65 - FRAMINGHAM SECONDARY – WALPOLE DISTANT SIGNAL CHANGE

The distant signal governing southbound movements approaching Walpole interlocking located at MP 9.8 has been retired and removed from service.

A new distant signal governing southbound movements approaching Walpole Interlocking has been installed at MP 11.50. This single color light signal is located on the right hand side of the track and is now in service. NORAC Rule 293c applies.

Track diagram on Page 65 of Timetable and Special Instructions No. 8 modified accordingly.

Be Governed Accordingly.

P. Christopher Podgurski, President & CEO

Operations
Maintenance of Way
Signal and Communications

January 7, 2026

Dear Mr. Moroney,

As requested, below please find additional details requested for your that can be used in your work related to bid documents. Answers/comments to your questions are provided in RED:

Replacement of the Culverts at MP 44.27 and MP 44.29.

1. MC-1 comes on duty at Rochester at 7am Mon – Fri. What time does the train typically leave the yard so that the contractor can plan the start of his track time each day? Is MCRR able to adjust its schedule at all to get the contractor work window started as soon as possible each day to maximize work time?
   It is likely that in March, the MC-1 may start as early as 6:00 AM. The MC-1 departure time out of the yard depends on if they need to provide switching service to SEMASS or MBTA first, or go to Middleboro Yard prior to proceeding south.

2. MC-2 comes on duty at 1pm, but appears to be taxied to Yarmouth to bring the loaded trash train north. What time is that train expected to arrive at Rochester each day and is there any wiggle room in that schedule to help the contractor maximize his day (this would be the case where a contractor may want to work 4 – 10 to 12 hour days).
   The MC-2 operation depends on other train movements and/or customer needs/activities. Sometimes the MC-2 runs empties south to Yarmouth prior to returning north with loads, and sometimes they drive to Yarmouth to run loads north. When being taxied to Yarmouth to return north, the train will not likely be at Rochester prior to 5:00 PM.

3. There is nothing in the timetable for the equipment moves in and out of the Rochester Facility. While I recognize that this may be on an as needed basis, the contractor will have to clear for these moves so it is important that the project be supplied with the best approximate information available. The MBTA Rochester Facility will also be asked for their input.
   MBTA moves are as needed by MBTA. There are times when these moves are simply switching equipment within the facility. There are times when these moves include operating on the main track to test equipment, or to deliver equipment to Middleboro.

Although not in the schedule, Keolis will run familiarization/qualification trips through this area prior to the beginning of the Cape Flyer season. Historically, these unscheduled trips may begin on short notice any time after April 15.

Installation of the 1200 foot Sheet Pile Wall to create access to the culvert project site

1. It is hoped that immediately upon receiving their Contract and NTP in early March, the Contractor will begin work on the installation of the sheet Pile Wall.
2. In order to install the sheeting, the Pile Rig will have to occupy and straddle the siding track. In addition, there are anchor piles which also must be driven adjacent to the sheeting which are the tie-back system to support railroad loading of the sheet pile wall. MCRR/MBTA coordination of train movements will be imperative as the Pile Rig will have to move out of the way for MCRR to service the MBTA Facility.
3. Because the sheet pile wall is the Critical Path for this project, whatever ideas, suggestions, and/or recommendations that MCRR can provide on how to manage these movements so as to maximize pile driving work time would be greatly appreciated.

In March and April, the area around Rochester rarely sees train operation on the weekends. If RWIC services are available, in addition to the weekday work, longer/continuous work windows may be available on the weekends to expedite the sheet-pile portion of the project.

Prior to Cape Flyer season, depending on the train movements needed in this area, MC-1 and MC-2 trains often exit/enter the yard at the crossovers at each end of the yard. Although the south crossovers are adjacent to the worksite, there is at least some flexibility for using different parts of the yard and main track to facilitate the necessary train movements.

Retirement of the Cattle Passes at MP 68.00 and MP 71.66

Depending on the date of operation, 4-6 train movements may pass these locations on a given day. Weekend outages for these projects will not be possible during the seasonal operation of Cape Cod Central or Cape Flyer trains. I strongly encourage this project be completed before Memorial Day weekend.

1. For MC-1 information is needed as to what time each day this southbound move is expected to go through these two areas.
   MC-1 would expect to pass these locations between 8:00 AM and 11:00 AM, depending on the availability of the use of the bridge at Buzzards Bay.

2. For MC-2 information is needed as to what time each day this northbound move is expected to go through these two areas.
   When it is necessary for MC-2 to operate northbound only, I would expect to pass these locations after 4:00 PM. However, depending on the availability of the use of the bridge at Buzzards Bay, and if the MC-2 needs to operate south to Yarmouth prior to returning north, movements may pass this location anytime between 2:00 and 5:00 PM.

3. There is nothing in the Timetable for Cape Cod Central Railroad's train movements. Because construction at these two locations could happen at any time from mid-March to the end of June, could MCRR please provide the Project with the current Cape Cod Central Scenic and Dinner Train Schedule for the Calendar 2026 Season for inclusion in the Bid Package.
   The 2026 schedule for excursion and dinner trains has not yet been finalized. Although subject to change, the following will likely be planned:
   - Valentine's Day trains on February 14 and 15.
   - St. Patrick's Day trains sometime March 14 through 17.
   - Easter trains April 5.
   - Cinco de Mayo trains May 2 through 5.
   - Mother's Day trains May 10.
   - When excursion season starts in mid-May, we may run Wednesday through Sunday, but do not usually run excursions on Mondays or Tuesdays.

   Beginning Memorial Day weekend, revenue Cape Flyer trains operate on FRI-SAT-SUN and holidays.

With all of the above, train operations are subject to change. Customer operating schedules and limitations for crossing the lift bridge at Buzzards Bay dictate our train movements. We understand the need for these projects to occur, but it is imperative that Mass Coastal trains be able to move as needed to stay on our schedule or as needed to get back on schedule.

Sincerely,

P. Christopher Podgurski

P. Christopher Podgurski
President & CEO

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00903

GEOTECHNICAL REPORTS

THIS PAGE IS INTENTIONALLY LEFT BLANK

REPORT

Preliminary Geotechnical Design Report

Cape Main Culvert Replacements and Retaining Wall, Rochester MA

Submitted to:

Benny R. D'Artista

WSP USA Inc.
100 Summer Street, 13th Floor
Boston, MA 02110

Submitted by:

WSP USA, Inc.
10 Al Paul Lane, Suite 103, Merrimack, NH 03054



US0035009.6582

August 7, 2025

Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT BACKGROUND 1

3.0 GEOLOGIC SETTING 1

3.1 Regional Surficial Geology 1

3.2 Regional Bedrock Geology 1

4.0 SUBSURFACE INVESTIGATIONS 2

5.0 LABORATORY TESTING PROGRAM 2

6.0 SUBSURFACE CONDITIONS 3

7.0 CULVERT ANALYSIS AND RECOMMENDATIONS 4

7.1 Design Parameters 4

7.2 Lateral Earth Pressure 5

7.3 Bearing Resistance 5

7.4 Settlement 6

7.5 Subgrade Modulus 7

8.0 RETAINING WALL ANALYSIS AND RECOMMENDATIONS 7

8.1 Design Parameters and Assumptions 7

8.2 Model Analysis 8

8.3 Results and Recommendations 9

9.0 CONSTRUCTION CONSIDERATIONS 10

10.0 REPORT AND EXPLORATION LIMITATIONS 11

TABLES (embedded)

Table 5-1: Type and Number of Soil Laboratory Tests Performed

Table 7-1: Engineering Design Parameters for In Situ Soils and Construction Fills

Table 7-2: Summary of Recommended Bearing Resistance for Proposed Culverts

Table 8-1: Summary of Analysis Results for Proposed Retaining Wall

TABLES (attached)

Table 1: Subsurface Exploration Locations

Table 2: Summary of Rock Core Quality

Table 3: Summary of Soil Index and Classification Laboratory Testing Results

FIGURES (attached)

Figure 1: Interpretive Subsurface Profile (ISP) along Proposed Culvert at MP 44.27

Figure 2: Interpretive Subsurface Profile (ISP) along Proposed Retaining Wall

APPENDICES

APPENDIX A
Boring Logs

APPENDIX B
Rock Core Photographs

APPENDIX C
Laboratory Test Results

APPENDIX D
Culvert Calculations

APPENDIX E
Retaining Wall Calculations

1.0 INTRODUCTION

This Preliminary Geotechnical Design Report (PGDR) summarizes the results of WSP's geotechnical investigation, preliminary geotechnical design, and geotechnical recommendations for the proposed culvert replacements at mileposts (MP) 44.27 and 44.29 and the accompanying proposed retaining wall for the railroad embankment carrying the Cape Mainline track, SEMASS lead track, and Rochester siding track over the wetlands associated with the East Branch Sippican River in Rochester, MA. The purpose of this PGDR is to present soils and bedrock information for the proposed culvert replacement and retaining wall sites obtained from subsurface investigations and laboratory tests; present recommended geotechnical parameters for the proposed design; and provide preliminary geotechnical design recommendations for construction of the proposed retaining wall and replacement culverts.

2.0 PROJECT BACKGROUND

Two existing culverts carry the Cape Mainline track, SEMASS lead track, and Rochester siding track over wetlands to the southeast of the East Branch Sippican River in Rochester, MA. The existing MP 44.27 culvert structure consists of an 80-foot long 24"x48" stone box culvert transitioning to a 42"-diameter CMP culvert. The existing MP 44.29 culvert structure consists of an 82-foot long 24"x36" stone box culvert transitioning to a 24"-diameter RCP culvert. During the September and November 2024 culvert inspections[1], WSP observed that a localized CMP collapse in the MP 44.27 culvert resulted in sinkhole forming to the east of the rail tracks, causing a gap between the bottom of the rails and the tie plate and a gap between adjacent rail segments. Ballast had accumulated within the culvert due to the CMP collapse. At the MP 44.29 culvert, a void in the culvert roof resulted in a sinkhole forming between adjacent ties. WSP recommended replacement of the culverts due to the collapse and sinkholes. Per discussion with MassDOT, the preferred replacement will consist of two 48"-diameter RCP culverts. WSP understands that MassDOT also intends to construct a retaining wall extending east of the culvert locations towards the MBTA Rochester facility to support widening of the rail embankment for culvert construction equipment access.

3.0 GEOLOGIC SETTING

3.1 Regional Surficial Geology

The surficial geology of the site is mapped as swamp deposits, described as stratified organic muck and peat containing minor amounts of sand, silt, and clay and occurring in low-lying, poorly drained areas. These swamp deposits overlie glacial outwash and stagnant-ice sediments, consisting of sand, gravel, silty sand, and interlayered beds of silt, deposited by glacial meltwater. Bedding stratification in the glacial sediments may be distorted and faulted due to post-depositional collapse from ice melting.[2]

3.2 Regional Bedrock Geology

The bedrock beneath the site is mapped as Proterozoic-aged unnamed granite, gneiss, and schist of the Milford-Dedham Zone. The granite, where present, is described as plutonic in origin.[3]

---

[1] WSP. Draft Culvert Inspection Report, Buzzards Bay Secondary Rail Line, RR Mile Posts 44.27 and 44.29. Inspection Date 9/10/2024 & 11/19/2024.

[2] Stone, B.D., DiGiacomo-Cohen, M.L., and Kincare, K.A. 2018. Surficial materials map of the Snipatuit Pond Quadrangle, Massachusetts. U.S. Geological Survey Scientific Investigations Map 3402, 1 sheet, scale 1:24,000. https://doi.org/10.3133/sim3402.

[3] Zen, E.A., Goldsmith, R., Ratcliffe, N.M., Robinson, P., and Stanley, R.S. 1983. Bedrock Geologic Map of Massachusetts. U.S. Geological Survey. Map scale 1:250,000. https://ngmdb.usgs.gov/Prodesc/proddesc_16357.htm.

4.0 SUBSURFACE INVESTIGATIONS

WSP completed seven (7) borings (B-1 through B-7) over two different phases of drilling. Borings B-1 and B-2 were completed between January 17 and January 20, 2025, to collect subsurface geotechnical information for the culvert replacements. Borings B-3 through B-7 were completed between April 7 and April 11, 2025, to collect additional subsurface geotechnical information for the proposed retaining wall. As-drilled boring location coordinates and ground surface elevations are summarized in Table 1 (attached). Borings B-1 and B-2 were completed within the railroad corridor offset from the existing culverts at MP 44.27 and MP 44.29. Borings B-3 through B-7 were completed within the railroad corridor and spaced out approximately 200 ft feet apart.

A WSP geotechnical engineer monitored drilling activities, selected sampling intervals, logged subsurface conditions encountered, and obtained soil samples for use in visual descriptions and subsequent laboratory testing and classification.

WSP subcontracted GeoLogic Earth Explorations, Inc. (Geologic) of Norfolk, Massachusetts to complete the borings using a CME-45C drill rig with cased wash boring methods. Borings were advanced using 4-inch (inside diameter) casing in 5-foot lengths driven with an automatic safety hammer. Soil in the casing was washed out using a roller bit and water to the depth where samples were subsequently collected.

Geologic performed Standard Penetration Testing (SPT) using a calibrated automatic hammer system and standard 2-inch split spoon sampler in general accordance with American Society for Testing and Materials (ASTM) D1586 for all borings. Sampling was conducted at approximately 5-foot intervals for both borings. Geologic drove the split spoon sampler 24 inches with a 140-pound hammer dropped 30 inches and WSP recorded the number of hammer blows required to advance the split spoon sampler through each 6-inch increment. Measured, uncorrected N-values, calculated as the sum of the hammer blows to advance the sampler during the 6-inch to 12-inch and 12-inch to 18-inch intervals, are provided in the boring logs in Appendix A. WSP used the average hammer energy transfer ratio of 77.4% for the CME-45C drill rig (provided by Geologic[4]) to convert the measured N-values to N_{60} values for further calculations. Soil samples were collected and stored in sealed glass jars for later evaluation and laboratory testing.

The boring logs provided in Appendix A present details of the sampling methods used, field data obtained, and soil and rock conditions encountered during the investigation. Soils were field categorized in general accordance with ASTM D2488. A description of the boring log symbols and terms used for the soil and rock descriptions precedes the boring logs in Appendix A.

5.0 LABORATORY TESTING PROGRAM

Geotechnical index laboratory tests were performed by GeoTesting Express of Acton, Massachusetts in accordance with applicable ASTM testing procedures. WSP selected representative SPT split spoon soil samples from each of the borings for geotechnical laboratory testing to assist in soil classification. The types and numbers of each of the laboratory tests conducted on soil samples are presented in Table 5-1. Measured index and classification test results from soil samples are summarized in Table 3 (attached) and include AASHTO and ASTM Unified Soil Classification System (USCS) classifications. Soil testing results are included on the boring logs in Appendix A. Complete laboratory testing results are provided in Appendix C.

[4] GZA GeoEnvironmental, Inc., SPT Energy Testing: ATV Drill Rig No. CME-45C Serial Number 248634, Prepared for Geologic – Earth Explorations, Inc., August 21, 2019.

Table 5-1: Type and Number of Soil Laboratory Tests Performed

Soil Laboratory Test	Test Standard	No. Tests Completed
Grain Size Analysis (sieve only)	ASTM D6913	23
Moisture Content	ASTM D2216	20

6.0 SUBSURFACE CONDITIONS

The soils WSP encountered in the borings generally include ballast and fill materials placed during construction of the railroad embankment; a thin layer of peat grading to silty sand with organics; sand and gravel interpreted as glacial outwash; and a zone of sandy silt to silty sand interbedded within the glacial sand and gravel sediments. The boring logs in Appendix A provide detailed descriptions of the soil conditions encountered in the borings. WSP's Interpretive Subsurface Profile (ISP) parallel to the proposed culvert alignment at MP 44.27 is presented in Figure 1 (attached) and our ISP parallel to proposed retaining wall is presented in Figure 2 (attached). Boring locations are shown in Sheets 6 through 8 of the PS&E Submission Plans[5]. The following descriptions summarize the major stratigraphic units from the existing ground surface to depth.

Ballast: Ballast thickness observed in each boring was approximately 3 to 5 inches of coarse gravel.

Fill: A layer interpreted as existing embankment fill was encountered in all borings and ranged from 7 feet to 10 feet thick. The fill consists of fine to coarse sand with some to none gravel fractions and some to trace silt fractions. N_{60}-values ranged from 6 to 19 (loose to medium dense) in the fill.

Peat and Silty Sand: A layer of peat grading to silty sand with organics was encountered beneath the embankment fill in borings B-1, B-2, B-3, and B-6. The layer thickness ranged from 1 foot to 5 feet. The material consists of organics interpreted as peat with some woody debris and none to trace sand fractions, or fine to medium sand with “silty” to little silt fractions and trace fine gravel. Laboratory classifications generally described the material as A-2-4 (AASHTO classification). N_{60}-values in the layer ranged from 3 to 5 (very loose to loose).

Sands and Gravels: A layer of sand and gravel interpreted as glacial outwash was encountered beneath the embankment fill in borings B-4, B-5, and B-7, and beneath the peat / silty sand in borings B-1, B-2, B-3, and B-6. The layer thickness ranged from 25 feet to 38 feet. The material consists of fine to coarse sand with trace to “gravelly” fine to coarse gravel fractions and trace to some silt fractions, or fine to coarse gravel with some to “sandy” sand fractions with trace to little silt fractions. Laboratory classifications generally describe the layer as A-3, A-4, A-1-a, or A-1-b (AASHTO classification). The N_{60}-values for the layer ranged from 7 to 104 (loose to very dense) with an average of 33 (dense).

Sandy Silt and Silty Sand: An interbedded layer of sandy silt to silty sand was encountered within the glacial sand and gravel layer in borings B-1 and B-6. The layer thickness ranged from 5 feet to 10 feet. The material consists of varying amounts of silt and sand as the primary constituents and trace to none gravel. Laboratory classifications generally described the material as A-4 (AASHTO classification). The N_{60}-values for the layer ranged from 12 to 21 (medium dense).

Bedrock: Refusal was encountered in borings B-2, B-3, B-4, and B-5 at 46.5 feet, 47.0 feet, 43.0 feet, and 43.0 feet bgs, respectively, and was interpreted as bedrock based on drill rig response and examination of wash cuttings material. Bedrock was encountered in borings B-6 and B-7 at 37.0 feet and 34.0 feet bgs, respectively, and was identified with 5 feet of rock coring in each boring. The bedrock lithology generally consists of light grey, fine to medium grained, very strong to extremely strong (R5 to R6), fresh to slightly weathered (W1 to W2), gneiss. The Rock Quality Designation (RQD) ranged from 82% to 83%, and the estimated Rock Mass Rating (RMR) ranged from 55 to 60. The estimated Geological Strength Index (GSI) was 60. Table 2 provides detailed information about recovery, RQD, RMR, and descriptions of lithology, rock mass, and discontinuities.

Groundwater: Groundwater levels were measured in each of the borings upon their completion and prior to removal of the casing. Measured groundwater levels ranged from 5.5 feet bgs (Elevation (EL) 67.7 feet) in B-2 to 8.5 feet bgs (EL 65.5 feet) in B-5. Based on the WSP PS&E Submission[5], the Mean High Water (MHW) or Ordinary High Water (OHW) elevation is EL 67.7 feet for both culverts. The interpreted groundwater level shown on the culvert ISP (Figure 1) is based on mean / ordinary high water. The interpreted groundwater level shown on the retaining wall ISP (Figure 2) is based on the water level measurements recorded in the borings during the subsurface investigation program.

7.0 CULVERT ANALYSIS AND RECOMMENDATIONS

Based on the WSP PS&E Submission[5], the proposed replacement culvert structures will consist of dual 48-inch diameter Class V RCP culverts with gasket joints, backfilled with reused stockpiled granular fill and railroad ballast. The replacement culvert at MP 44.27 will be located between Station 44+25 and Station 44+30 along the Rochester Siding track centerline, with a proposed culvert invert elevation at EL 65.33 feet at the inlet and EL 64.90 feet at the outlet. The replacement culvert at MP 44.29 will be located between Station 45+12 and Station 45+17, with a proposed culvert invert elevation at EL 62.50 feet at the inlet and EL 62.12 feet at the outlet. Based on these elevations, the proposed replacement culverts and headwall / wingwall footings will be founded in the transition between the peat and silty sand layer and the sand and gravel layer. We recommend that at least one foot of compacted 3/4"-inch crushed stone be placed under the culvert as a bearing layer.

Our analyses and recommendations related to the design and construction of the proposed culverts are described in the subsections below. Geotechnical evaluation calculations with references and assumptions are provided in Appendix D.

7.1 Design Parameters

WSP evaluated the subsurface geotechnical data collected and developed geotechnical material design parameters to serve as a basis for calculations, analyses, and evaluations discussed herein. Table 7-1 provides a summary of design parameters for each soil layer encountered and for proposed fills as identified in the MassDOT Standard Specifications[6] and the AREMA Manual for Railway Engineering[7].

[5] WSP for Massachusetts Department of Transportation Rail & Transit Division, Cape Main Culvert Replacements at MP 44.27 & MP 44.29, Rochester, Plymouth County. PS&E Submission, dated May 20, 2025.

[6] MassDOT 2024 Standard Specifications for Highways and Bridges: Division III: Material Specifications.

[7] American Railway Engineering and Maintenance-of-Way Association (AREMA). 2019 Manual for Railway Engineering. Chapter 8 Concrete Structures and Foundations.

Table 7-1: Engineering Design Parameters for In Situ Soils and Construction Fills

Soil Materials		γ (pcf)	ϕ (°)	[1]K_0	K_a	K_p
In Situ Materials	Existing Fill	125	30	0.50	0.33	3.00
	Peat & Silty Sand	120	29	0.52	0.35	2.88
	Sandy Silt & Silty Sand	120	32	0.47	0.31	3.25
	Sands and Gravels	130	35	0.43	0.27	3.69
Construction Fill	Crushed Stone (M2.01.0)	125	37	0.40	0.25	4.02
	[2]Gravel Borrow (M1.03.0)	125	30	0.50	0.33	3.00

Notes:
1. Lateral earth pressure coefficient at rest was determined using the equation $K_0 = 1\text{-}\sin\phi'$.
2. The gravel borrow was assumed to have design parameters equivalent to the parameters interpreted for the existing fill, to allow reuse of excavated fill for proposed embankment construction.

7.2 Lateral Earth Pressure

For the recommended soil parameters, the calculated lateral earth pressure coefficients for the proposed culvert range from 0.40 to 0.52 for the at-rest conditions, 0.25 to 0.35 for the Rankine full active earth pressure coefficient, and 2.88 to 4.02 for the Rankine full passive earth pressure coefficient.

7.3 Bearing Resistance

The base elevation of the proposed culverts as specified in the project plans[5] will be founded within both the peat and silty sand layer and the sands and gravels layer. Figure 1 shows the culvert location with respect to the interpreted stratigraphic cross-section. WSP evaluated the bearing resistance of the underlying soils for the proposed culvert dimensions and for the largest wingwall or headwall footing at each proposed culvert. We used the procedure in the AREMA Manual for Railway Engineering to assess allowable bearing capacity and allowable settlement pressure.

For the proposed replacement culvert at MP 44.27, the estimated allowable bearing capacity for a continuous footing bearing on the silty sand and peat layer with a 1-foot-thick pad of crushed stone below the culvert is 5 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 0.4 ksf after a 50% reduction is applied due to a water table located above the footing (per AREMA 3.4.3.3) and limiting settlement to 1 inch. If the interpreted 4-foot-thickness of silty sand and peat below the proposed culvert footing elevation were excavated and replaced with gravel borrow or crushed stone, the estimated allowable bearing capacity for a continuous footing bearing on the in-situ sand and gravel layer is 15 ksf using a factor of safety of 3, and the estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to a water table located above the footing (per AREMA 3.4.3.3) and limiting settlement to 1 inch.

For the outlet wingwalls of the proposed MP 44.27 culvert, the estimated allowable bearing capacity for a continuous strip footing bearing on the silty sand and peat layer with a 1-foot-thick pad of crushed stone below the wingwall is 2 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 0.4 ksf after a 50% reduction is applied due to a water table located above the footing (per AREMA 3.4.3.3) and limiting settlement to 1 inch. If the interpreted 2-foot-thickness of silty sand below the proposed wingwall footing elevation were excavated and replaced with gravel borrow or crushed stone, the estimated allowable bearing capacity for a continuous footing bearing on the in-situ sand and gravel layer is 5

ksf using a factor of safety of 3, and the estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to a water table located above the footing (per AREMA 3.4.3.3) and limiting settlement to 1 inch.

For the proposed replacement culvert at MP 44.29, the estimated allowable bearing capacity for a continuous footing bearing on the in-situ sands and gravels layer with a 1-foot-thick pad of crushed stone below the culvert is 16 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to a water table located above the footing (per AREMA 3.4.3.3) and limiting settlement to 1 inch.

For the inlet headwall of the proposed MP 44.29 culvert, the estimated allowable bearing capacity for a continuous strip footing bearing on the in-situ sands and gravels layer with a 1-foot-thick pad of crushed stone below the wingwall is 5 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to the water table located above the footing (per AREMA 3.4.3.3) and limiting settlement to 1 inch.

Results of our evaluation are summarized in Table 7-2 below. Full calculations are provided in Appendix D.

Table 7-2: Summary of Recommended Bearing Resistance for Proposed Culverts

Bearing Resistance		Allowable Bearing Capacity on Peat and Silty Sand (ksf)	Allowable Bearing Capacity on Sand and Gravel (ksf)	Allowable Settlement Pressure[1] on Peat and Silty Sand (ksf)	Allowable Settlement Pressure[1] on Sand and Gravel (ksf)
MP 44.27	Culvert	5	15	0.4	3
	Wingwalls	2	5	0.4	3
MP 44.29	Culvert	-	16	-	3
	Headwall	-	5	-	3

Notes:
1. Settlement limited to 1 inch.

7.4 Settlement

The proposed replacement culverts will be constructed at offset alignments from the existing culverts, in areas of the railroad embankment that currently consist of compacted embankment fill. Based on the PS&E plans[5], installation of the proposed replacement culverts will require excavation of site soils at and adjacent to the railroad corridor to elevations ranging from 59.12 feet to 62.00 feet, with excavation extending into the peat & silty sand layer and the sands & gravels layer to accommodate the culvert, and will include a minimum of an additional 12 inches of excavation below those elevations to accommodate crushed stone backfill beneath the culvert and the headwall / wingwall footings. The approximate maximum depth for this excavation is 14 feet at the location investigated. Due to the proposed excavation of this thickness of existing compacted embankment fill and replacement with a 48”-diameter culvert, we estimated that no increase in the vertical effective stress state at the base of the footings is expected to occur. Thus, settlement of the culvert and the headwall / wingwall footings is not anticipated. We recommend that compressible soils (peat) encountered beneath the footing elevations during culvert construction be removed and replaced with crushed stone, since disturbance of compressible soils due to construction activities may lead to localized differential settlement.

7.5 Subgrade Modulus

A modulus of subgrade reaction (K) of the soil for use in the structural design of the proposed culvert was estimated based on the corrected average N_{60}-values encountered in the soils at site using literature correlation values[8]. We propose a K value of 88 pounds per cubic inch (pci) for the sand and gravel layer and 20 pci for the peat and silty sand layer be used for design.

8.0 RETAINING WALL ANALYSIS AND RECOMMENDATIONS

WSP understands that MassDOT wishes to construct a retaining wall at the northeastern edge of the Cape Mainline right-of-way adjacent to the MBTA Rochester facility. The existing embankment slope behind the proposed wall will be backfilled to create a travel lane for construction equipment used in the culvert replacements at mileposts 44.27 and 44.29. After the completion of culvert construction, the backfilled area behind the proposed wall will support a proposed third railroad track.

Per discussion with MassDOT, the proposed wall design will consist of an anchored sheetpile wall. Tierods will connect the sheetpiles to H-pile deadmen anchors buried behind the wall. WSP analyzed cross-sections through the proposed wall to identify the required sheetpile, tierod, and H-pile deadmen anchor component criteria.

8.1 Design Parameters and Assumptions

WSP plotted the existing ground surface elevation at the toe of the proposed wall and the proposed finish grade behind the wall along the length of the wall to identify the range of exposed wall heights. The exposed wall height along the proposed sheetpile wall will range from approximately 2.5 feet to approximately 8.5 feet. We grouped this range of exposed wall heights into three categories for the geotechnical analysis of the wall.

- An exposed wall height of 8.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 6.5 feet to 8.5 feet. We selected a cross-section at Station 46+25 along the construction centerline for this analysis.
- An exposed wall height of 6.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 4.5 feet to 6.5 feet. We selected a cross-section at Station 54+00 along the construction centerline for this analysis.
- An exposed wall height of 4.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 2.5 feet to 4.5 feet. We selected a cross-section at Station 49+00 along the construction centerline for this analysis.

The soil profile at each analyzed location was based on the closest boring drilled during the subsurface investigation in January and April 2025. The groundwater elevation at each analyzed location was based on the water surface measured in this closest boring during the drilling. The friction angles for the in-situ soil layers were correlated from SPT N_{60} values encountered in all seven borings performed at site (B-1 through B-7), based on the Peck, Hanson, and Thornburn (1974) correlation.

Borings B-1, B-2, B-3, and B-6 encountered a thin layer of peat grading to silty sand with organics beneath the embankment fill. Since the peat and silty sand materials were sampled within the same SPT interval in all four borings, the materials were modeled as a single layer with material properties correlated from these combined N_{60}

[8] Bridge Software Institute. FB-MultiPier Soil Parameter Table (US Customary Units). Dated 2018.

values. Borings B-1 and B-6 encountered a deep layer of sandy silt and silty sand within the sand and gravel layer. Due to the high percentage of sand and the low plasticity, the sandy silt / silty sand was modeled as a cohesionless material with a friction angle correlated from N_{60} values.

The H-pile deadmen were assumed to be installed in weak axis bending orientation to facilitate tierod connections through the pile web. Sacrificial steel corrosion loss of $^{1}/_{16}$-inch per steel face over a design life of 75 years was assumed for the sheetpiles and H-pile deadmen. The H-pile deadmen anchor location was modeled at the northeastern edge of the existing embankment slope, between the existing Rochester Siding track and the proposed third track. Although this location places the deadmen anchors within the active soil wedge of the sheetpile wall, it permits installation of the tierods without removal of the existing Rochester Siding track, and it permits maintenance of train traffic on the existing tracks during construction.

Interface friction was assumed to occur on the back of the retaining wall using $\delta = 0.33\phi_f$ for soil against steel, per AASHTO LRFD[9] Article C3.11.5.3. Backfill for the construction travel lane was modeled to the proposed tierod elevation (elev. 70 feet), in order to reduce earth pressure loading on the cantilever wall and reduce fill excavation for tierod installation. Due to the existing embankment slope, the travel lane width at elev. 70 feet was modeled to be approximately 8.3 feet.

8.2 Model Analysis

WSP used the shoring software *DeepEX* to analyze cross-section models of the interpreted soil stratigraphy and proposed retaining wall geometry at the three representative locations. Each model was analyzed in stages to represent the sequence of construction. Since MassDOT proposes to install the tierods connecting the sheetpiles and the H-pile deadman after completion of culvert construction, the sheetpile wall will act as a cantilever wall during the construction travel lane stage.

The analyzed stages of construction are as follows:

1) Install sheetpiles and H-pile deadmen.

2) Backfill sheetpiles to the tierod elevation to create the construction travel lane. The sheetpile wall will be cantilever during this stage and will support surcharge loading from construction equipment on the travel lane and trains on the existing Rochester Siding and Cape Main Line tracks.

3) Excavate trenches to install tierods between sheetpiles and H-pile deadmen.

4) Install tierods and connect to waler welded to front of sheetpiles.

5) Backfill tierods to final ground surface elevation and construct proposed third railroad track. The sheetpile wall will be anchored during this stage and will support surcharge loading from trains on the existing Rochester Siding and Cape Mainline tracks and the proposed third track.

6) End of design life including sacrificial steel corrosion loss.

Each construction stage was analyzed in the *DeepEX* software using both limit equilibrium and non-linear soil spring methods. During the model computation process, each stage was first analyzed using the limit equilibrium method to calculate the external factor of safety against wall overturning. Each stage was then re-analyzed using

[9] American Association of State Highway and Transportation Officials (AASHTO). 2024 LRFD Bridge Design Specifications, 10th Edition.

the non-linear method to calculate the wall flexural capacity, lateral deflection, and (for Stages 4 through 6) the tierod tensile load.

The sheetpile design was assessed using a minimum allowable design factor of safety (FS) of 1.5 for wall horizontal forces and overturning moments per AREMA[10] Chapter 8 Section 5.4.2; a minimum allowable design FS of 2 for flexural capacity per AREMA Chapter 8 Section 4.2.3; and a minimum allowable design FS of 1.8 (i.e., $0.55F_y$) for tensile capacity per AREMA Table 15-1-11.

Cooper E80 train loading was assumed on each existing track for all stages and on the proposed third track for the final two stages. The train load on each track was implemented in the *DeepEX* models as a distributed load of 1882 psf acting over the tie width, based on AREMA Figure 8-2-1 and assuming a tie width of 8.5 feet as shown in WSP's PS&E plans. The resulting live load surcharge pressure acting on the sheetpile wall was calculated by the *DeepEX* software during each model analysis.

Construction equipment loading of 400 psf was assumed on the construction travel lane for the second stage and on the tierod work area for the third and fourth stages. The resulting live load surcharge pressure acting on the sheetpile wall was calculated by the *DeepEX* software during each model analysis.

8.3 Results and Recommendations

The three representative cross-sections through the proposed retaining wall were analyzed to determine the minimum pile embedment length, deadmen anchor spacing, pile sizing, and tierod elevation to satisfy the required factors of safety. Analysis results are summarized in Table 8-1 below. The full calculation and model output are provided in Appendix E.

The analysis at Station 46+25 represented the tallest exposed wall height and thus was the critical section. To meet the minimum factor of safety against overturning during the cantilever wall scenario with construction travel lane (Stage 2), the analysis indicated that a sheetpile embedment of 26.5 feet (total sheetpile length of 35 feet) would be needed. This embedment length would result in a sheetpile toe at approximately elevation 39 feet. The borings performed at site encountered boulders at elevations ranging from 33.6 feet to 31.5 feet, and encountered bedrock at elevations ranging from 39.2 feet to 26.7 feet. Thus, we anticipate that the sheetpiles can be driven to the required minimum embedment without refusing on boulders or bedrock. The analysis indicated that H-pile deadmen and tierods spaced at 8 feet center-to-center with deadman embedment of 25 feet would be needed for the anchored wall scenario with proposed railroad track (Stages 5 and 6). The deadmen piles were assumed to be cut off 1 foot below finish grade to avoid interference with the railroad ballast and ties, resulting in a deadman pile length of 24 feet embedded to 25 feet below finish grade.

The analysis at Station 54+00 represented an intermediate exposed wall height. Due to this reduced wall height, the analysis indicated that the sheetpile embedment could be reduced to 21.5 feet (total sheetpile length of 28 feet), and the deadman embedment could be reduced to 20 feet. The sheetpile size, deadman size, and deadman spacing were not varied in order to standardize construction. The deadmen piles were assumed to be cut off 1 foot below finish grade to avoid interference with the railroad ballast and ties, resulting in a deadman pile length of 19 feet embedded to 20 feet below finish grade.

[10] American Railway Engineering and Maintenance-of-Way Association (AREMA). 2019 Manual for Railway Engineering. Chapter 8 Concrete Structures and Foundations; Chapter 15 Steel Structures.

The analysis at Station 49+00 represented one of the shortest exposed wall heights. Due to this reduced wall height, the analysis indicated that the deadmen anchors could be eliminated at locations with exposed wall heights shorter than 4.5 feet. The sheetpile size was not varied from the other stations in order to standardize construction.

Table 8-1: Summary of Analysis Results for Proposed Retaining Wall

Analysis Location:		Station 46+25	Station 54+00	Station 49+00
Exposed Wall Height at Analysis Location		8.5 feet	6.5 feet	4.5 feet
Recommended Exposed Wall Height Range		6.5 feet to 8.5 feet	4.5 feet to 6.5 feet	2.5 feet to 4.5 feet
Sheetpiles	*Pile Size*	NZ 19, Grade 50	NZ 19, Grade 50	NZ 19, Grade 50
	Total Length	35 feet	28 feet	18 feet
	Embedment Length	26.5 feet	21.5 feet	13.5 feet
H-Pile Deadmen	*Pile Size*	HP 12x84, Grade 50	HP 12x84, Grade 50	N/A
	Total Length	24 feet	19 feet	N/A
	Embedment Length	25 feet	20 feet	N/A
	Center-to-Center Spacing	8 feet	8 feet	N/A
	Orientation	Weak axis	Weak axis	N/A
Tierods	*Tierod Size*	#8 bar, Grade 60	#8 bar, Grade 60	N/A
	Installation Location	Elevation 70 feet	Elevation 70 feet	N/A
	Tensile Load	8.6 kips per bar	6.7 kips per bar	N/A
Waler	*Waler Size*	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall	N/A
Deflection at Top of Wall		0.44 inches	0.24 inches	0.16 inches

9.0 CONSTRUCTION CONSIDERATIONS

All areas proposed for embankment fill placement should be cleared, grubbed, and stripped of existing vegetation, topsoil, and railroad ballast per MassDOT Standard Specification Subsections 101 and 150. During the grubbing and stripping process, unsuitable materials exposed at the subgrade level, such as wood, logs, tree stumps, forest mat materials, peat, debris fill, or other materials that may decay or collapse should be removed. Prior to placing new fill materials, the existing slopes should be benched to provide a stable surface for compaction and ensure new fills are keyed into the existing embankment. Bench widths should be at least 3 feet, and each bench should be excavated as the layers of the new embankment are being constructed. Subgrade surfaces for embankment fill should be prepared in accordance with MassDOT Specification 150.61 which requires a surface

compacted to attain at least 95 percent of the maximum dry density of the material as determined by AASHTO T99, Method C.

Embankment fill should be placed systematically in horizontal layers not more than 12 inches in thickness prior to compaction in accordance with MassDOT Specification 150.62. Cobbles larger than 6 inches should be removed from the fill prior to placement. Compaction equipment should preferably consist of large, self-propelled vibratory rollers. Where hand-guided equipment is used, such as a small vibratory plate compactor, the lose lift thickness should not exceed 6 inches and cobbles larger than 4 inches should be removed from the fill prior to placement. The embankment materials should be compacted to attain at least 95 percent of the maximum dry density of the material as determined by AASHTO T99, Method C, in accordance with MassDOT Specification 150.62. Embankment backfill for the proposed retaining wall, whether coming from excavation or borrow, should meet the requirements of MassDOT Specification M1.03.0 Gravel Borrow.

Prior to placing the proposed culverts, headwalls, and wingwalls, we recommend undercutting the foundation a minimum of 12 inches and placing a compacted crushed stone base meeting the requirements of MassDOT Specification M2.01.0 Crushed Stone. Peat material or other compressible or loose soils encountered beneath this elevation should be removed and replaced with compacted crushed stone.

Construction activities at the proposed culvert replacements will require soil excavation below the water table encountered in the borings and the mean high water level in the surrounding wetlands. Cofferdams to control water flow in the work area will be necessary. Design of all temporary cofferdam systems should comply with MassDOT Specification 140.60.C[6]. Temporary dewatering of the excavation may be required and should be performed to limit disturbance to the culvert bearing surfaces. Dewatering activities should comply with MassDOT Specification 140.60.E. The contractor should additionally control groundwater and surface water infiltration so that construction can be completed under dry conditions.

10.0 REPORT AND EXPLORATION LIMITATIONS

This Preliminary Geotechnical Design Report (PGDR) was prepared for the exclusive use of the Massachusetts Department of Transportation Rail & Transit Division to support the culvert replacements at Mileposts 44.27 and 44.29 and associated sheetpile retaining wall along the Cape Main Railroad in Rochester, Massachusetts. We performed our investigations, conducted our evaluations, and compiled our recommendations in accordance with generally accepted soil and foundation engineering practices in this geographical area and under similar time and financial constraints. WSP makes no other warranty, either express or implied. If changes in the nature, design, or location of the proposed project are planned, WSP should be notified to review the appropriateness of our conclusions and recommendations, and to modify the recommendations as appropriate to reflect the changes in design. In addition, WSP should review the final plans and specifications to evaluate compliance with these recommendations.

Our analyses and recommendations are based, in part, on information obtained from the referenced subsurface explorations completed at the discrete locations described in the report. Variations in the nature and extent of subsurface conditions between explorations should be expected. WSP should be notified if conditions encountered during construction vary from those described in this report so that we may re-evaluate, and if necessary, revise the recommendations made in this report.

The professional services provided by WSP for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the

site of materials from off-site sources are outside the terms of reference for this report and have not been investigated or addressed.

Signature Page

WSP USA, Inc.



Karen A. Roth
Senior Consultant, Geotechnical Engineering

Christopher C. Benda, PE
Vice President, Geotechnical Engineering

RJN/KAR/CCB

https://wsponlinenam.sharepoint.com/sites/us-massgeotech/shared documents/massdot rochester rr culvert/06 deliverables/rochester culvert mp 44.27 & 44.29 pgdr draft for massdot rail.docx

Tables

Table 1: Subsurface Exploration Locations
Preliminary Geotechnical Design Report
Culvert Replacements at MP 44.27 and MP 44.29 and Proposed Anchored Sheetpile Retaining Wall
MassDOT Cape Main Railroad, Rochester, MA

Boring Designation[1,2,3]	As-Drilled Locations[4]		Existing Ground Surface Elevation[4] (feet)	Bedrock Depth[5] (feet bgs)	Maximum Depth of Investigation (feet bgs[6])
	Northing	Easting			
B-1	2753078.95	850384.38	73.6	-	50.0
B-2	2753006.94	850522.59	73.2	46.5	49.0
B-3	2752866.14	850702.17	73.4	47.0	48.0
B-4	2752758.51	850872.08	73.8	43.0	44.0
B-5	2752647.70	851039.79	74.0	43.0	46.5
B-6	2752513.10	851238.93	73.6	37.0	44.0
B-7	2752394.52	851429.65	73.2	34.0	41.0

Notes:

1. Boring locations are shown in Sheets 6 through 8 of the PS&E Submission Plans.
2. Borings were performed by GeoLogic Earth Explorations, Inc. in January and April 2025.
3. Boring logs are presented in Appendix A of the Preliminary Geotechnical Design Report.
4. Boring locations and elevations are derived from survey data collected by WSP on December 20, 2024 (B-1 and B-2) and April 1, 2025 (B-3 through B-7), supplemented by hand-taped measurements of as-drilled offsets during the subsurface investigation program.
5. The bedrock depth in borings B-2 through B-5 was interpreted based on drill rig response and examination of wash cuttings material. The bedrock depth in borings B-6 and B-7 was identified based on rock coring.
6. bgs = below ground surface.

Prepared By: RJN
Checked By: KAR
Reviewed By: CCB

Table 2: Summary of Rock Core Quality
Preliminary Geotechnical Design Report
Culvert Replacements at MP 44.27 and MP 44.29 and Proposed Anchored Sheetpile Retaining Wall
MassDOT Cape Main Railroad, Rochester MA

Test Boring Designation	Core Size	Run						TCR [1]		RQD [2]			Physical Rock Parameters			Lithologic, Rock Mass and Discontinuity Description [5,6]
		No.	Midpoint Depth Below Bedrock Surface	Depth Below Ground Surface (ft)			Length	Length		Length		Designation	Weathering [3]	Estimated Field Strength [3]	Rock Mass Rating [RMR] [4]	
	(in)		(ft)	Start	End	Midpoint	(ft)	(ft)	%	(ft)	%					
B-6	NX (1.88)	R1	4.5	39.0	44.0	41.5	5.0	4.7	93%	4.17	83%	Good	Fresh (W1)	Very Strong (R5)	55	Light grey, fine to medium grained, very strong (R5), GNEISS, fresh (W1); discontinuities shallowly dipping (35°), moderately closely spaced, open. planar, average 1 fracture per foot, infilling with sand.
B-7	NX (1.88)	R1	4.5	36.0	41.0	38.5	5.0	4.1	82%	4.09	82%	Good	Fresh to Slightly Weathered (W1 to W2)	Extremely Strong (R6)	60	Light grey, fine to medium grained, extremely strong (R6), GNEISS, fresh to slightly weathered (W1 to W2); discontinuities moderately dipping (60°), widely spaced, open, planar to stepped, average 0.5 fractures per foot, infilling with sand.

Notes:

1. TCR = total core recovery. Total core recovery is the length of core recovered divided by the length of the run.
2. RQD = rock quality designation. RQD is the total length of intact, full diameter core pieces recovered with a length greater than or equal to 4 inches measured along the core axis. The percent RQD is the total length of RQD measured divided by the run length. Note that vertical discontinuities are not included in determination of RQD.
3. Weathering and Estimated Field Strength based on Tables II.4 and II.3 (respectively) in Wyllie and Mah, 2004, Rock Slope Engineering: Civil and Mining, 4th Edition (based on ISRM, 1981).
4. Rock Mass Rating (RMR) System (Bieniawski, 1989) assigns numerical ratings to six parameters, including the strength of the intact rock, the RQD, the discontinuity spacing, groundwater conditions, and orientation of discontinuities. These ratings are summed to provide the RMR value. The rating adjustment for joint orientation was assigned a value of 0; correlation of geologic field mapping data of exposed rock outcrops with the rock core samples and proposed foundation type may allow for a different rating adjustment for joint orientation, and thus a modification to the RMR value shown on this table.
5. ft = feet, in = inches

Prepared by: JKW
Checked by: KAR
Reviewed by: CCB

Table 3: Summary of Soil Index and Classification Laboratory Testing Results
Preliminary Geotechnical Design Report
Culvert Replacements at MP 44.27 and MP 44.29 and Proposed Anchored Sheetpile Retaining Wall
MassDOT Cape Main Railroad, Rochester, MA

Test Boring Designation[1]	Ground Surface Elevation [2] (feet)	Sample Number	Sample Depth Below Ground Surface (feet)	Approximate Sample Elevation (feet) [2]	Laboratory Testing[3]		Soil Classification	
					Sieve Minus No. 200[4] (%)	Moisture Content [5] (%)	AASHTO[6]	USCS[6]
B-1	73.6	S-2	4.0 - 6.0	69.6 - 67.6	-	15.1	-	-
		S-3A	9.0 - 9.4	64.6 - 64.2	12.2	33.4	A-2-4 (0)	SM
		S-4	14.0 - 16.0	59.6 - 57.6	6.5	12.5	A-1-b (1)	SP-SM
		S-8	29.0 - 31.0	44.6 - 42.6	91.2	-	A-4 (0)	ML
		S-13	48.0 - 50.0	25.6 - 23.6	9.4	-	A-1-b (1)	SP-SM
B-2	73.2	S-3A	9.0 - 10.0	64.2 - 63.2	11.9	24.5	A-2-4 (0)	SP-SM
		S-6	24.0 - 26.0	49.2 - 47.2	8.0	16.6	A-3 (1)	SP-SM
		S-9	39.0 - 41.0	34.2 - 32.2	19.4	-	A-1-b (0)	SM
		S-10	44.0 - 46.0	29.2 - 27.2	5.4	-	A-1-a (1)	GW-GM
B-3	73.4	S-3	9.0 - 11.0	64.4 - 62.4	6.9	24.5	A-3 (1)	SP-SM
		S-6	24.0 - 26.0	49.4 - 47.4	11.8	13.9	A-1-a (0)	SW-SM
		S-10	44.0 - 45.9	29.4 - 27.5	15.0	6.0	A-1-b (0)	GM
B-4	73.8	S-2	4.0 - 6.0	69.8 - 67.8	8.9	16.3	A-3 (1)	SP-SM
		S-5	19.0 - 21.0	54.8 - 52.8	9.6	12.1	A-1-b (1)	SP-SM
		S-9	39.0 - 41.0	34.8 - 32.8	18.6	4.5	A-1-b (0)	GM
B-5	74.0	S-2	4.0 - 6.0	70.0 - 68.0	5.9	9.1	A-1-a (1)	GP-GM
		S-4B	14.4 - 16.0	59.6 - 58.0	46.2	20.1	A-4 (0)	SM
		S-8	34.0 - 36.0	40.0 - 38.0	16.9	8.2	A-1-b (0)	SM
B-6	73.6	S-3B	9.3 - 11.0	64.3 - 62.6	5.6	19.5	A-3 (1)	SP-SM
		S-6	24.0 - 26.0	49.6 - 47.6	36.5	23.4	A-4 (0)	SM
		S-7	29.0 - 31.0	44.6 - 42.6	55.0	13.9	A-4 (0)	ML
B-7	73.2	S-1	0.0 - 2.0	73.2 - 71.2	4.5	9.8	A-1-a (1)	GP
		S-5	19.0 - 21.0	54.2 - 52.2	9.0	22.1	A-3 (1)	SP-SM
		S-7	29.0 - 31.0	44.2 - 42.2	21.6	10.3	A-1-b (0)	SM

Notes:

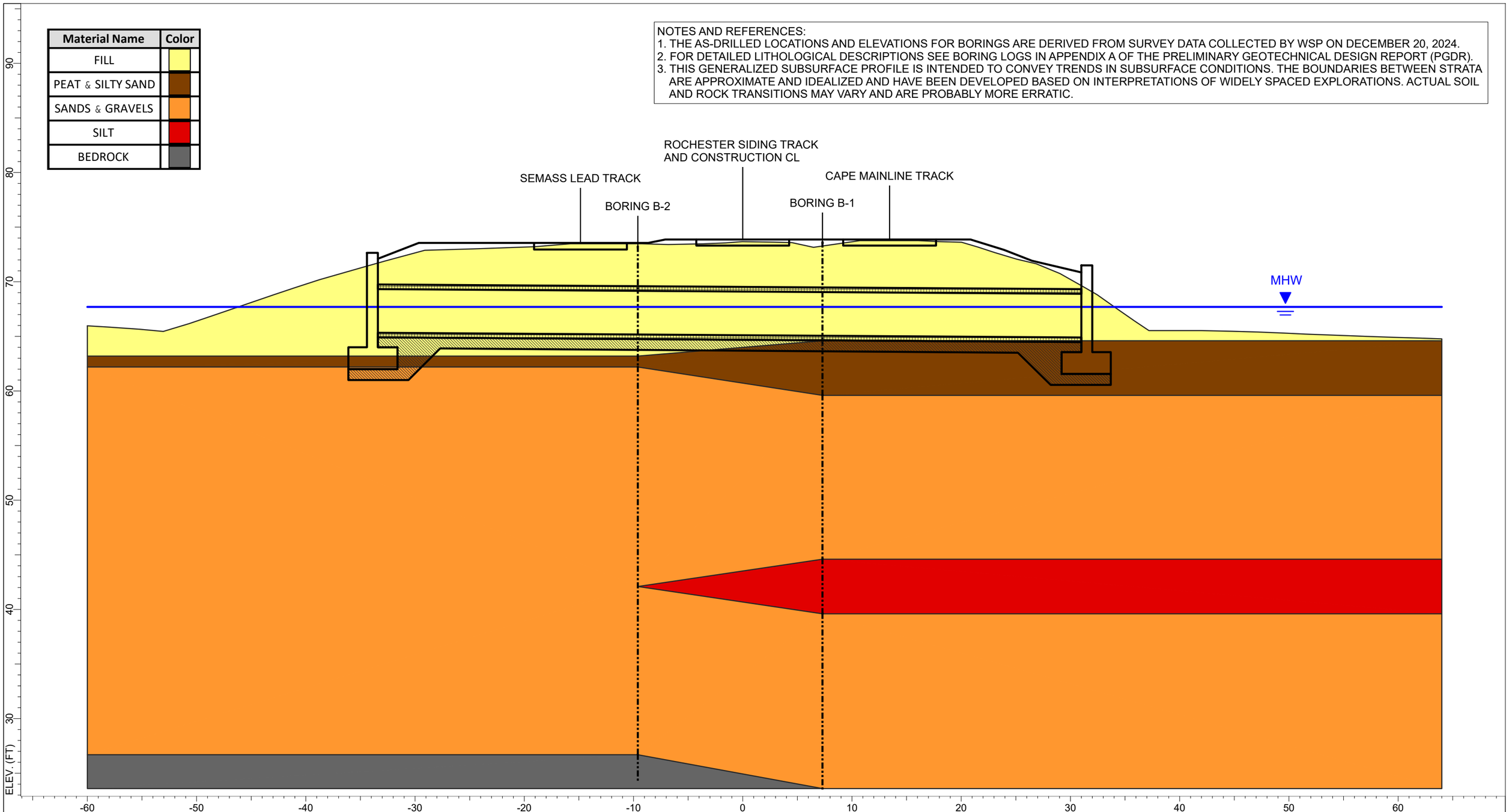
1. Boring locations are shown in Sheets 6 through 8 of the PS&E Submission Plans.
2. Boring locations and elevations are derived from survey data collected by WSP on December 20, 2024 (B-1 and B-2) and April 1, 2025 (B-3 through B-7), supplemented by hand-taped measurements of as-drilled offsets during the subsurface investigation
3. Laboratory testing was performed by Geotesting Express of Acton, MA.
4. Particle size testing was performed in accordance with ASTM D6913, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
5. Moisture content testing was performed in accordance with ASTM D2216, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
6. AASHTO and USCS symbols were assigned based on interpreted laboratory test results provided by Geotesting Express on 02/03/2025.
7. Complete laboratory test results for soil testing are provided in Appendix C of the Preliminary Geotechnical Design Report.

Prepared By: RJN
Checked By: LDN
Reviewed By: CCB

Figures

Material Name	Color
FILL	
PEAT & SILTY SAND	
SANDS & GRAVELS	
SILT	
BEDROCK	

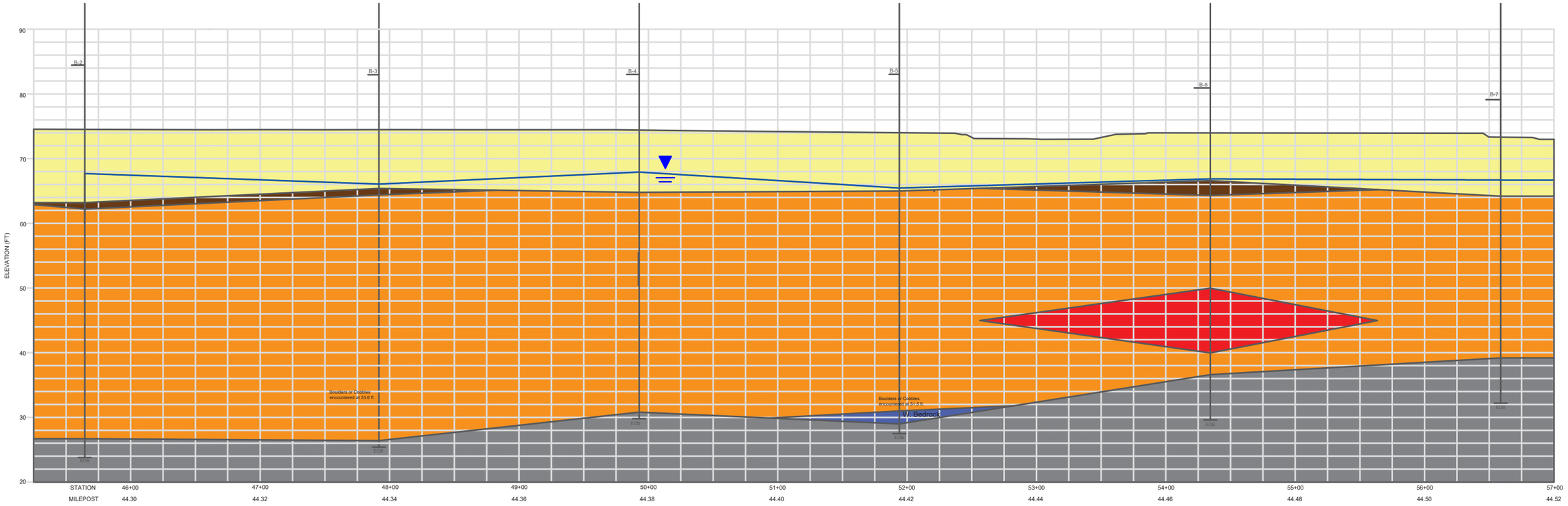
NOTES AND REFERENCES:
1. THE AS-DRILLED LOCATIONS AND ELEVATIONS FOR BORINGS ARE DERIVED FROM SURVEY DATA COLLECTED BY WSP ON DECEMBER 20, 2024.
2. FOR DETAILED LITHOLOGICAL DESCRIPTIONS SEE BORING LOGS IN APPENDIX A OF THE PRELIMINARY GEOTECHNICAL DESIGN REPORT (PGDR).
3. THIS GENERALIZED SUBSURFACE PROFILE IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED AND HAVE BEEN DEVELOPED BASED ON INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS. ACTUAL SOIL AND ROCK TRANSITIONS MAY VARY AND ARE PROBABLY MORE ERRATIC.



Project	US0035009.6582: MASSDOT CAPE MAIN, ROCHESTER MA, CULVERT REPLACEMENTS MP 44.27 & 44.29			
Title	INTERPRETED SUBSURFACE PROFILE - CULVERT AT MP 44.27			
Drawn By: KAR	Checked By: RJN	Reviewed By: CCB	Scale: 1:100	**FIGURE 1**
Date: 7/23/2025	File Name: MP44.27_CulvertSection_ISP-07-23-2025.slmd			

Material Name	Color
FILL	
PEAT & SILTY SAND	
SANDS & GRAVELS	
SANDY SILT & SILTY SAND	
BEDROCK	

NOTES AND REFERENCES:
1. THE AS-DRILLED LOCATIONS AND ELEVATIONS FOR BORINGS ARE DERIVED FROM SURVEY DATA COLLECTED BY WSP ON APRIL 1, 2025.
2. FOR DETAILED LITHOLOGICAL DESCRIPTIONS SEE BORING LOGS IN APPENDIX A OF THE PRELIMINARY GEOTECHNICAL DESIGN REPORT (PGDR).
3. THIS GENERALIZED SUBSURFACE PROFILE IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED AND HAVE BEEN DEVELOPED BASED ON INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS. ACTUAL SOIL AND ROCK TRANSITIONS MAY VARY AND ARE PROBABLY MORE ERRATIC.
4. THE GROUNDWATER SURFACE IS INTERPRETED FROM LOCALIZED WATER LEVELS AND MEASUREMENTS TAKEN DURING THE SUBSURFACE EXPLORATION PROGRAM. ACTUAL FIELD CONDITIONS MAY VARY.



Project	US0035009.6582: MASSDOT CAPE MAIN, ROCHESTER MA, CULVERT REPLACEMENTS MP 44.27 & 44.29				
Title	INTERPRETED SUBSURFACE PROFILE ALONG PROPOSED RETAINING WALL				
Drawn By	JKW	*Checked By*	KAR	*Reviewed By*	CCB
Scale	as shown				
Date	5/13/2025	*File Name*	Rochester Soil Profile 5.13.25 JKW.dwg		

FIGURE 2

APPENDIX A

Boring Logs

Table A-1

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (more than half of material is larger than No. 200 sieve size)	GRAVELS (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel sand mixtures, little or no fines.
		GRAVEL WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines
			SP	Poorly-graded sands, gravelly sand, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.

Desired Soil Observations: (in this order)

Color (Munsell color chart)
Moisture (dry, damp, moist, wet, saturated)
Density/Consistency (from above right hand side)
Name (sand, silty sand, clay, etc., including portions - trace, little, etc.)
Gradation (well-graded, poorly-graded, uniform, etc.)
Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic)
Structure (layering, fractures, cracks, etc.)
Bonding (well, moderately, loosely, etc., if applicable)
Cementation (weak, moderate, or strong, if applicable, ASTM D 2488)
Geologic Origin (till, marine clay, alluvium, etc.)
Unified Soil Classification Designation
Groundwater level

TERMS DESCRIBING DENSITY/CONSISTENCY

Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Consistency is rated according to standard penetration resistance.

Modified Burmister System

Descriptive Term	Portion of Total
trace	0% - 10%
little	11% - 20%
some	21% - 35%
adjective (e.g. sandy, clayey)	36% - 50%

Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

Fine-grained soils (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to shear strength as indicated.

Consistency of Cohesive soils	SPT N-Value blows per foot	Approximate Undrained Shear Strength (psf)	Field Guidelines
Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily Penetrates
Soft	2 - 4	250 - 500	Thumb easily penetrates
Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort
Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort
Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail
Hard	>30	over 4000	Indented by thumbnail with difficulty

Rock Quality Designation (RQD):

$$RQD = \frac{\text{sum of the lengths of intact pieces of core* > 100 mm}}{\text{length of core advance}}$$

*Minimum NQ rock core (1.88 in. OD of core)

Correlation of RQD to Rock Mass Quality

Rock Mass Quality	RQD
Very Poor	<25%
Poor	26% - 50%
Fair	51% - 75%
Good	76% - 90%
Excellent	91% - 100%

Desired Rock Observations: (in this order)

Color (Geological Society of America Rock Color Chart)
Texture (aphanitic, fine-grained, etc.)
Strength (ISRM Classification per Table A-2)
Lithology (igneous, sedimentary, metamorphic, etc.)
Hardness (very hard, hard, mod. hard, etc.)
Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)
Geologic discontinuities/jointing:
-dip (horiz - 0-5, low angle - 5-35, mod. dipping - 35-55, steep - 55-85, vertical - 85-90)
-spacing (very close - <5 cm, close - 5-30 cm, mod. close 30-100 cm, wide - 1-3 m, very wide >3 m)
-tightness (tight, open or healed)
-infilling (grain size, color, etc.)
Formation (Waterville, Ellsworth, Cape Elizabeth, etc.)
RQD and correlation to rock mass quality (very poor, poor, etc.)
ref: AASHTO Standard Specification for Highway Bridges 17th Ed. Table 4.4.8.1.2A
Recovery

Sample Container Labeling Requirements:

Project Name / Town
Boring Number
Sample Number
Sample Depth
Blow Counts
Sample Recovery
Date
Personnel Initials

wsp

Key to Soil and Rock Descriptions
Including Boring Log Terms and Field Identification Information

May 2023

Table A-2

Classification of Rock Material Strengths[1]

Grade	Description	Field Identification	Approx. Range of Uniaxial Compressive Strength	
			MPa	psi
S1	Very soft clay	Easily penetrated several inches by fist	<0.025	<4
S2	Soft clay	Easily penetrated several inches by thumb	0.025-0.05	4-7
S3	Firm clay	Can be penetrated several inches by thumb with moderate effort	0.05-0.10	7-15
S4	Stiff clay	Readily indented by thumb but penetrated only with great effort	0.10-0.25	15-35
S5	Very stiff clay	Readily indented by thumbnail	0.25-0.50	35-70
S6	Hard clay	Indented with difficulty by thumbnail	>0.50	>70
R0	Extremely weak rock	Indented by thumbnail	0.25-1.0	35-150
R1	Very weak rock	Crumbles under firm blows with point of geological hammer; can be peeled by a pocket knife	1-5	150-725
R2	Weak rock	Can be peeled by a pocket knife with difficulty; shallow indentations made by firm blow with point of geological hammer	5-25	725-3,500
R3	Medium strong rock	Cannot be scraped or peeled with a pocket knife; specimen can be fractured with single firm blow of geological hammer	25-50	3,500-7,000
R4	Strong rock	Specimen requires more than one blow of geological hammer to fracture it	50-100	7,000-15,000
R5	Very strong rock	Specimen requires many blows of geological hammer to fracture it	100-250	15,000-36,000
R6	Extremely strong rock	Specimen can only be chipped with geological hammer	>250	>36,000

Note: Grades S1 to S6 apply to cohesive soils, for example clays, silty clays, and combinations of silts and clays with sand, generally slow draining. Discontinuity wall strength will generally be characterized by grades R0-R6 (rock) while S1-S6 (clay) will generally apply to filled discontinuities.

[1] International Society for Rock Mechanics (ISRM), Commission on standardization of laboratory and field tests (1978): Suggested methods for the quantitative description of discontinuities in rock masses. Int. J. Rock Mech. Min. Sci. & Geomech. Abstr., Vol. 15, No. 6, pp. 319-368.

RECORD OF BOREHOLE: B-1

CLIENT: MassDOT Rail
PROJECT: MassDOT Rail Culvert Rochester
PROJECT NO: US0035009.6582
LOCATION: Cape Main MP 44.27 & 44.29
DATE: January 17, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.6 ft (Ground)
COORDINATES: N: 2753078.9 ft E: 850384.4 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
0	Ballast	GP	0.0									
	Fill		73.3									
1			0.3	S-1	SS	60	5-8-10-16	18	0 - 0.3 ft bgs: Grey, dry, medium dense, coarse GRAVEL, little silt. (Railroad Ballast) 0.3 - 2.0 ft bgs (S-1): Brown to tan, fine to coarse SAND, little coarse gravel, little silt, poorly-graded.			
2												
3												
4												
5		SP		S-2	SS	20	11-5-3-3	8	Olive brown, wet, loose, fine SAND, little fine to coarse gravel, trace silt, poorly-graded.	MC = 15.1%		
6												
7											17Jan25 ▼ 13:09	
8												
9			64.6									
	Silty Sand	SW-SM	9.0	S-3A	SS	50	2-2-3-6	5	9.0 - 9.4 and 9.7 - 11.0 ft bgs (S-3A): Very dark grey, wet, loose, fine to medium SAND, little silt, trace fine gravel. 9.4 - 9.7 ft bgs (S-3B): Dark brown, moist, loose, PEAT, some woody debris, trace sand.	MC = 33.4% Fines = 12.2% A-2-4		
	Peat	PT	64.2	S-3B								
10	Silty Sand	SW-SM	9.4									
			63.9									
11			9.7									
12												
13												
14			59.6									
	Well-graded Sands and Gravels	SW	14.0	S-4	SS	70	9-15-16-17	31	Greyish brown, moist, dense, fine to coarse SAND, little fine to coarse gravel, trace silt, well-graded.	MC = 12.5% Fines = 6.5% A-1-b (1)		
15												
16												
17												
18												
19												
20				S-5	SS	0	5-5-5-4	10	No Recovery.			
21												
22				S-6	SS	55	3-4-3-4	7	Tan, wet, loose, medium to coarse SAND, little fine gravel, well-graded.			
23												
24												
25				S-7	SS	45	4-3-3-5	6	Tan, wet, loose, Sandy fine GRAVEL, trace silt, well-graded.			
26												

DRILL RIG: CME-45C
DRILL METHOD: Cased Washed - 4.50-in Hole Dia.

Continued on Next Page

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: R. Nagle
DATE: Jan 17, 2025
CHECKED: L. Nunez
DATE: Feb 04, 2025

RECORD OF BOREHOLE: B-1

CLIENT: MassDOT Rail
PROJECT: MassDOT Rail Culvert Rochester
PROJECT NO: US0035009.6582
LOCATION: Cape Main MP 44.27 & 44.29
DATE: January 17, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.6 ft (Ground)
COORDINATES: N: 2753078.9 ft E: 850384.4 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
27	CME-45C	Cased Washed - 4.50-in Hole Dia.	Well-graded Sands and Gravels	SW		44.6									
28															
29			Low Plasticity Silt			29.0									
30				ML			S-8	SS	35	5-6-4-4	10	Light olive brown, wet, stiff, SILT, trace fine sand, low plasticity.	Fines = 91.2% A-4		
31															
32															
33															
34			Well-graded Sands and Gravels			39.6 / 34.0									
35				SW			S-9	SS	50	8-5-5-9	10	Tan, wet, loose, fine to coarse GRAVEL, some fine to coarse sand, little silt, well-graded.			
36															
37															
38															
39															
40							S-10	SS	70	15-13-10-9	23	Tan, wet, medium dense, fine to medium SAND, some fine to coarse gravel, trace silt, well-graded.			
41															
42															
43															
44															
45							S-11	SS	0	30-19-13-10	32	No Recovery.			
46															
47							S-12	SS	65	10-13-19-17	32	Tan, wet, dense, fine Sandy fine to coarse GRAVEL, little silt, poorly-graded.			
48															
49							S-13	SS	90	21-19-18-17	37	Light olive brown, wet, dense, fine to coarse SAND, some fine to coarse gravel, trace silt, well-graded.	Fines = 9.4% A-1-b (1)		
50						23.6									
			Boring was terminated at 50.0 ft bgs and backfilled with drill cuttings. End of hole at 50.00 ft.			50.0									
51															
52															

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: R. Nagle
DATE: Jan 17, 2025
CHECKED: L. Nunez
DATE: Feb 04, 2025

RECORD OF BOREHOLE: B-2

CLIENT:	MassDOT Rail	START DATE:	January 17, 2025	ELEVATION:	73.2 ft (Ground)
PROJECT:	MassDOT Rail Culvert Rochester	END DATE:	January 20, 2025	COORDINATES:	N: 2753006.9 ft E: 850522.6 ft
PROJECT NO:	US0035009.6582			COORD SYS:	SP MA Mainland FIPS 2001 Ft
LOCATION:	Cape Main MP 44.27 & 44.29	CONTRACTOR:	GeoLogic Earth Explorations, Inc.	HORZ DATUM:	NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
0	CME-45C	Cased Washed - 4.50-in Hole Dia.	Ballast	GP		0.0	S-1A					0 - 0.4 ft bgs (S-1A): Grey, dry, loose, coarse GRAVEL and topsoil. (Railroad Ballast).			
0			Fill	SP		72.8 0.4	S-1B	SS	35	2-3-3-4	6	0.4 - 2.0 ft bgs (S-1B): Tan, loose, dry, fine SAND, little silt, trace gravel, poorly graded.			
5							S-2	SS	0	8-8-5-4	13	No Recovery.		20Jan25 ▼ 14:17	
10						63.2	S-3A	SS	65	1-2-1-1	3	9.0 - 10.0 ft bgs (S-3A): Light olive brown, wet, very loose, fine SAND, little silt, poorly graded.	MC = 24.5% Fines = 11.9% A-2-4		
10			Peat	PT		10.0	S-3B					10.0 -11.0 ft bgs (S-3B): Brown, wet, very loose, PEAT, some woody debris.			
11			Well-graded Sands and Gravels	SW		62.2 11.0						Driller Note: Wash water stayed a blackish color for approximately one foot to 12 ft bgs before turning to a grey color.			
15							S-4	SS	65	8-7-7-10	14	Tan to grey, wet, medium dense, fine to coarse SAND, little coarse gravel, trace silt, well graded. Little organics in top two inches.			
20							S-5	SS	40	5-4-3-6	7	Tan to grey, wet, loose, fine to coarse SAND, trace silt, trace fine gravel, poorly graded.			
25							S-6	SS	80	6-6-8-17	14	Grey, wet, medium dense, fine to coarse SAND, trace silt, trace fine gravel, poorly graded.	MC = 16.6% Fines =		

Continued on Next Page

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: R. Nagle DATE: Jan 17, 2025

CHECKED: L. Nunez DATE: Feb 04, 2025

RECORD OF BOREHOLE: B-2

CLIENT:	MassDOT Rail	START DATE:	January 17, 2025	ELEVATION:	73.2 ft (Ground)
PROJECT:	MassDOT Rail Culvert Rochester	END DATE:	January 20, 2025	COORDINATES:	N: 2753006.9 ft E: 850522.6 ft
PROJECT NO:	US0035009.6582			COORD SYS:	SP MA Mainland FIPS 2001 Ft
LOCATION:	Cape Main MP 44.27 & 44.29	CONTRACTOR:	GeoLogic Earth Explorations, Inc.	HORZ DATUM:	NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
27	CME-45C	Cased Washed - 4.50-in Hole Dia.	Well-graded Sands and Gravels	SW									8.0% A-3 (1)		
28															
29															
30							S-7	SS	40	39-22-25-20	47	Tan, wet, dense, fine to coarse Gravelly fine to coarse SAND, trace silt, trace cobbles, well graded.			
31															
32															
33															
34															
35							S-8	SS	55	4-34-8	7	Tan, wet, loose, fine to coarse Sandy fine to coarse Gravel, trace silt, well graded.			
36															
37															
38															
39															
40							S-9	SS	45	23-31-43-36	74	Olive grey, wet, very dense, fine to coarse Gravelly fine to coarse SAND, little silt, well graded.	Fines = 19.4% A-1-b		
41															
42															
43															
44															
45							S-10	SS	35	22-21-18-19	39	Dark greyish brown, wet, dense, fine to coarse GRAVEL, some fine to coarse sand, trace silt, well graded.	Fines = 5.4% A-1-a (1)		
46						26.7									
47			Potential Bedrock			46.5						Driller Note: Potential bedrock or boulder encountered at 46.5 ft bgs. Advanced roller bit to 49.0 ft bgs without getting past the obstruction.			
48															
49						24.2									
50			Boring terminated in potential bedrock or boulder and backfilled with cuttings. End of hole at 49.00 ft.			24.2 49.0									
51															
52															

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: R. Nagle DATE: Jan 17, 2025

CHECKED: L. Nunez DATE: Feb 04, 2025

RECORD OF BOREHOLE: B-3

CLIENT: MassDOT Rail
PROJECT: Cape Main Culverts & Retain. Wall
PROJECT NO: US0035009.6582
LOCATION: MP44.27/44.29, Rochester MA
DATE: April 07, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.4 ft (Ground)
COORDINATES: N: 2752866.1 ft E: 850702.2 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
0	CME-45C	Cased Wash - 4.50-in Hole Dia.	Ballast	GP		0.0	S-1A					0 - 0.4 ft bgs (S-1A): Grey to brown, dry, medium dense, coarse GRAVEL, some sand, little silt (Railroad Ballast).			
			Fill			72.9 / 0.4	S-1B	SS	62	3-8-8-6	16	0.4 - 2.0 ft bgs (S-1B): Tan, dry, medium dense, fine to coarse SAND, little fine to medium gravel, little silt.			
5				SP			S-2	SS	34	4-4-7-4	11	Tan, moist, medium dense, fine to medium SAND, little silt, trace fine gravel.			
8			Peat	PT		65.4 / 8.0								07Apr'25 14:00 ▼	7.33 ft: Observed water level at end of drilling. 8.00 ft: Brown to black wash water return.
9			Sands and Gravels			64.4 / 9.0									
10							S-3	SS	54	7-8-11-12	19	Tan, wet, medium dense, fine SAND, trace silt, poorly graded.	MC = 24.5% Fines = 6.9% SP-SM, A-3		
15							S-4	SS	58	7-6-9-7	15	Tan, wet, medium dense, fine to medium SAND, little silt, trace fine gravel.			
				SP-SM											
20							S-5	SS	16	5-6-6-5	12	Tan to grey, wet, medium dense, fine to coarse SAND, little silt, trace fine gravel.			
25							S-6	SS	29	10-11-12-14	23	Tan, wet, medium dense, Gravelly fine to coarse SAND, little silt, well graded.	MC = 13.9% Fines =		
26															

Continued on Next Page

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler
DATE: Apr 07, 2025
CHECKED: K. Roth
DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-3

CLIENT: MassDOT Rail
PROJECT: Cape Main Culverts & Retain. Wall
PROJECT NO: US0035009.6582
LOCATION: MP44.27/44.29, Rochester MA
DATE: April 07, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.4 ft (Ground)
COORDINATES: N: 2752866.1 ft E: 850702.2 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
27–52	CME-45C	Cased Wash - 4.50-in Hole Dia.	Sands and Gravels	SP-SM									11.8% SW-SM, A-1-a		
30							S-7	SS	79	12-9-6	14	Tan to grey, wet, medium dense, fine to coarse SAND, some fine to medium gravel, trace silt.			
35							S-8	SS	25	22-13-21-19	34	Tan to brown, wet, dense, fine to coarse SAND, some fine to medium gravel, little silt.			
39						33.6	S-9	SS	100	51-100/3"		Tan, wet, very dense, Gravelly fine to coarse SAND, little silt.			
40			Boulders or Cobbles			39.8									39.75 ft: Driller notes boulders or cobbles from 39.75 to 43 ft bgs.
43						30.4									
43			Sands and Gravels	SP-SM		43.0									
45							S-10	SS	47	23-18-50/5"	36	Tan, wet, dense, Sandy GRAVEL, little silt, poorly graded.	MC = 6.0% Fines = 15.0% GM, A-1-b		
47						26.4									47.00 ft: Advanced roller bit into hard material 47 to 48 ft bgs; rig chattering.
47			Potential Bedrock			47.0									
48						25.4									
48			End of hole at 48.00 ft. Backfilled with drill cuttings.												

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler DATE: Apr 07, 2025
CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-4

CLIENT: MassDOT Rail
PROJECT: Cape Main Culverts & Retain. Wall
PROJECT NO: US0035009.6582
LOCATION: MP44.27/44.29, Rochester MA
DATE: April 08, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.8 ft (Ground)
COORDINATES: N: 2752758.5 ft E: 850872.1 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
0	CME-45C	Cased Wash - 4.50-in Hole Dia.	Ballast	GP		0.0	S-1A					0 - 0.4 ft bgs (S-1A): Grey, moist, medium dense, fine to coarse GRAVEL, some sand, little silt (Railroad Ballast).			
			Fill			73.4 / 0.4	S-1B	SS	29	2-6-8-11	14	0.4 - 2.0 ft bgs (S-1B): Dark brown, moist, medium dense, fine to medium SAND, some fine gravel, little silt, poorly graded.			
4				SP			S-2	SS	42	4-5-5-7	10	Tan, moist, medium dense, fine to coarse SAND, trace fine to medium gravel, trace silt, poorly graded.	MC = 16.3% Fines = 8.9% SP-SM, A-3	08Apr'25 14:50	6.10 ft: Observed water level at end of drilling.
9			Sands and Gravels	SP-SM		64.8 / 9.0	S-3	SS	46	6-9-11-10	20	Tan to orange, wet, medium dense, fine to coarse SAND, little gravel, trace silt, poorly graded.			
14							S-4	SS	54	5-12-16-14	28	Tan to grey, wet, medium dense, fine SAND, little silt, little gravel, poorly graded.			
19							S-5	SS	34	6-7-5-6	12	Tan to grey, wet, medium dense, fine to coarse SAND, little gravel, trace silt, poorly graded.	MC = 12.1% Fines = 9.6% SP-SM, A-1-b		
24							S-6	SS	71	21-22-26-22	48	Tan, wet, dense, fine to coarse SAND, some gravel, little silt, well-graded.			
26															

Continued on Next Page

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler DATE: Apr 08, 2025
CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-4

CLIENT:	MassDOT Rail	DATE:	April 08, 2025	ELEVATION:	73.8 ft (Ground)
PROJECT:	Cape Main Culverts & Retain. Wall			COORDINATES:	N: 2752758.5 ft E: 850872.1 ft
PROJECT NO:	US0035009.6582			COORD SYS:	SP MA Mainland FIPS 2001 Ft
LOCATION:	MP44.27/44.29, Rochester MA	CONTRACTOR:	GeoLogic Earth Explorations, Inc.	HORZ DATUM:	NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
27–29			Sands and Gravels												
29–31	CME-45C	Cased Wash - 4.50-in Hole Dia.		SP-SM			S-7	SS	25	12-29-56-15	85	Tan to grey, wet, very dense, fine to coarse SAND, some silt, some gravel, well-graded.			
31–34															
34–36							S-8	SS	100	18-29-30-29	59	Tan, wet, very dense, fine to coarse SAND, some fine to medium gravel, little silt, well-graded.			
36–39															
39–41							S-9	SS	50	19-27-24-26	51	Tan, wet, very dense, Sandy GRAVEL, little silt, poorly graded.	MC = 4.5% Fines = 18.6% GM, A-1-b		
41–43						30.8									43.00 ft: Advanced roller bit into hard material 43 to 44 ft bgs.
43			Potential Bedrock			43.0									
44			End of hole at 44.00 ft. Backfilled with drill cuttings.			29.8									
45–52															

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler DATE: Apr 08, 2025

CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-5

CLIENT:	MassDOT Rail	DATE:	April 09, 2025	ELEVATION:	74.0 ft (Ground)
PROJECT:	Cape Main Culverts & Retain. Wall			COORDINATES:	N: 2752647.7 ft E: 851039.8 ft
PROJECT NO:	US0035009.6582			COORD SYS:	SP MA Mainland FIPS 2001 Ft
LOCATION:	MP44.27/44.29, Rochester MA	CONTRACTOR:	GeoLogic Earth Explorations, Inc.	HORZ DATUM:	NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
0	CME-45C	Cased Wash - 4.50-in Hole Dia.	Ballast	GP		0.0	S-1A					0 - 0.3 ft bgs (S-1A): Grey, dry, medium dense, fine to coarse GRAVEL, some fine to coarse sand, little silt.			
			Fill			73.7									
1						0.3	S-1B	SS	34	3-3-8-10	11	0.3 - 2.0 ft bgs (S-1B): Dark brown, moist, medium dense, fine to medium SAND, little gravel, little silt, poorly graded.			
2															
3															
4															
5				SP			S-2	SS	21	8-8-12-11	20	Tan, wet, medium dense, Sandy GRAVEL, trace silt, poorly graded.	MC = 9.1% Fines = 5.9% GP-GM, A-1-a		
6															
7															
8														09Apr25 13:33	
9						65.0									8.50 ft: Observed water level at end of drilling.
			Sands and Gravels			9.0									
10				SP-SM			S-3	SS	42	7-8-6-5	14	Tan to brown, wet, medium dense, fine to coarse, SAND, little gravel, little silt, well-graded.			
11															
12															
13															
14						60.0									
			Fine Sand	SM		14.0	S-4A					14.0 - 14.4 ft bgs (S-4A): Grey, wet, medium dense, fine SAND, little silt, poorly graded.			
			Sands and Gravels			59.6									
15						14.4	S-4B	SS	38	5-7-7-6	14	14.4 - 16.0 ft bgs (S-4B): Tan to orange, wet, medium dense, Silty fine to coarse SAND, trace gravel, poorly graded.	MC = 20.1% Fines = 46.2% SM, A-4		
16															
17															
18															
19															
20				SP-SM			S-5	SS	25	8-6-6-8	12	Tan to orange, wet, medium dense, fine to coarse SAND, little silt, well-graded.			
21															
22															
23															
24															
25							S-6	SS	21	8-6-4-6	10	Tan, wet, loose, fine to coarse SAND, trace silt, well-graded.			
26															

Continued on Next Page

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler DATE: Apr 09, 2025

CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-5

CLIENT:	MassDOT Rail	DATE:	April 09, 2025	ELEVATION:	74.0 ft (Ground)
PROJECT:	Cape Main Culverts & Retain. Wall			COORDINATES:	N: 2752647.7 ft E: 851039.8 ft
PROJECT NO:	US0035009.6582			COORD SYS:	SP MA Mainland FIPS 2001 Ft
LOCATION:	MP44.27/44.29, Rochester MA	CONTRACTOR:	GeoLogic Earth Explorations, Inc.	HORZ DATUM:	NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
27–52	CME-45C	Cased Wash - 4.50-in Hole Dia.	Sands and Gravels	SP-SM											
30							S-7	SS	12	35-28-21-12	49	Tan, wet, dense, Gravelly fine to coarse SAND, little silt, well-graded.			
35							S-8	SS	46	7-22-32-29	54	Grey, wet, very dense, Gravelly fine to coarse SAND, little silt, poorly graded.	MC = 8.2% Fines = 16.9% SM, A-1-b		
40							S-9	SS	42	22-24-17-16	41	Tan to grey, wet, dense, fine to coarse SAND, some gravel, some silt, well-graded.			
42						31.5									
43			Cobbles			42.5									42.50 ft: Rig grinding on cobbles from 42.5 to 43 ft bgs.
			Weathered Rock			31.0 43.0									
44							S-10	SS	100	50/1"		44.0 - 44.1 ft bgs (S-10): Grey, wet, very dense, Silty fine to medium SAND, little gravel. Recovery 100%. Hammer blows 100/1".			
45						29.0									45.00 ft: Advanced roller bit into hard material 45 to 46.5 ft bgs; rig chattering.
46			Potential Bedrock			45.0 27.5									
47			End of hole at 46.50 ft. Backfilled with drill cuttings												

REV:

HAMMER TYPE: Automatic, 140lb, 30" drop

LOGGED: K. Wheeler DATE: Apr 09, 2025

CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-6

CLIENT: MassDOT Rail
PROJECT: Cape Main Culverts & Retain. Wall
PROJECT NO: US0035009.6582
LOCATION: MP44.27/44.29, Rochester MA
DATE: April 10, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.6 ft (Ground)
COORDINATES: N: 2752513.1 ft E: 851238.9 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
0	CME-45C	Cased Wash - 4.50-in Hole Dia.	Ballast			0.0	S-1A								
			Fill	SP		73.4 / 0.2	S-1B	SS	29	4-4-7-9	11	0 - 0.2 ft bgs (S-1A): Grey, moist, medium dense, fine to coarse GRAVEL, little sand, trace silt, organics, wood. 0.2 - 2.0 ft bgs (S-1B): Dark brown, moist, medium dense, fine to medium SAND, some silt, little gravel, organics, poorly graded.			
5							S-2	SS	29	6-5-5-6	10	Tan, wet, medium dense, fine to coarse SAND, little gravel, trace silt.			
7			Peat grading to Silty Sand with Organics	PT		66.6 / 7.0								10Apr'25 13:12	7.00 ft: Dark brown to black wash water return. 7.10 ft: Observed water level at end of drilling.
9						64.3	S-3A					9.0 - 9.3 ft bgs (S-3A): Dark brown, wet, medium dense, Silty fine to medium SAND, roots, organics.			
			Sands and Gravels	SP-SM		9.3	S-3B	SS	71	3-6-10-15	16	9.3 - 11.0 ft bgs (S-3B): Tan, wet, medium dense, fine to medium SAND, trace gravel, trace silt, trace organics, poorly graded.	MC = 19.5% Fines = 5.6% SP-SM, A-3		
15							S-4	SS	34	20-25-36-38	61	Grey, wet, very dense, Gravelly fine to coarse SAND, little silt, well-graded.			
20							S-5	SS	0	23-15-12-7	27	No Recovery.			
24			Sandy Silt and Silty Sand	ML		49.6 / 24.0	S-6	SS	46	8-6-9-19	15	Grey, wet, medium dense, Silty fine to medium SAND, trace gravel, poorly graded.	MC = 23.4% Fines =		
26															

Continued on Next Page

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler DATE: Apr 10, 2025
CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-6

CLIENT: MassDOT Rail
PROJECT: Cape Main Culverts & Retain. Wall
PROJECT NO: US0035009.6582
LOCATION: MP44.27/44.29, Rochester MA
DATE: April 10, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.6 ft (Ground)
COORDINATES: N: 2752513.1 ft E: 851238.9 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
27–29	CME-45C	Cased Wash - 4.50-in Hole Dia.	Sandy Silt and Silty Sand	ML									36.5% SM, A-4		
30							S-7	SS	29	9-7-10-10	17	Grey, wet, very stiff, Sandy SILT, trace gravel, low plasticity.	MC = 13.9% Fines = 55.0% ML, A-4		
31–33															
34						39.6									
34			Sands and Gravels	SP-SM		34.0	S-8	SS	25	16-11-26-47	37	Grey, wet, dense, fine to coarse SAND, some gravel, some silt, well-graded.			
35–36															
37						36.6									37.00 ft: Advanced roller bit into hard material 37 to 39 ft bgs.
37			Bedrock			37.0									
38															
39															
39–44	CME-45C	NX Rock Core - 2.92-in Hole Dia.					C-1		93			Light grey, fine to medium grained, very strong (R5), GNEISS, fresh (W1); discontinuities shallowly dipping (35°), moderately closely spaced, open, planar, average 1 fracture per foot, infilling with sand. RQD = 83.3%.			39.00 - 44.00 ft: Rock Core Rate (min:sec per foot) 1:50 2:15 2:26 2:37 2:10
44						29.6									
44			End of hole at 44.00 ft. Backfilled with bentonite chips and drill cuttings.												
45–52															

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler DATE: Apr 10, 2025
CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-7

CLIENT: MassDOT Rail
PROJECT: Cape Main Culverts & Retain. Wall
PROJECT NO: US0035009.6582
LOCATION: MP44.27/44.29, Rochester MA
DATE: April 11, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.2 ft (Ground)
COORDINATES: N: 2752394.5 ft E: 851429.6 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES REC %	SAMPLES BLOWS	SAMPLES N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
0	CME-45C	Cased Wash - 4.50-in Hole Dia.	Ballast			0.0									
			Fill			73.0									
1						0.2	S-1	SS	25	1-4-4	8	Dark brown, moist, loose, Sandy GRAVEL, trace silt, trace organics, poorly graded.	MC = 9.8% Fines = 4.5% GP, A-1-a		
2															
3															
4															
5				SP			S-2	SS	38	3-4-5	9	Light brown, moist, loose, fine to medium SAND, trace silt, poorly graded.			
6															
7														11Apr'25 11:00	6.60 ft: Observed water level at end of drilling.
8															
9			Sands and Gravels			64.2 9.0									
10							S-3	SS	29	21-11-8	19	Tan, wet, medium dense, fine to coarse SAND, little gravel, little silt, well-graded.			
11															
12															
13															
14							S-4	SS	50	5-4-4-5	8	Tan, wet, loose, fine to coarse SAND, little gravel, trace silt, well-graded.			
15															
16															
17				SP-SM											
18															
19															
20							S-5	SS	42	5-5-6-5	11	Tan, wet, medium dense, fine to coarse SAND, trace gravel, trace silt, poorly graded.	MC = 22.1% Fines = 9.0% SP-SM, A-3		
21															
22															
23															
24															
25							S-6	SS	92	10-8-8-6	16	Tan, wet, medium dense, fine to coarse SAND, some gravel, trace silt, well-graded.			
26															

Continued on Next Page

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler DATE: Apr 11, 2025
CHECKED: K. Roth DATE: Apr 28, 2025

RECORD OF BOREHOLE: B-7

CLIENT: MassDOT Rail
PROJECT: Cape Main Culverts & Retain. Wall
PROJECT NO: US0035009.6582
LOCATION: MP44.27/44.29, Rochester MA
DATE: April 11, 2025
CONTRACTOR: GeoLogic Earth Explorations, Inc.
ELEVATION: 73.2 ft (Ground)
COORDINATES: N: 2752394.5 ft E: 851429.6 ft
COORD SYS: SP MA Mainland FIPS 2001 Ft
HORZ DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	SOIL SAMPLE DESCRIPTION	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
27–33	CME-45C	Cased Wash - 4.50-in Hole Dia.	Sands and Gravels	SP-SM											
29–31							S-7	SS	29	12-15-9	23	Tan, wet, medium dense, fine to coarse SAND, some gravel, some silt, poorly graded.	MC = 10.3% Fines = 21.6% SM, A-1-b		
34						39.2									34.00 ft: Advanced roller bit into hard material 34 to 36 ft bgs.
34			Bedrock			34.0									
36–40	CME-45C	NX Rock Core - 2.92-in Hole Dia.					C-1		82			Light grey, fine to medium grained , extremely strong (R6), GNEISS, fresh to slightly weathered (W1 to W2); discontinuities moderately dipping (60°), widely spaced, open, planar to stepped, average 0.5 fractures per foot, infilling with sand. RQD = 81.7%.			36.00 - 41.00 ft: Rock Core Rate (min:sec per foot) 3:07 3:07 2:28 0:56 2:32
41						32.2									
41			End of hole at 41.00 ft. Backfilled with bentonite chips and drill cuttings												

HAMMER TYPE: Automatic, 140lb, 30" drop

REV:

LOGGED: K. Wheeler
DATE: Apr 11, 2025
CHECKED: K. Roth
DATE: Apr 28, 2025

APPENDIX B

Rock Core Photographs

APPENDIX B
ROCK CORE PHOTOGRAPHS
Culvert Replacements at MP 44.27 and MP 44.29 and Proposed Anchored Sheetpile Retaining Wall
Rochester, MA
MassDOT Cape Main Railroad

Boring	Run	Depth Below Surface Feet	Recovery Feet	Recovery %	RQD Feet	RQD %	Rock Type	Box Row	Date Cored
B-6	R1	39.0 - 44.0	4.7 / 5.0	93	4.2 / 5.0	83	GNEISS	Row 1	4/10/2025
B-7	R1	36.0 - 41.0	4.1 / 5.0	82	4.1 / 5.0	82	GNEISS	Row 2	4/11/2025



Notes:
1. "Box row" indicates the section of the box where the core is contained: 1 = top, 4 = bottom.
2. Top of each core run is on the left and increases with depth to the right.

Prepared By: JKW
Checked By: LDN
Reviewed By: CCB

APPENDIX C

Laboratory Test Results

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	01/27/25	Checked By:	ank
Depth :	---	Test Id:	802160		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
B-1	S- 2	4-6 ft	Moist, olive brown gravel with silt and sand	15.1
B-1	S- 3A	9-9.4 ft	Moist, very dark gray silty sand	33.4
B-1	S- 4	14-16 ft	Moist, grayish brown sand with silt and gravel	12.5
B-2	S- 3A	9-10 ft	Moist, light olive brown sand with silt	24.5
B-2	S- 6	24-26 ft	Moist, gray sand with silt	16.6

Notes: Temperature of Drying : 110º Celsius

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	04/25/25	Checked By:	ank
Depth :	---	Test Id:	811836		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
B-3	S3	9-11 ft	Moist, yellowish brown sand with silt	24.5
B-3	S6	24-26 ft	Moist, light brown sand with silt and gravel	13.9
B-3	S10	44-45.9 ft	Moist, brown silty gravel with sand	6.0
B-4	S2	4-6 ft	Moist, dark yellowish brown sand with silt	16.3
B-4	S5	19-21 ft	Moist, pale brown sand with silt and gravel	12.1
B-4	S9	39-41 ft	Moist, yellowish brown silty gravel with sand	4.5
B-5	S2	4-6 ft	Moist, yellowish brown gravel with silt and sand	9.1
B-5	S4B	14.42-16 ft	Moist, brown silty sand	20.1
B-5	S8	34-36 ft	Moist, light olive brown silty sand with gravel	8.2
B-6	S3B	9.33-11 ft	Moist, dark yellowish brown sand with silt	19.5

Notes: Temperature of Drying : 110º Celsius

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	04/21/25	Checked By:	ank
Depth :	---	Test Id:	811847		

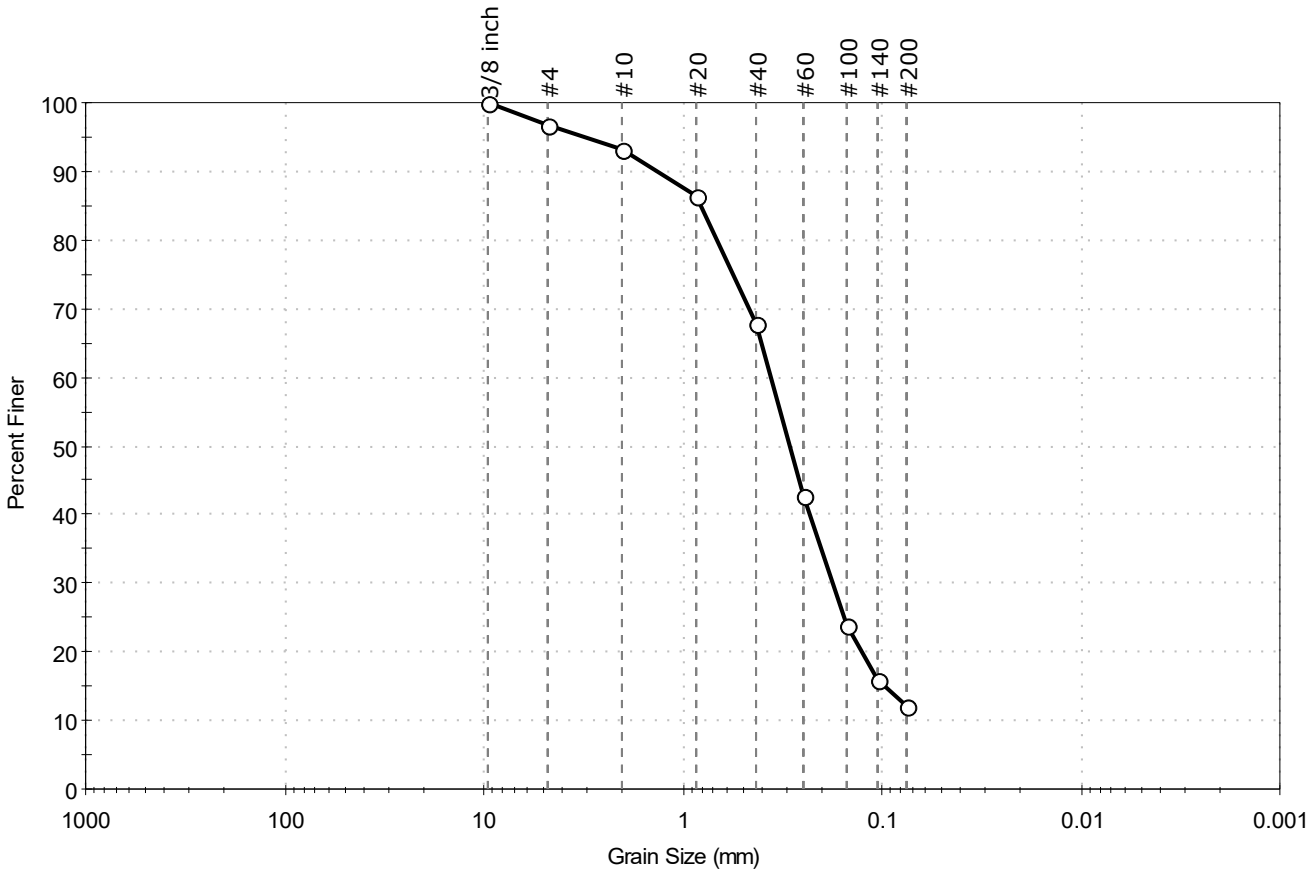
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
B-6	S6	24-26 ft	Moist, very pale brown silty sand	23.4
B-6	S7	29-31 ft	Moist, light brownish gray sandy silt	13.9
B-7	S1	0-2 ft	Moist, very dark gray gravel with sand	9.8
B-7	S5	19-21 ft	Moist, grayish brown sand with silt	22.1
B-7	S7	29-31 ft	Moist, very pale brown silty sand with gravel	10.3

Notes: Temperature of Drying : 110º Celsius

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-1	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-3A	Test Date:	01/28/25	Checked By:	ank
Depth :	9-9.4 ft	Test Id:	802148		
Test Comment:	---				
Visual Description:	Moist, very dark gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.4	84.4	12.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/8 inch	9.50	100		
#4	4.75	97		
#10	2.00	93		
#20	0.85	87		
#40	0.42	68		
#60	0.25	43		
#100	0.15	24		
#140	0.11	16		
#200	0.075	12		

Coefficients

D_{85} = 0.8034 mm D_{30} = 0.1768 mm

D_{60} = 0.3603 mm D_{15} = 0.0967 mm

D_{50} = 0.2912 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

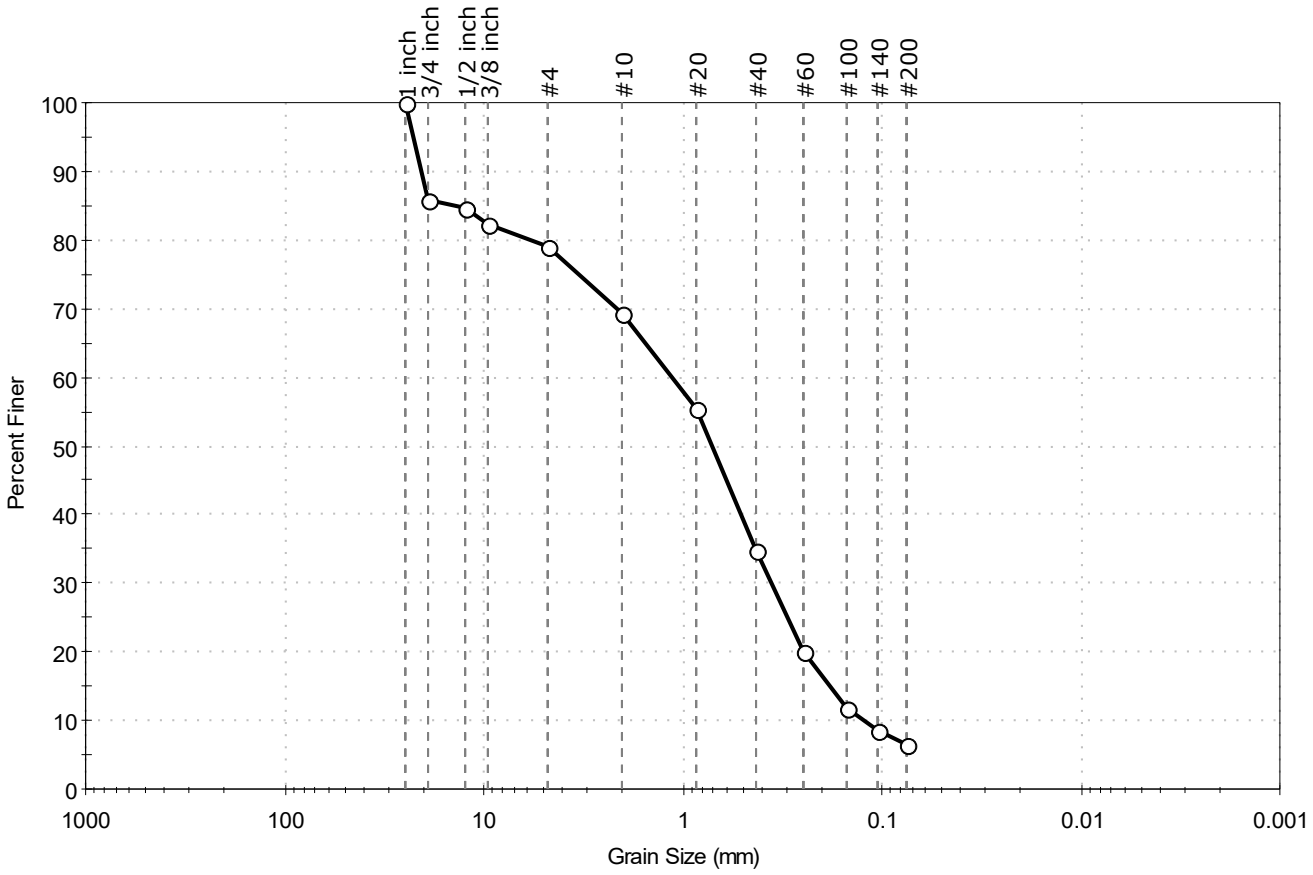
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-1	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-4	Test Date:	01/30/25	Checked By:	ank
Depth :	14-16 ft	Test Id:	802149		
Test Comment:	---				
Visual Description:	Moist, grayish brown sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	20.8	72.7	6.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	86		
1/2 inch	12.50	85		
3/8 inch	9.50	82		
#4	4.75	79		
#10	2.00	69		
#20	0.85	55		
#40	0.42	35		
#60	0.25	20		
#100	0.15	12		
#140	0.11	9		
#200	0.075	6.5		

Coefficients

D_{85} = 14.5788 mm
D_{30} = 0.3580 mm
D_{60} = 1.1280 mm
D_{15} = 0.1836 mm
D_{50} = 0.7092 mm
D_{10} = 0.1233 mm
C_u = 9.148
C_c = 0.921

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

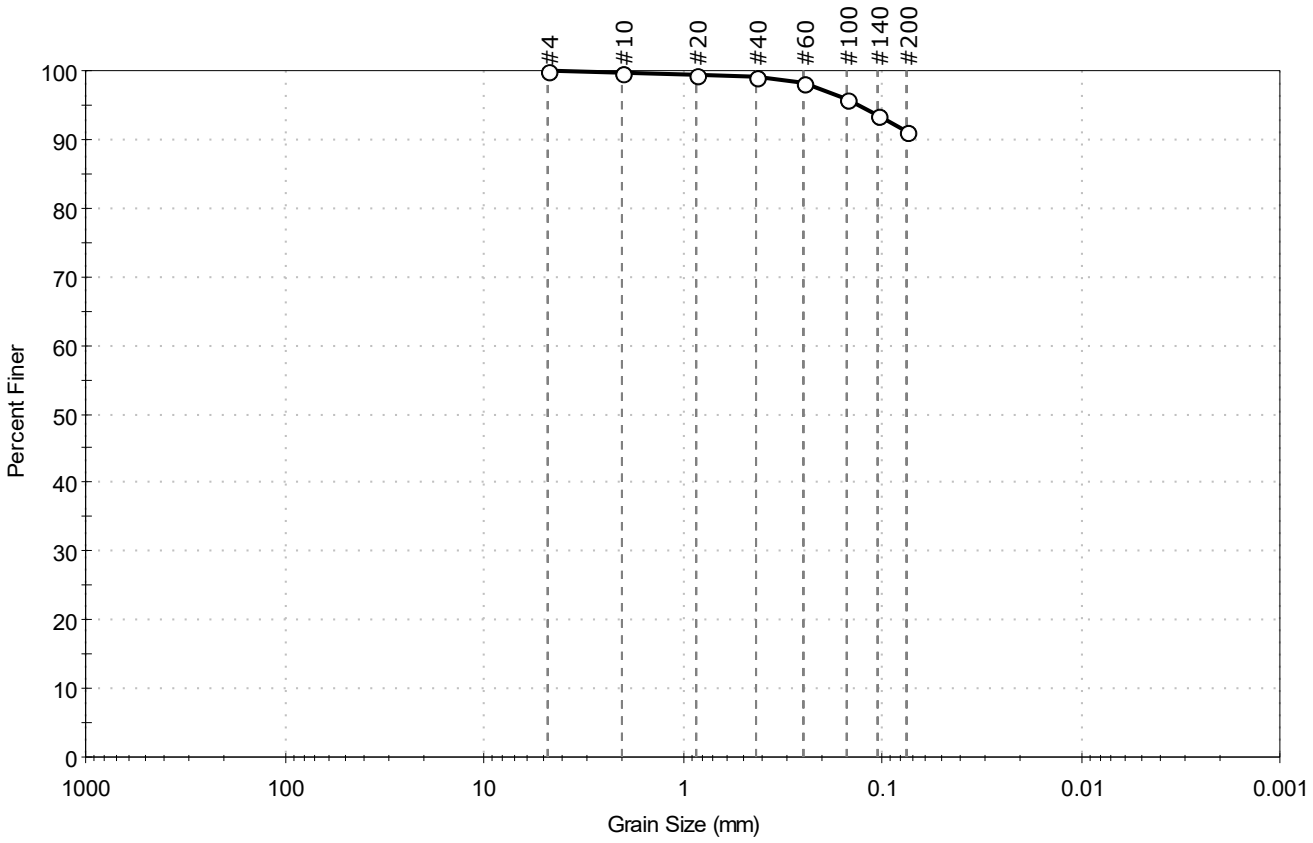
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-1	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-8	Test Date:	01/28/25	Checked By:	ank
Depth :	29-31 ft	Test Id:	802150		
Test Comment:	---				
Visual Description:	Moist, light olive brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	8.8	91.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	96		
#140	0.11	93		
#200	0.075	91		

Coefficients

D_{85} = N/A	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))

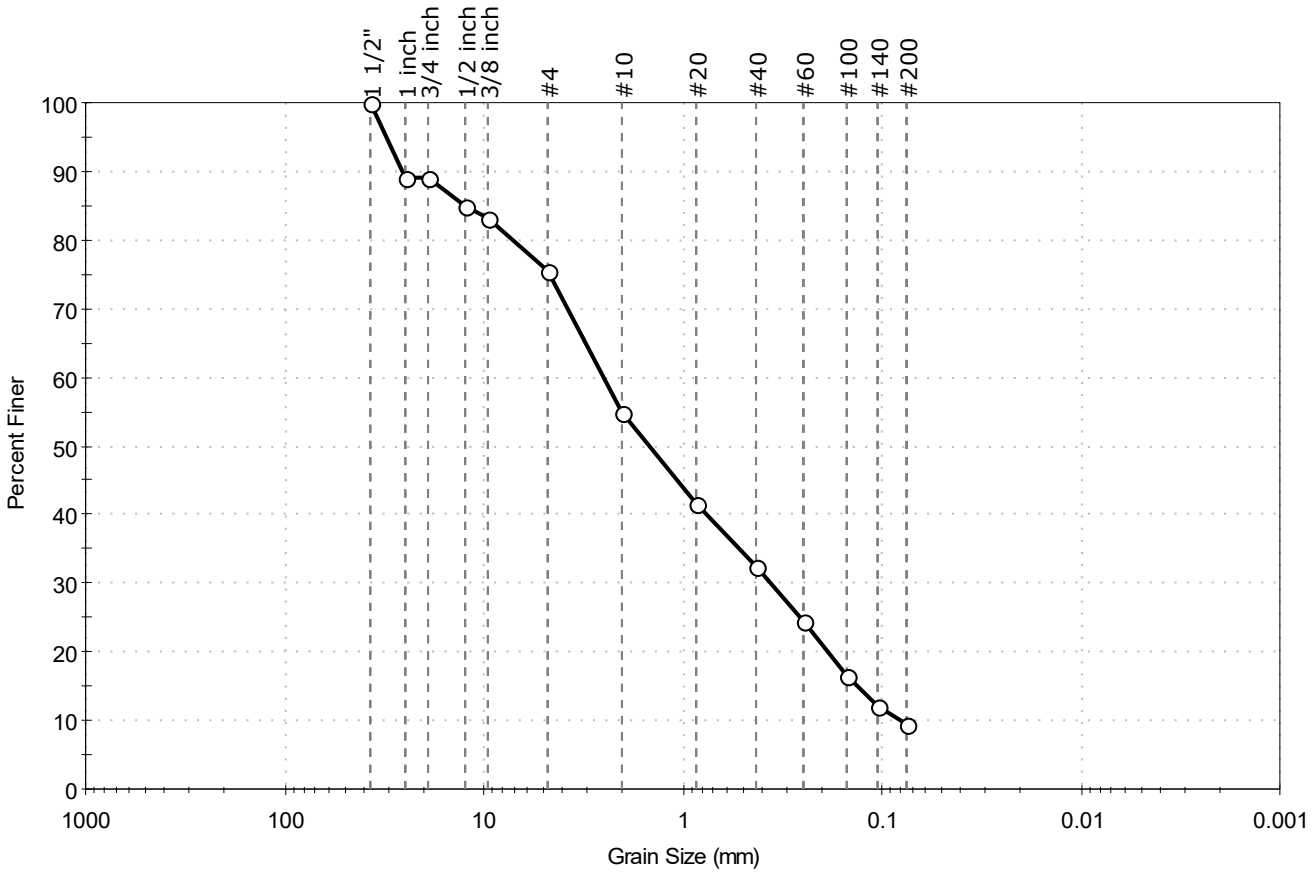
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-1	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-13	Test Date:	01/30/25	Checked By:	ank
Depth :	48-50 ft	Test Id:	802151		
Test Comment:	---				
Visual Description:	Moist, light olive brown sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	24.6	66.0	9.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	89		
3/4 inch	19.00	89		
1/2 inch	12.50	85		
3/8 inch	9.50	83		
#4	4.75	75		
#10	2.00	55		
#20	0.85	41		
#40	0.42	32		
#60	0.25	25		
#100	0.15	16		
#140	0.11	12		
#200	0.075	9.4		

Coefficients

D_{85} = 12.4373 mm	D_{30} = 0.3620 mm
D_{60} = 2.4940 mm	D_{15} = 0.1336 mm
D_{50} = 1.4745 mm	D_{10} = 0.0809 mm
C_u = 30.828	C_c = 0.649

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

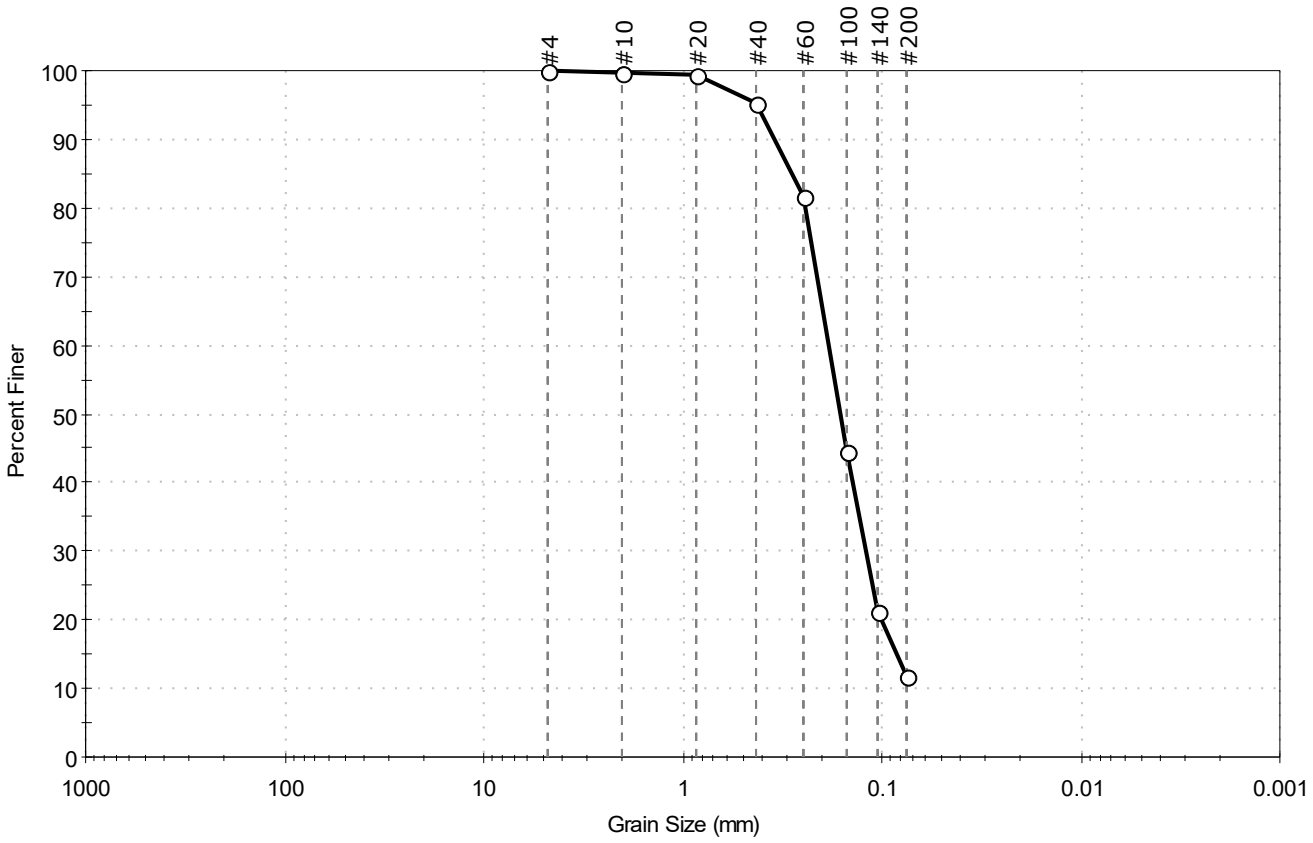
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-2	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-3A	Test Date:	01/28/25	Checked By:	ank
Depth :	9-10 ft	Test Id:	802152		
Test Comment:	---				
Visual Description:	Moist, light olive brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	88.1	11.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	95		
#60	0.25	82		
#100	0.15	44		
#140	0.11	21		
#200	0.075	12		

Coefficients

D_{85} = 0.2836 mm
D_{30} = 0.1207 mm
D_{60} = 0.1856 mm
D_{15} = 0.0840 mm
D_{50} = 0.1619 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

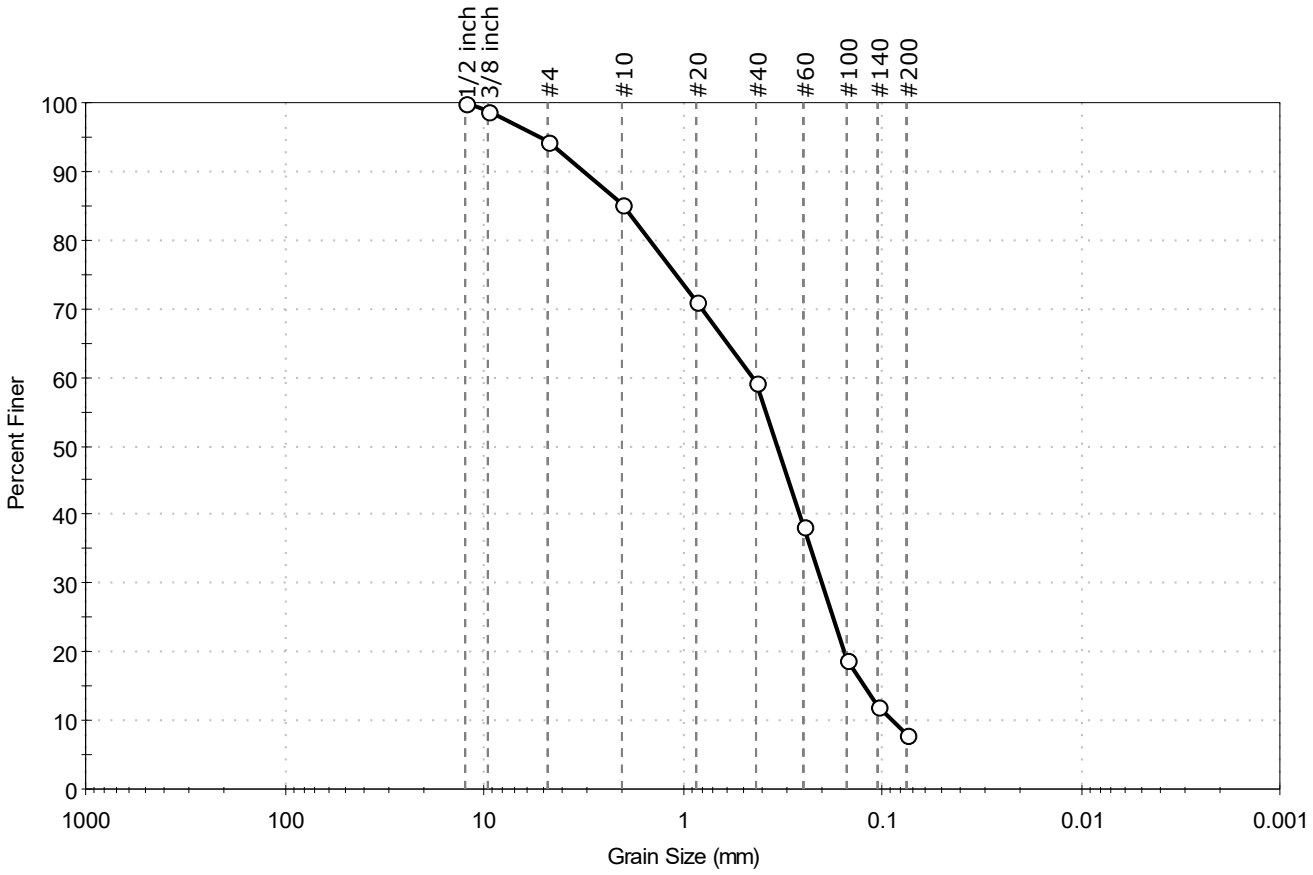
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-2	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-6	Test Date:	01/28/25	Checked By:	ank
Depth :	24-26 ft	Test Id:	802153		
Test Comment:	---				
Visual Description:	Moist, gray sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	5.5	86.5	8.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1/2 inch	12.50	100		
3/8 inch	9.50	99		
#4	4.75	94		
#10	2.00	85		
#20	0.85	71		
#40	0.42	59		
#60	0.25	38		
#100	0.15	19		
#140	0.11	12		
#200	0.075	8.0		

Coefficients

D_{85} = 1.9640 mm
D_{30} = 0.2007 mm
D_{60} = 0.4432 mm
D_{15} = 0.1234 mm
D_{50} = 0.3358 mm
D_{10} = 0.0894 mm
C_u = 4.957
C_c = 1.017

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

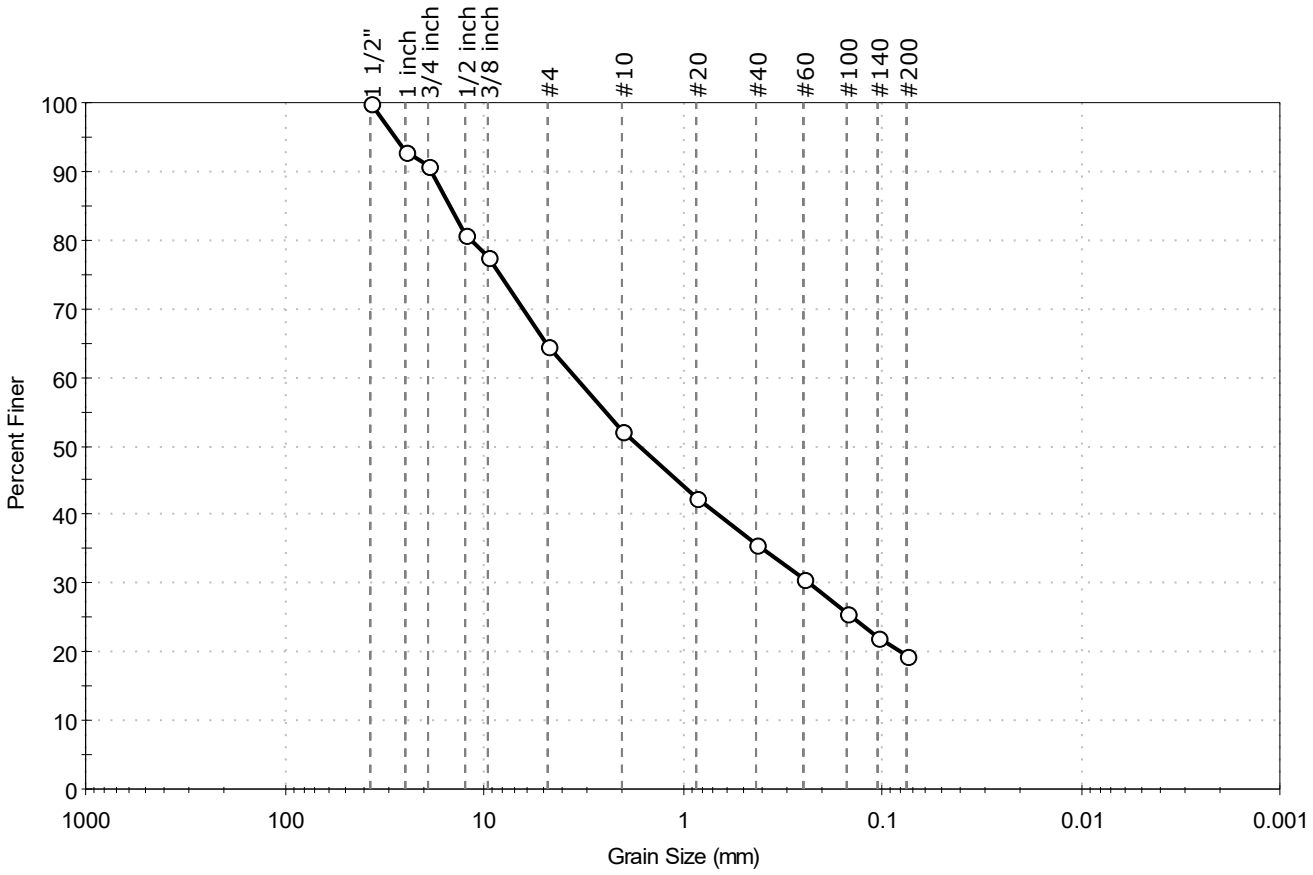
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-2	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-9	Test Date:	01/30/25	Checked By:	ank
Depth :	39-41 ft	Test Id:	802154		
Test Comment:	---				
Visual Description:	Moist, olive gray silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	35.5	45.1	19.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	93		
3/4 inch	19.00	91		
1/2 inch	12.50	81		
3/8 inch	9.50	77		
#4	4.75	65		
#10	2.00	52		
#20	0.85	42		
#40	0.42	36		
#60	0.25	31		
#100	0.15	26		
#140	0.11	22		
#200	0.075	19		

Coefficients

D_{85} = 14.9223 mm	D_{30} = 0.2317 mm
D_{60} = 3.4500 mm	D_{15} = N/A
D_{50} = 1.6369 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))

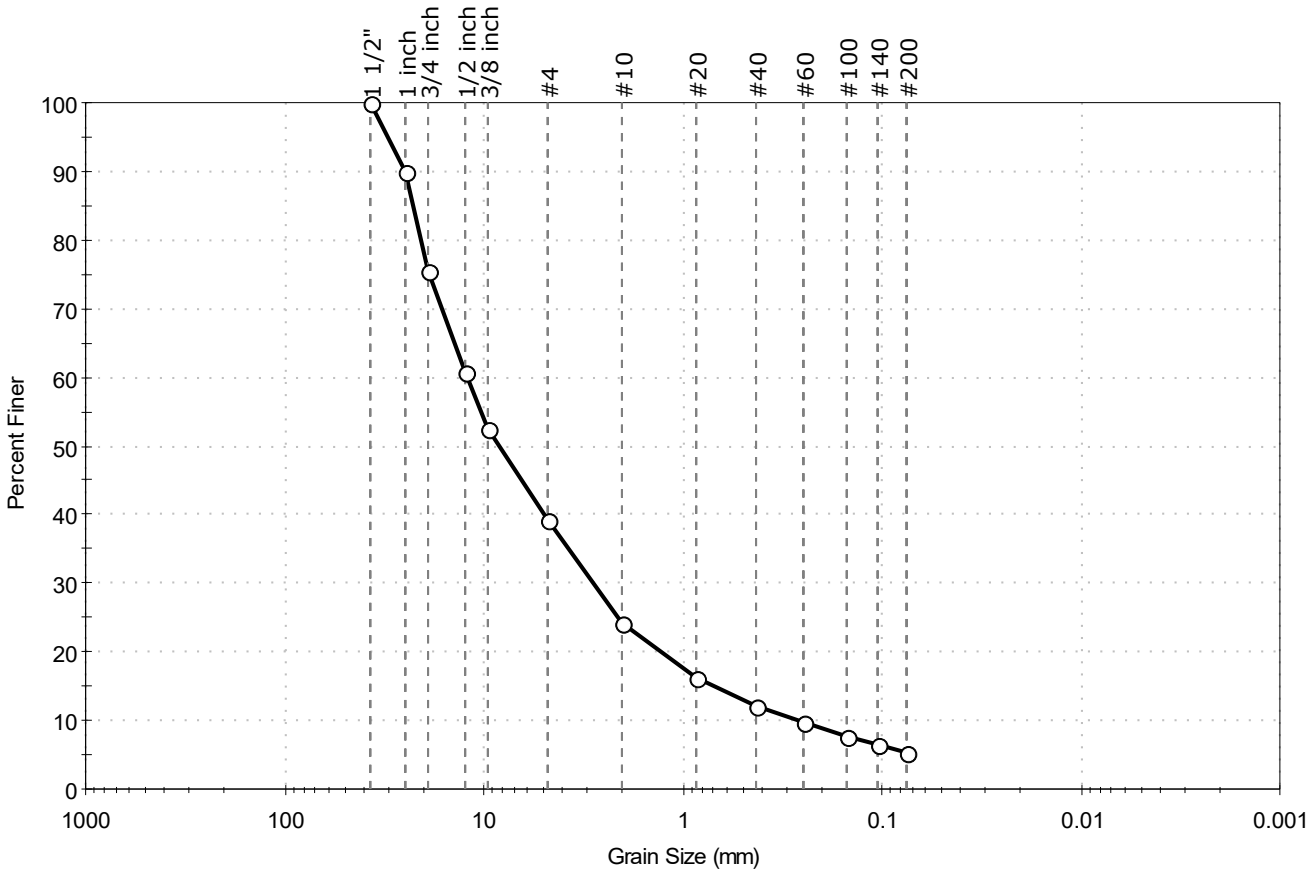
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Culvert				
Location:	---			Project No:	GTX-320460
Boring ID:	B-2	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-10	Test Date:	01/30/25	Checked By:	ank
Depth :	44-46 ft	Test Id:	802155		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown gravel with silt and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	60.7	33.9	5.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	90		
3/4 inch	19.00	76		
1/2 inch	12.50	61		
3/8 inch	9.50	52		
#4	4.75	39		
#10	2.00	24		
#20	0.85	16		
#40	0.42	12		
#60	0.25	10		
#100	0.15	8		
#140	0.11	6		
#200	0.075	5.4		

Coefficients

D_{85} = 22.7749 mm D_{30} = 2.7886 mm

D_{60} = 12.2137 mm D_{15} = 0.6992 mm

D_{50} = 8.3538 mm D_{10} = 0.2635 mm

C_u = 46.352 C_c = 2.416

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

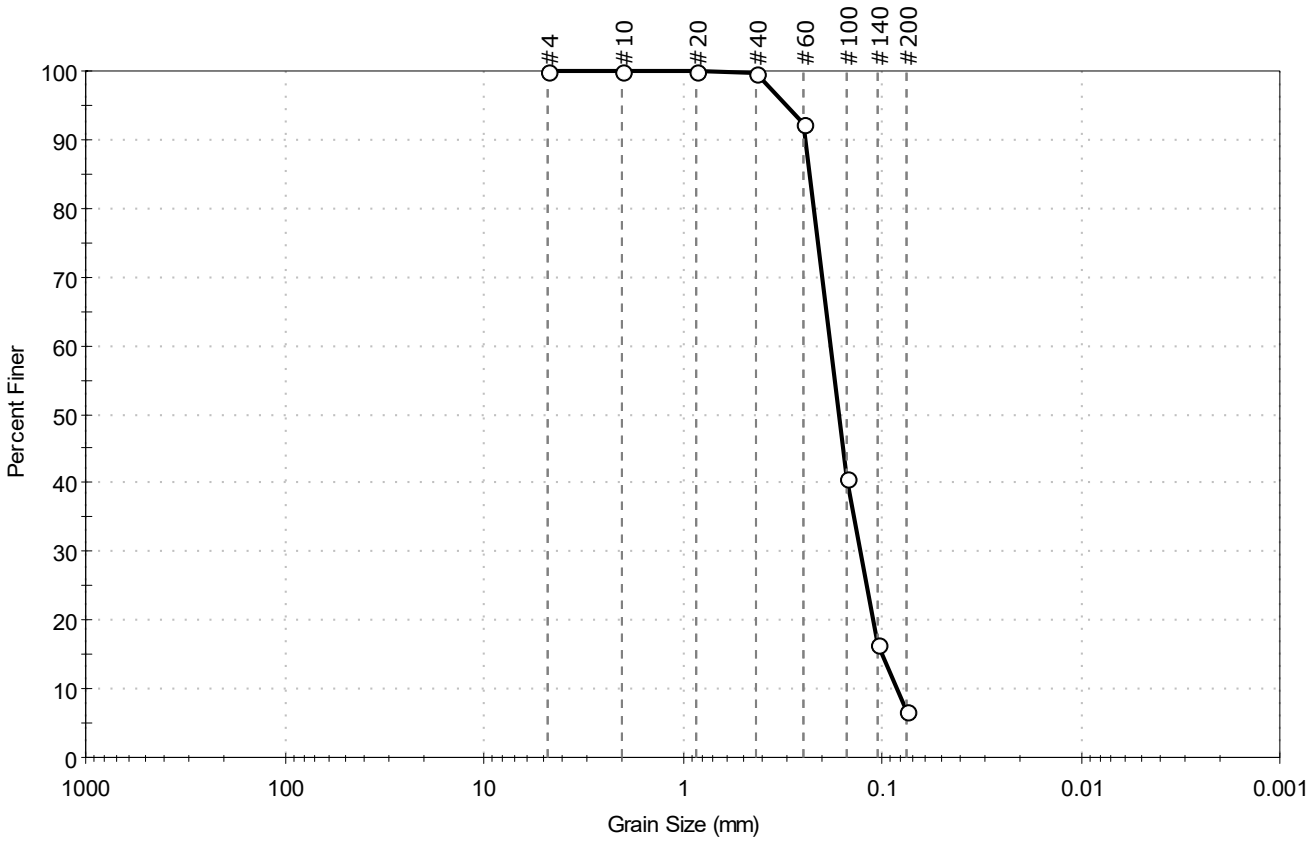
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-3	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S3	Test Date:	04/23/25	Checked By:	ank
Depth :	9-11 ft	Test Id:	811826		
Test Comment:	---				
Visual Description:	Moist, yellowish brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	93.1	6.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	92		
#100	0.15	41		
#140	0.11	17		
#200	0.075	6.9		

Coefficients

D_{85} =0.2324 mm	D_{30} =0.1286 mm
D_{60} =0.1815 mm	D_{15} =0.1002 mm
D_{50} =0.1645 mm	D_{10} =0.0838 mm
C_u =2.166	C_c =1.087

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

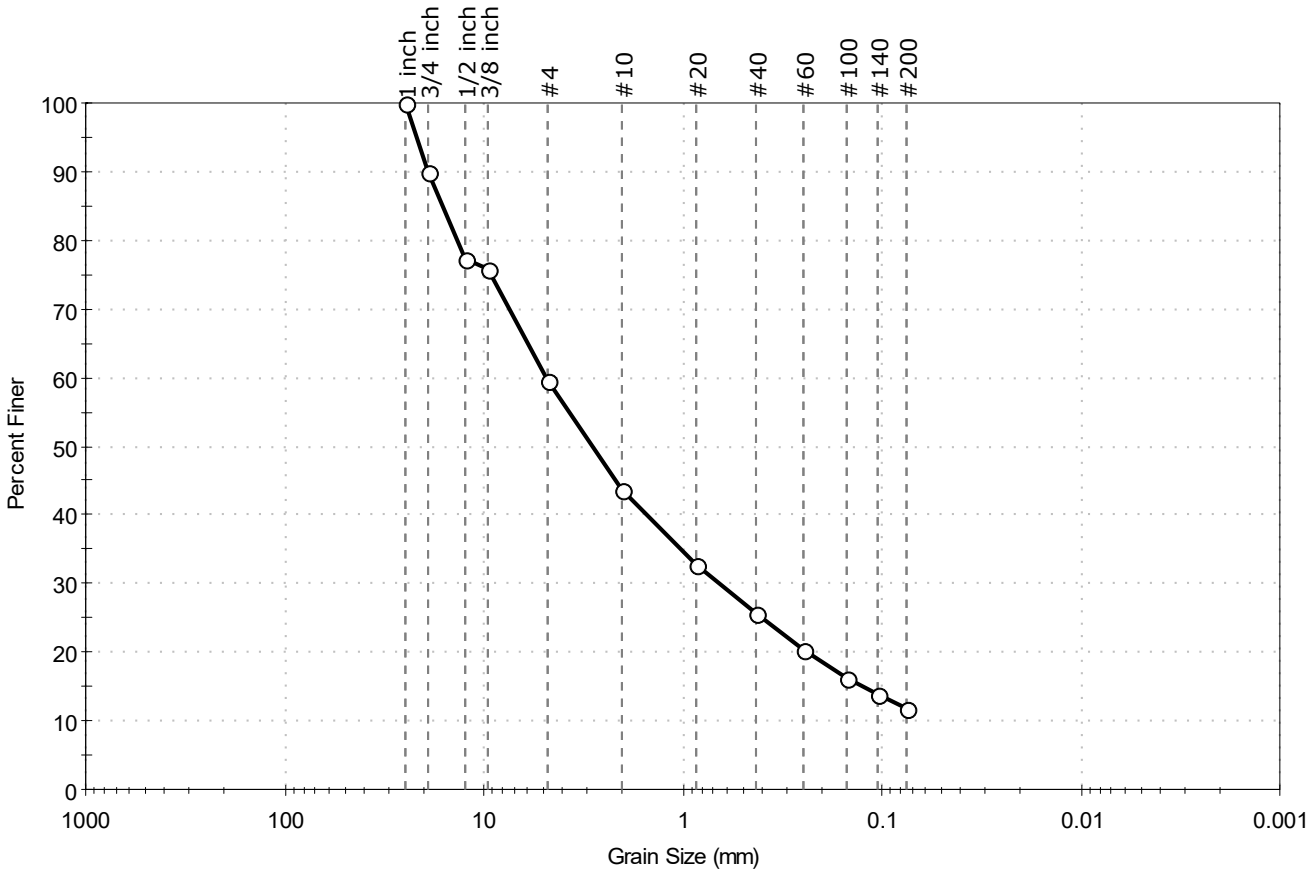
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-3	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S6	Test Date:	04/24/25	Checked By:	ank
Depth :	24-26 ft	Test Id:	811825		
Test Comment:	---				
Visual Description:	Moist, light brown sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	40.4	47.8	11.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	90		
1/2 inch	12.50	77		
3/8 inch	9.50	76		
#4	4.75	60		
#10	2.00	44		
#20	0.85	33		
#40	0.42	26		
#60	0.25	20		
#100	0.15	16		
#140	0.11	14		
#200	0.075	12		

Coefficients

D_{85} =16.1448 mm	D_{30} =0.6454 mm
D_{60} =4.8297 mm	D_{15} =0.1253 mm
D_{50} =2.8082 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-a (0))

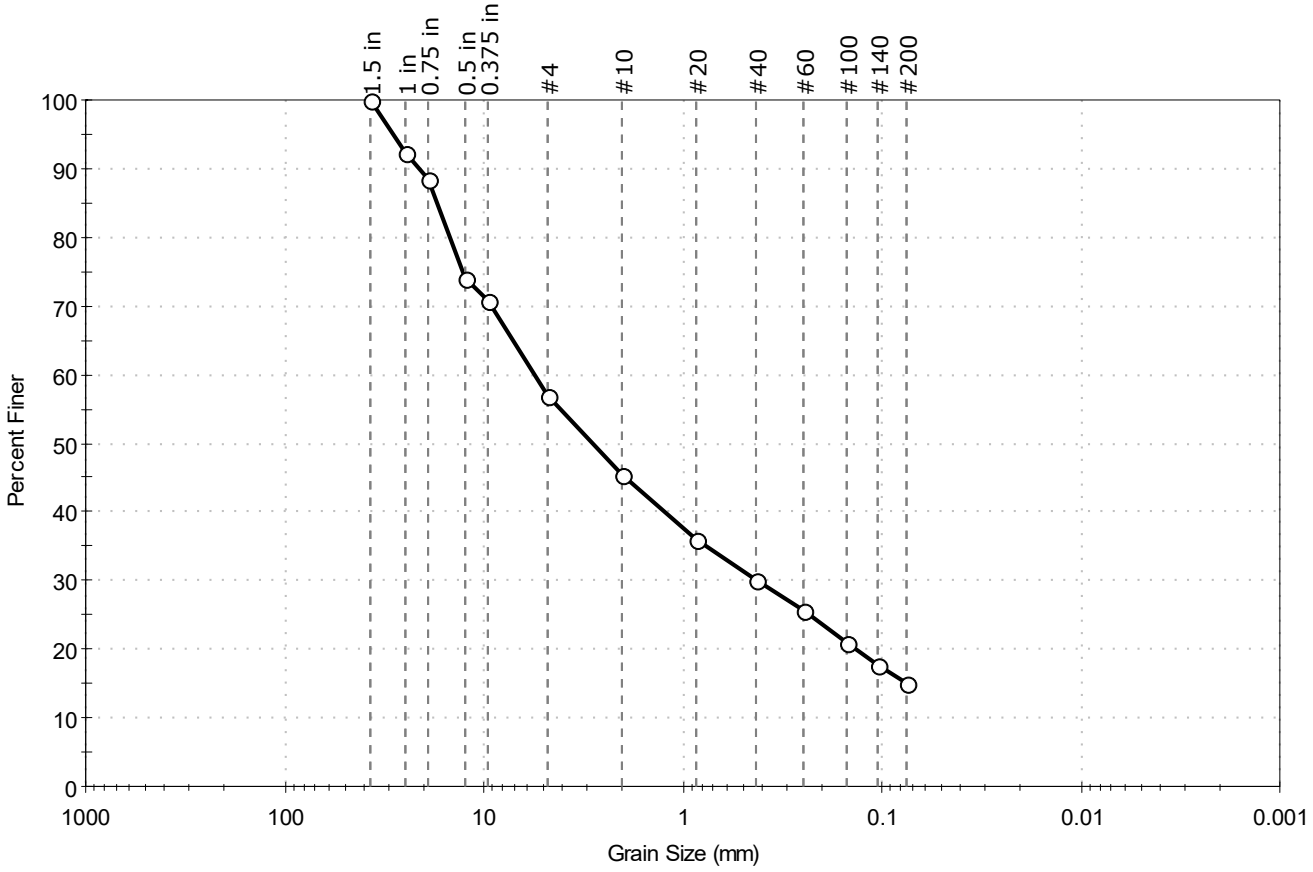
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-3	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S10	Test Date:	04/23/25	Checked By:	ank
Depth :	44-45.9 ft	Test Id:	811824		
Test Comment:	---				
Visual Description:	Moist, brown silty gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	43.0	42.0	15.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	92		
0.75 in	19.00	88		
0.5 in	12.50	74		
0.375 in	9.50	71		
#4	4.75	57		
#10	2.00	45		
#20	0.85	36		
#40	0.42	30		
#60	0.25	26		
#100	0.15	21		
#140	0.11	18		
#200	0.075	15		

Coefficients

D_{85} = 17.2135 mm	D_{30} = 0.4241 mm
D_{60} = 5.5193 mm	D_{15} = N/A
D_{50} = 2.8205 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))

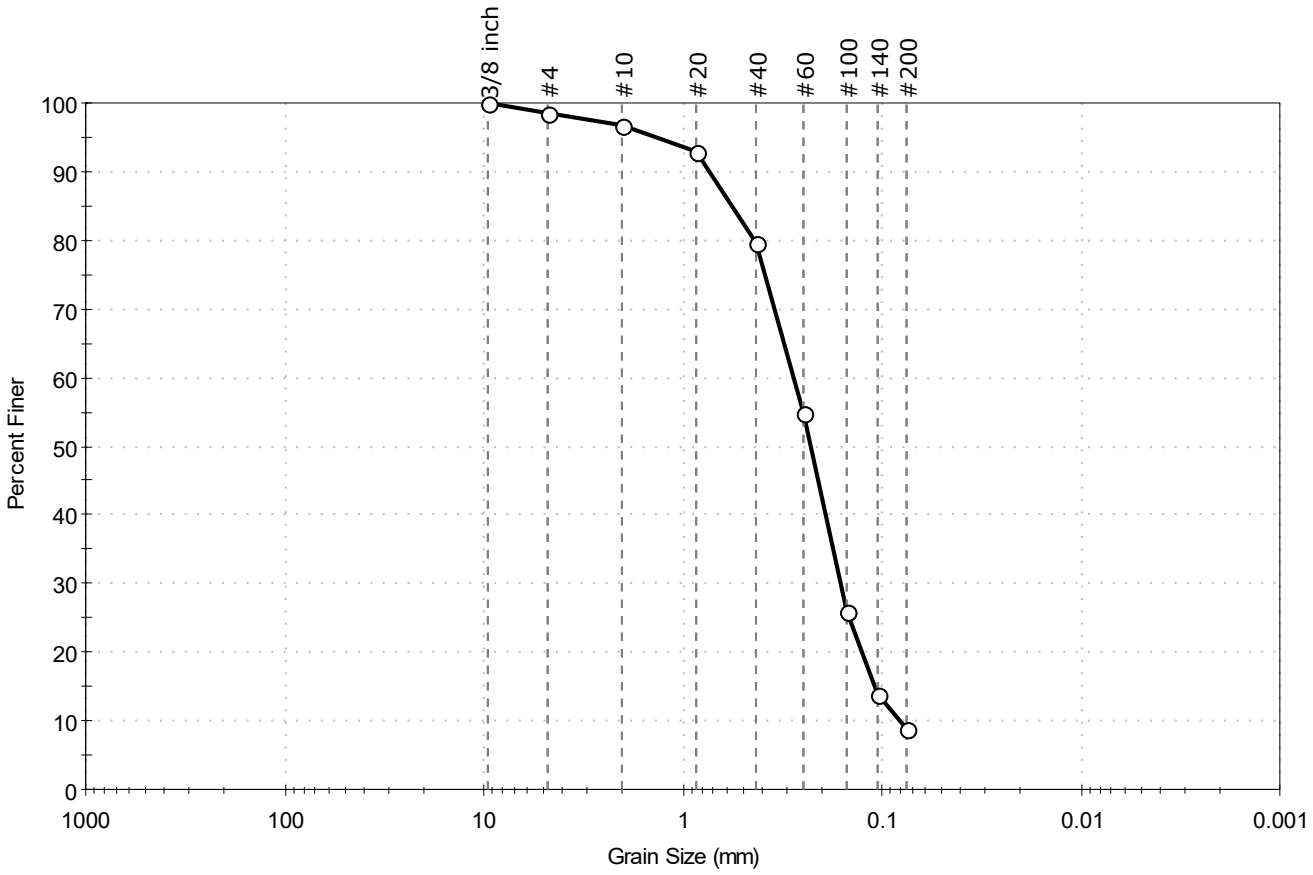
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-4	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S2	Test Date:	04/23/25	Checked By:	ank
Depth :	4-6 ft	Test Id:	811823		
Test Comment:	---				
Visual Description:	Moist, dark yellowish brown sand with silt				
Sample Comment:	One 1" rock removed				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.4	89.7	8.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/8 inch	9.50	100		
#4	4.75	99		
#10	2.00	97		
#20	0.85	93		
#40	0.42	80		
#60	0.25	55		
#100	0.15	26		
#140	0.11	14		
#200	0.075	8.9		

Coefficients

D_{85} =0.5642 mm	D_{30} =0.1615 mm
D_{60} =0.2797 mm	D_{15} =0.1091 mm
D_{50} =0.2299 mm	D_{10} =0.0809 mm
C_u =3.457	C_c =1.153

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

Sample/Test Description

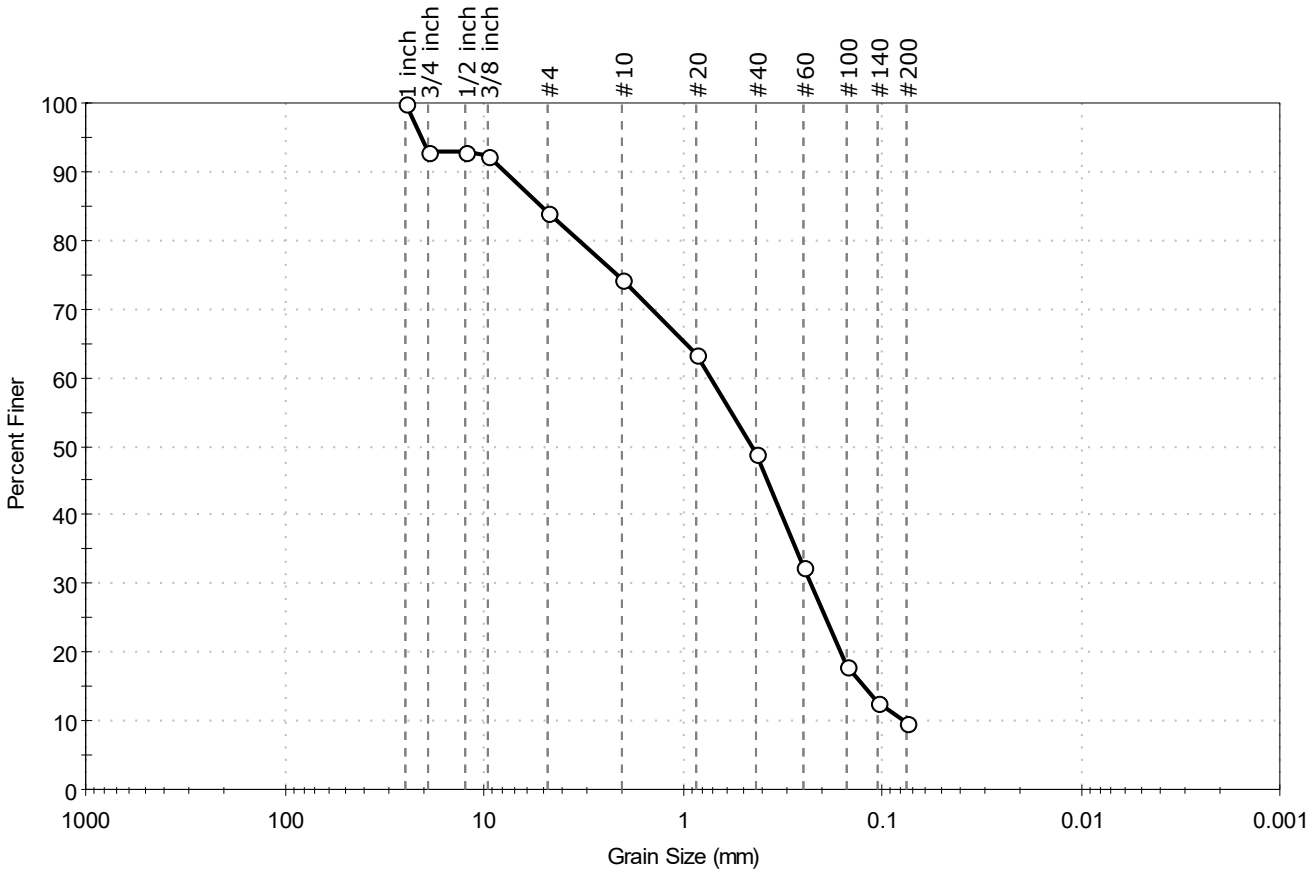
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

printed 4/25/2025 2:19:43 PM

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-4	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S5	Test Date:	04/24/25	Checked By:	ank
Depth :	19-21 ft	Test Id:	811822		
Test Comment:	---				
Visual Description:	Moist, pale brown sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	16.0	74.4	9.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	93		
1/2 inch	12.50	93		
3/8 inch	9.50	92		
#4	4.75	84		
#10	2.00	74		
#20	0.85	64		
#40	0.42	49		
#60	0.25	32		
#100	0.15	18		
#140	0.11	13		
#200	0.075	9.6		

Coefficients

D_{85} = 5.1534 mm
D_{30} = 0.2292 mm
D_{60} = 0.7181 mm
D_{15} = 0.1231 mm
D_{50} = 0.4447 mm
D_{10} = 0.0782 mm
C_u = 9.183
C_c = 0.935

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

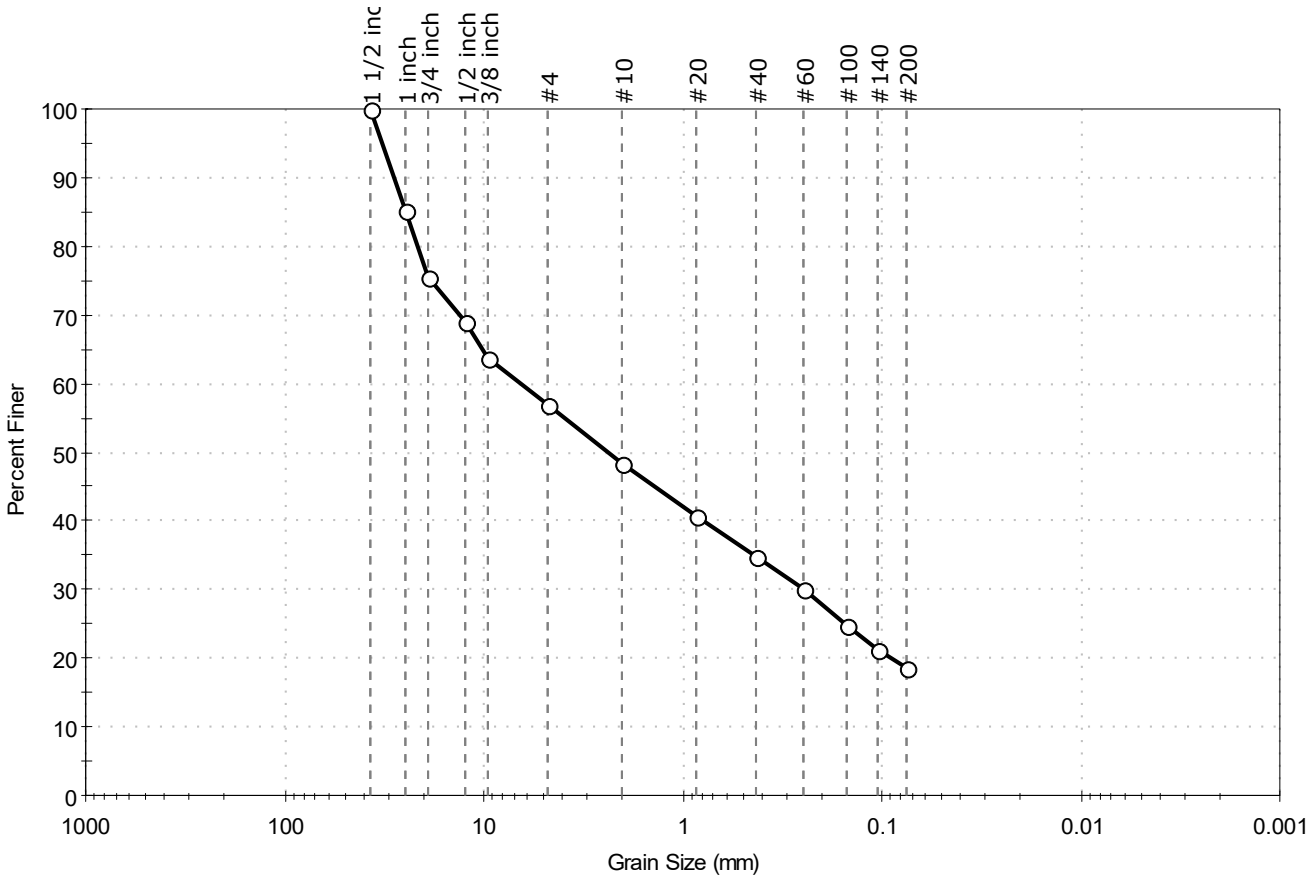
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-4	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S9	Test Date:	04/24/25	Checked By:	ank
Depth :	39-41 ft	Test Id:	811821		
Test Comment:	---				
Visual Description:	Moist, yellowish brown silty gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	43.1	38.3	18.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2 inch	37.50	100		
1 inch	25.00	85		
3/4 inch	19.00	75		
1/2 inch	12.50	69		
3/8 inch	9.50	64		
#4	4.75	57		
#10	2.00	49		
#20	0.85	41		
#40	0.42	35		
#60	0.25	30		
#100	0.15	25		
#140	0.11	21		
#200	0.075	19		

Coefficients

D_{85} =24.8458 mm	D_{30} =0.2480 mm
D_{60} =6.5581 mm	D_{15} =N/A
D_{50} =2.3311 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))

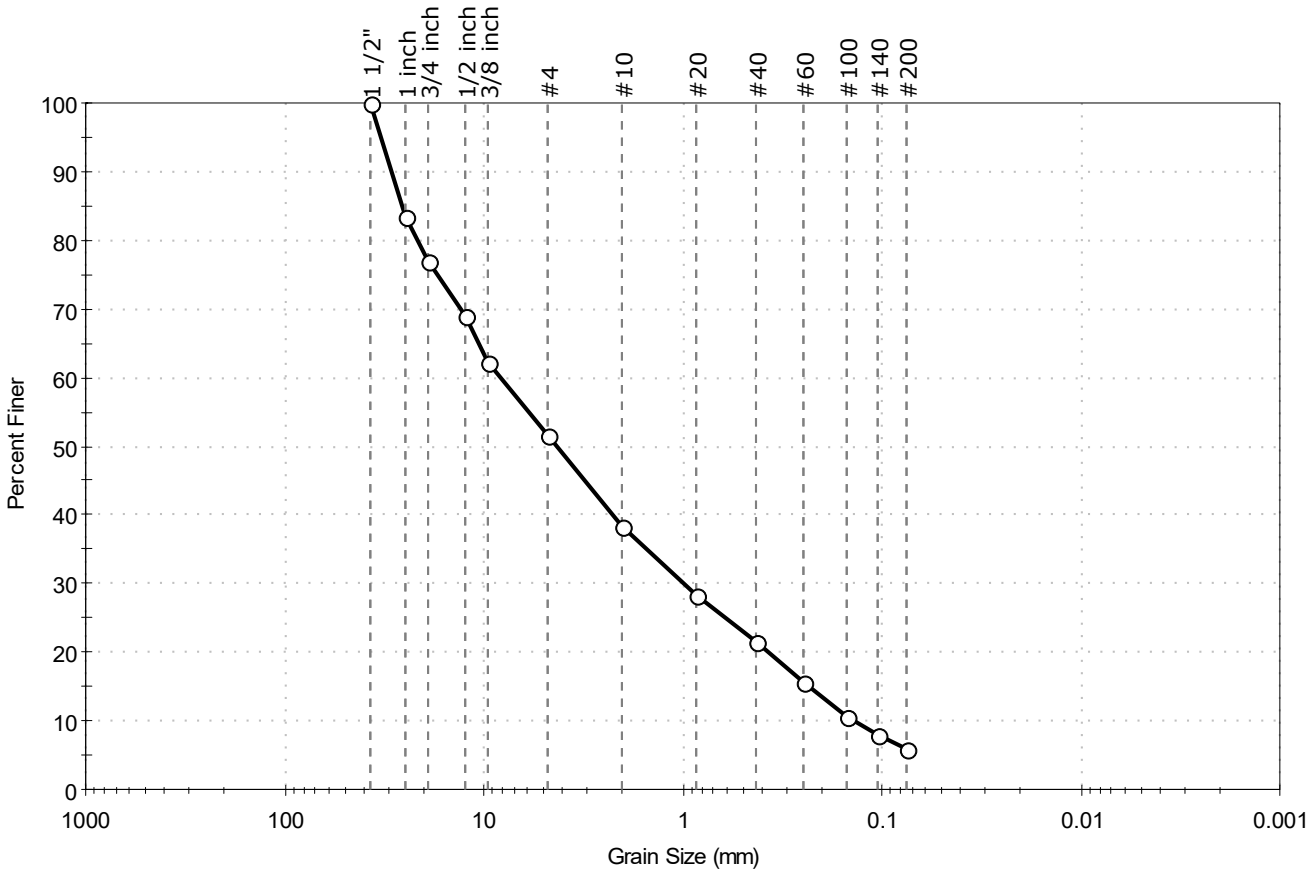
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-5	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S2	Test Date:	04/24/25	Checked By:	ank
Depth :	4-6 ft	Test Id:	811820		
Test Comment:	---				
Visual Description:	Moist, yellowish brown gravel with silt and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	48.3	45.8	5.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	83		
3/4 inch	19.00	77		
1/2 inch	12.50	69		
3/8 inch	9.50	62		
#4	4.75	52		
#10	2.00	38		
#20	0.85	28		
#40	0.42	21		
#60	0.25	16		
#100	0.15	11		
#140	0.11	8		
#200	0.075	5.9		

Coefficients

D_{85} = 25.9459 mm
D_{30} = 0.9844 mm
D_{60} = 8.2426 mm
D_{15} = 0.2352 mm
D_{50} = 4.2612 mm
D_{10} = 0.1381 mm
C_u = 59.686
C_c = 0.851

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

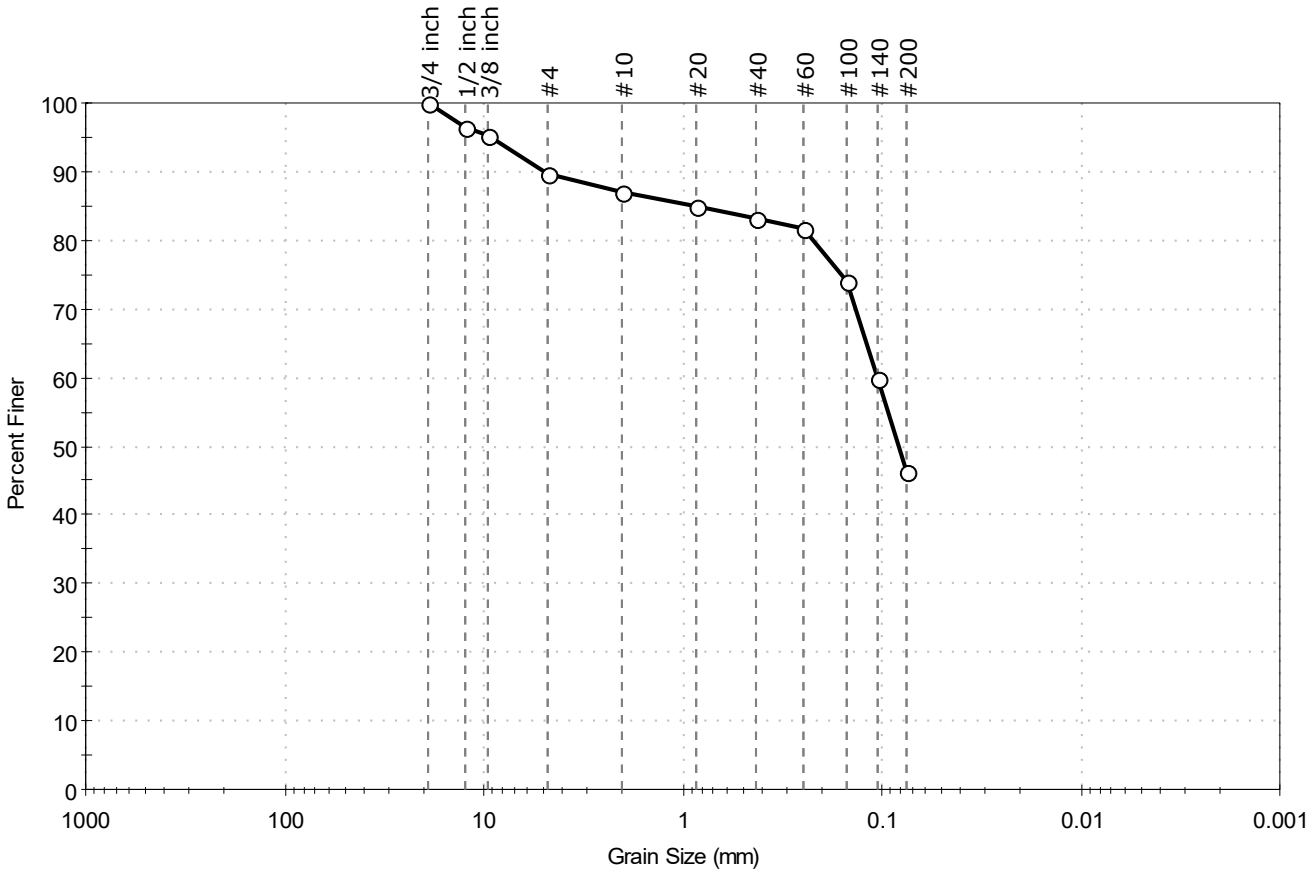
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-5	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S4B	Test Date:	04/23/25	Checked By:	ank
Depth :	14.42-16 ft	Test Id:	811819		
Test Comment:	---				
Visual Description:	Moist, brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	10.4	43.4	46.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	96		
3/8 inch	9.50	95		
#4	4.75	90		
#10	2.00	87		
#20	0.85	85		
#40	0.42	83		
#60	0.25	82		
#100	0.15	74		
#140	0.11	60		
#200	0.075	46		

Coefficients

D_{85} = 0.8649 mm D_{30} = N/A

D_{60} = 0.1061 mm D_{15} = N/A

D_{50} = 0.0825 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

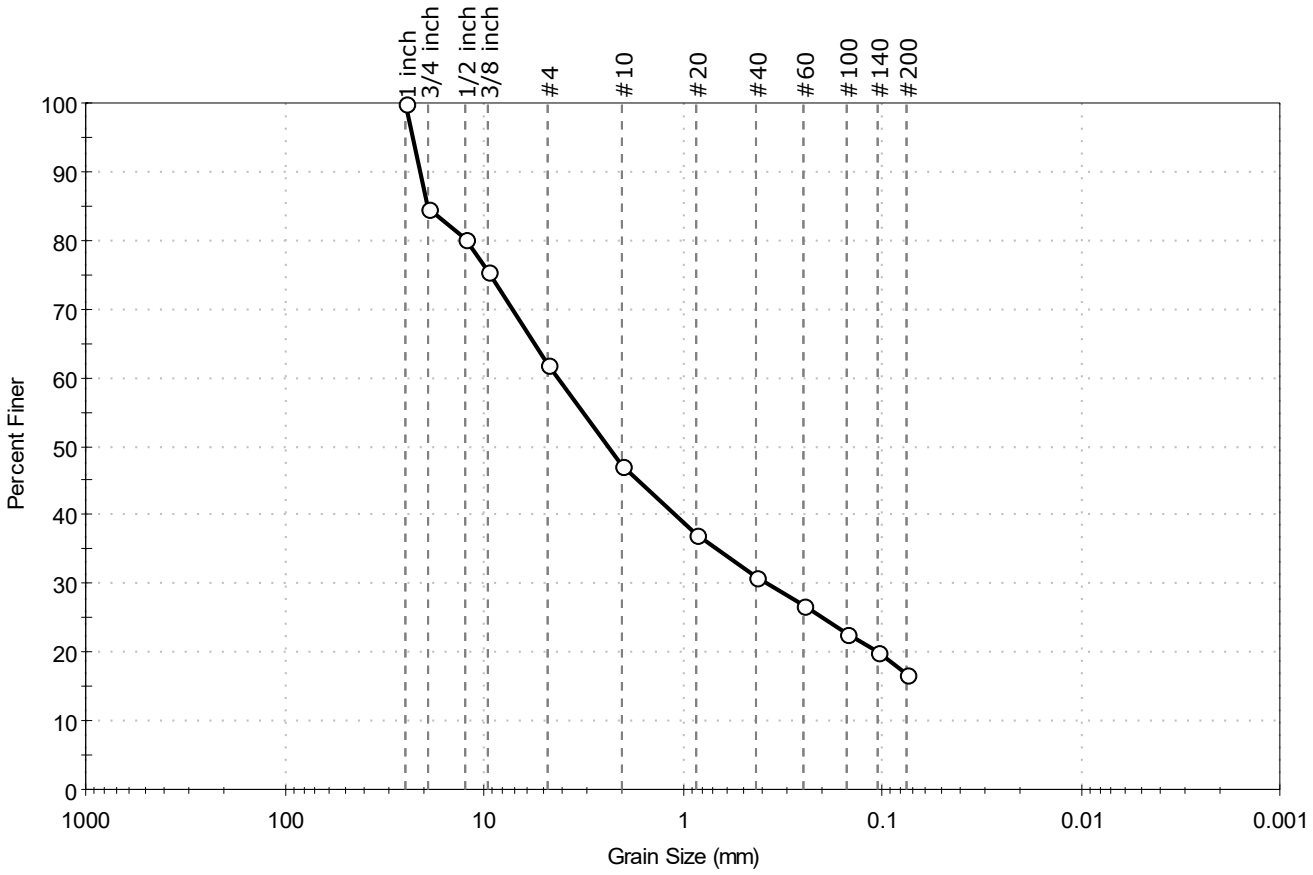
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-5	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S8	Test Date:	04/24/25	Checked By:	ank
Depth :	34-36 ft	Test Id:	811818		
Test Comment:	---				
Visual Description:	Moist, light olive brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	38.1	45.0	16.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	85		
1/2 inch	12.50	80		
3/8 inch	9.50	75		
#4	4.75	62		
#10	2.00	47		
#20	0.85	37		
#40	0.42	31		
#60	0.25	27		
#100	0.15	23		
#140	0.11	20		
#200	0.075	17		

Coefficients

D_{85} =19.0890 mm	D_{30} =0.3682 mm
D_{60} =4.2500 mm	D_{15} =N/A
D_{50} =2.3593 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

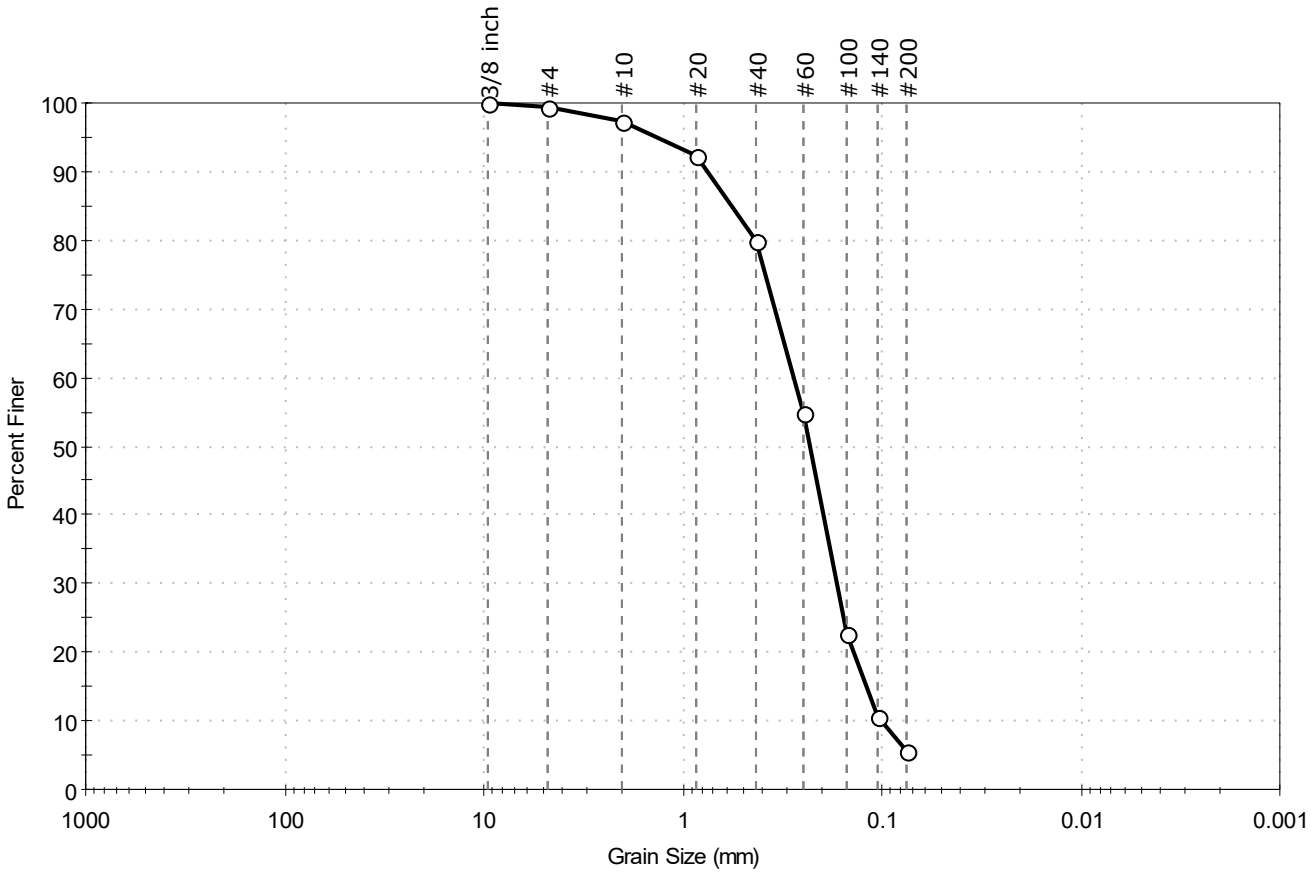
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-6	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S3B	Test Date:	04/23/25	Checked By:	ank
Depth :	9.33-11 ft	Test Id:	811817		

Test Comment: ---
Visual Description: Moist, dark yellowish brown sand with silt
Sample Comment: ---

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.5	93.9	5.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/8 inch	9.50	100		
#4	4.75	100		
#10	2.00	97		
#20	0.85	92		
#40	0.42	80		
#60	0.25	55		
#100	0.15	23		
#140	0.11	11		
#200	0.075	5.6		

Coefficients

D_{85} = 0.5654 mm D_{30} = 0.1682 mm
D_{60} = 0.2792 mm D_{15} = 0.1199 mm
D_{50} = 0.2316 mm D_{10} = 0.1013 mm
C_u = 2.756 C_c = 1.000

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

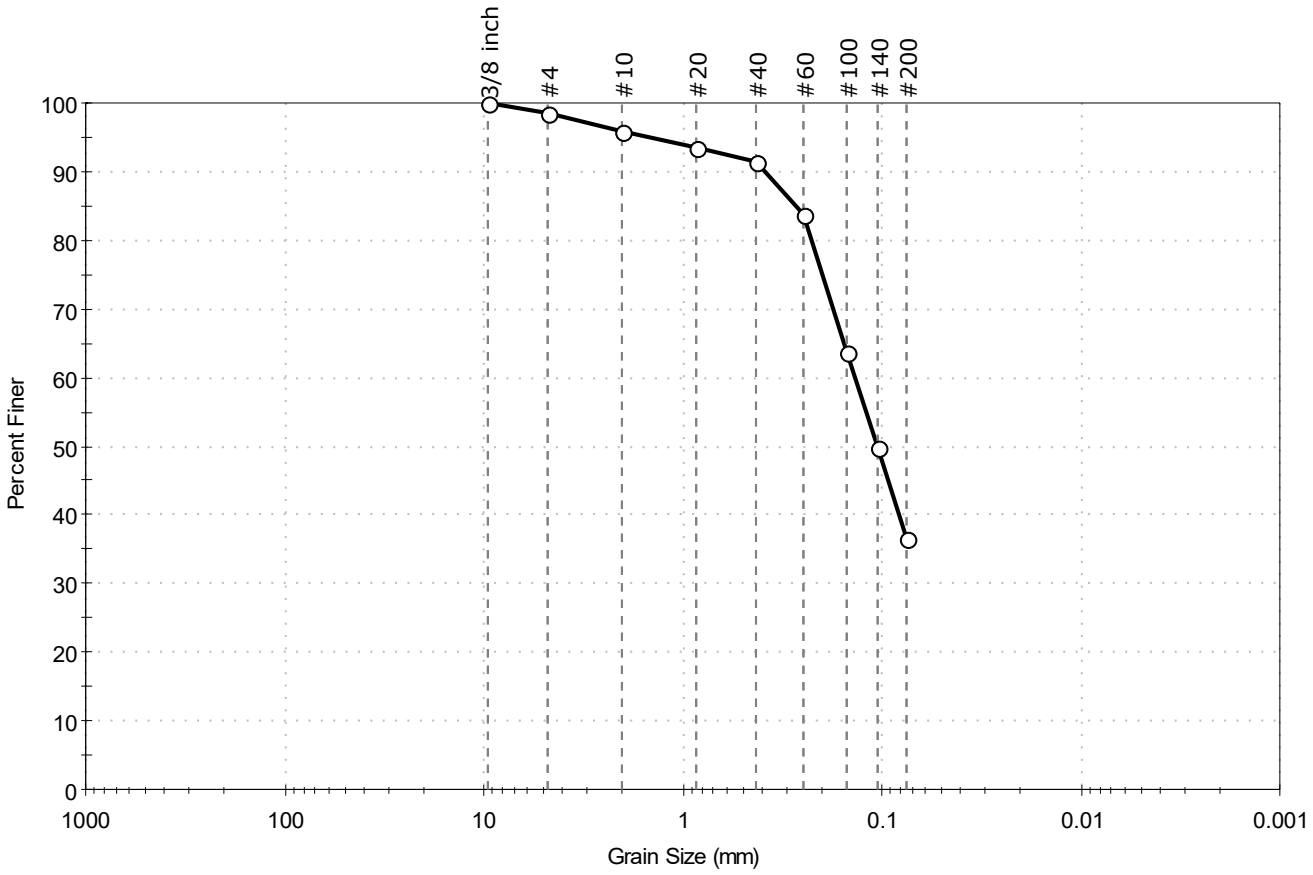
Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---

printed 4/25/2025 2:19:46 PM

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-6	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S6	Test Date:	04/23/25	Checked By:	ank
Depth :	24-26 ft	Test Id:	811816		
Test Comment:	---				
Visual Description:	Moist, very pale brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.5	62.0	36.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/8 inch	9.50	100		
#4	4.75	99		
#10	2.00	96		
#20	0.85	93		
#40	0.42	91		
#60	0.25	84		
#100	0.15	64		
#140	0.11	50		
#200	0.075	36		

Coefficients

D_{85} = 0.2724 mm D_{30} = N/A

D_{60} = 0.1371 mm D_{15} = N/A

D_{50} = 0.1066 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

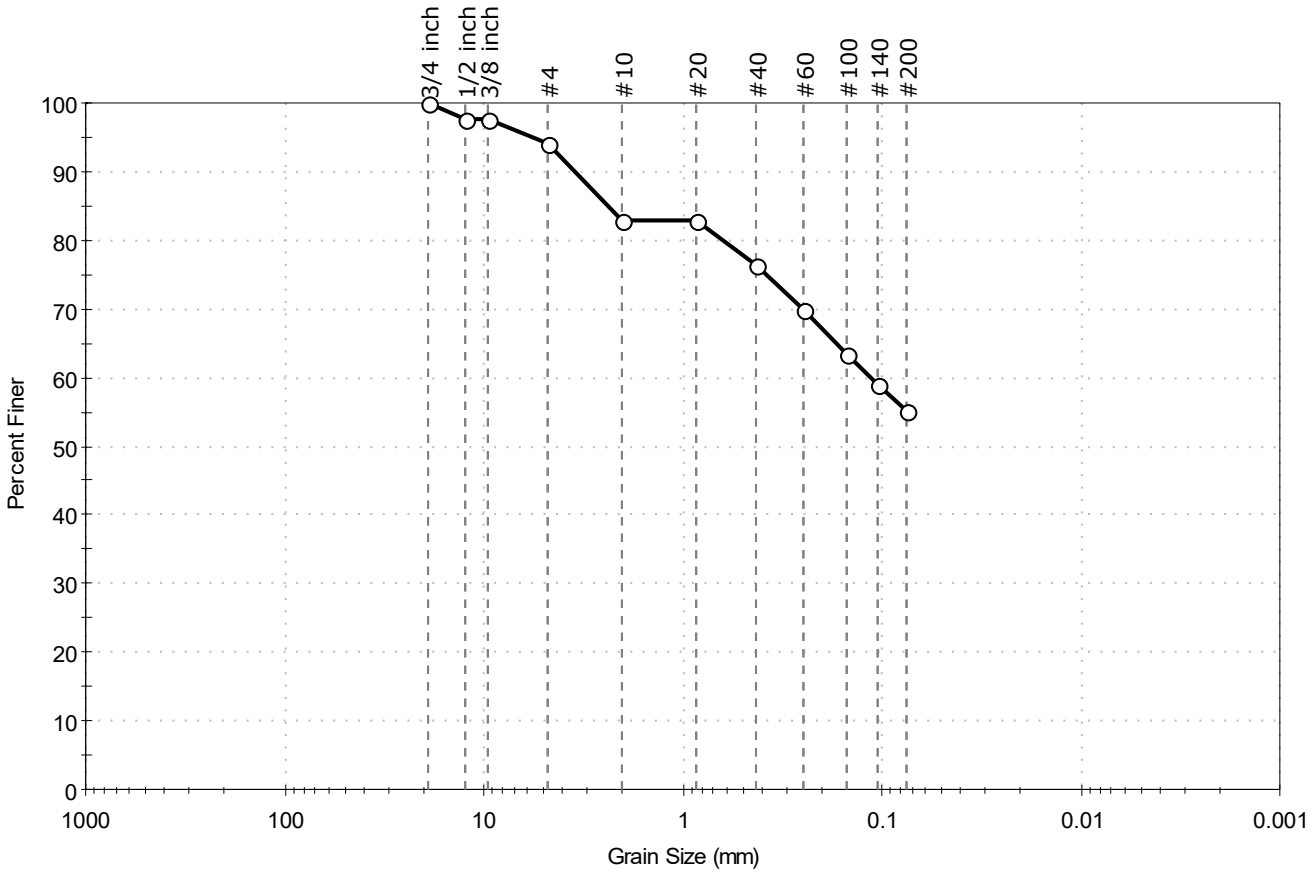
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-6	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S7	Test Date:	04/23/25	Checked By:	ank
Depth :	29-31 ft	Test Id:	811840		
Test Comment:	---				
Visual Description:	Moist, light brownish gray sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	6.0	39.0	55.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	98		
3/8 inch	9.50	98		
#4	4.75	94		
#10	2.00	83		
#20	0.85	83		
#40	0.42	76		
#60	0.25	70		
#100	0.15	63		
#140	0.11	59		
#200	0.075	55		

Coefficients

D_{85} = 2.3480 mm	D_{30} = N/A
D_{60} = 0.1136 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))

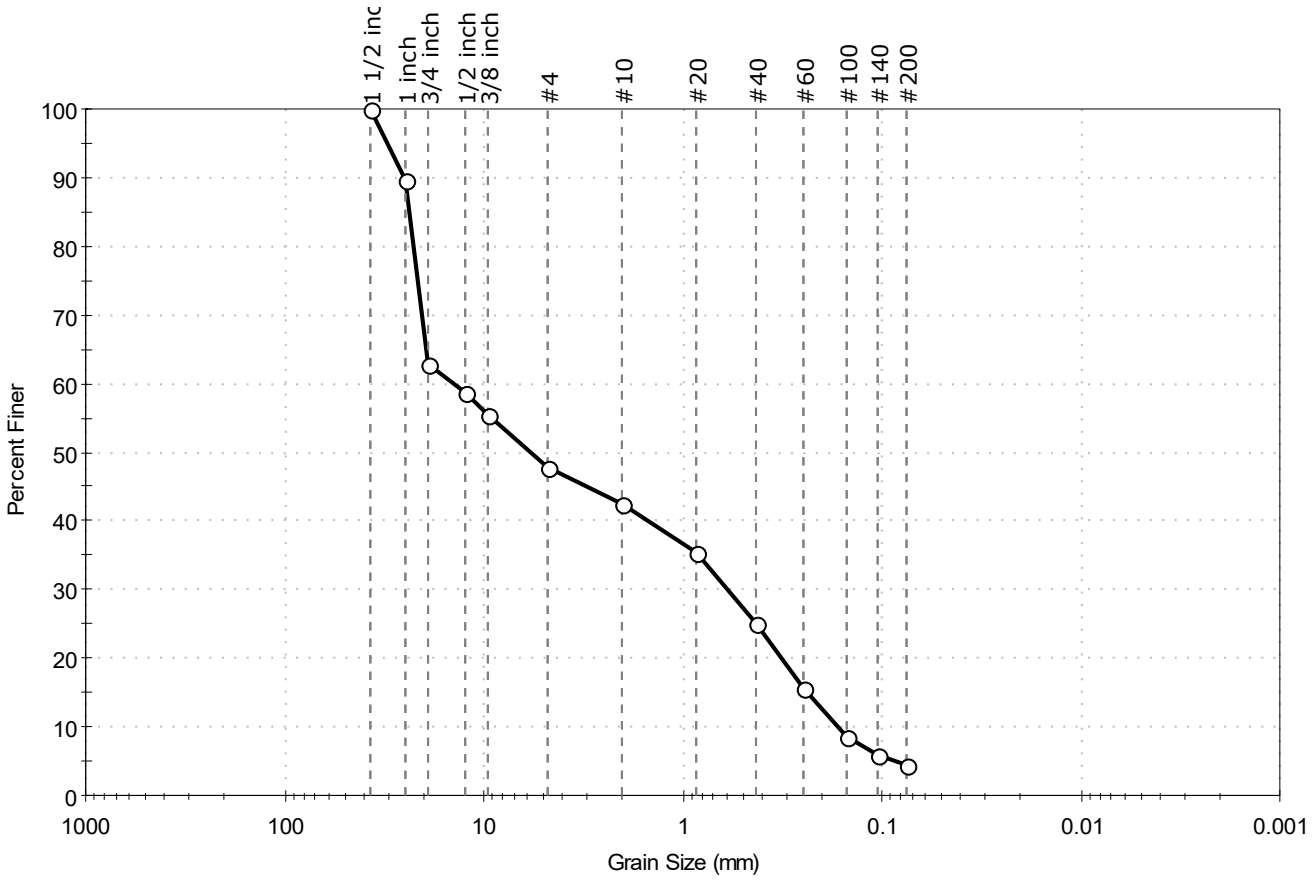
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-7	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S1	Test Date:	04/24/25	Checked By:	ank
Depth :	0-2 ft	Test Id:	811841		
Test Comment:	---				
Visual Description:	Moist, very dark gray gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	52.2	43.3	4.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2 inch	37.50	100		
1 inch	25.00	90		
3/4 inch	19.00	63		
1/2 inch	12.50	59		
3/8 inch	9.50	56		
#4	4.75	48		
#10	2.00	42		
#20	0.85	35		
#40	0.42	25		
#60	0.25	16		
#100	0.15	8		
#140	0.11	6		
#200	0.075	4.5		

Coefficients

D_{85} =23.8423 mm	D_{30} =0.5905 mm
D_{60} =14.3987 mm	D_{15} =0.2391 mm
D_{50} =5.7899 mm	D_{10} =0.1678 mm
C_u =85.809	C_c =0.144

Classification

ASTM — Poorly graded GRAVEL with Sand (GP)

AASHTO — Stone Fragments, Gravel and Sand (A-1-a (1))

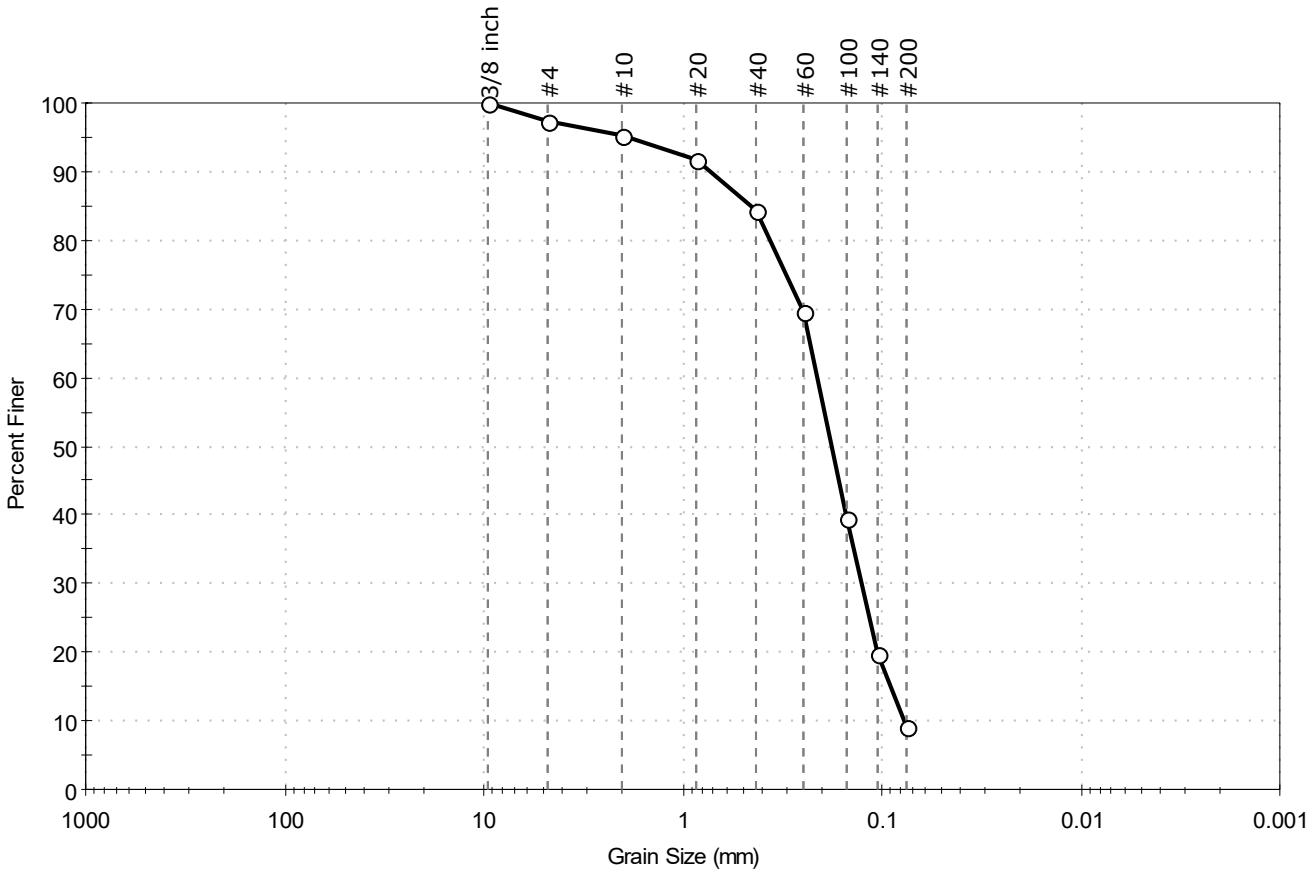
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-7	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S5	Test Date:	04/23/25	Checked By:	ank
Depth :	19-21 ft	Test Id:	811842		
Test Comment:	---				
Visual Description:	Moist, grayish brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	2.6	88.4	9.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/8 inch	9.50	100		
#4	4.75	97		
#10	2.00	95		
#20	0.85	92		
#40	0.42	84		
#60	0.25	70		
#100	0.15	39		
#140	0.11	20		
#200	0.075	9.0		

Coefficients

D_{85} =0.4479 mm	D_{30} =0.1271 mm
D_{60} =0.2125 mm	D_{15} =0.0911 mm
D_{50} =0.1794 mm	D_{10} =0.0775 mm
C_u =2.742	C_c =0.981

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

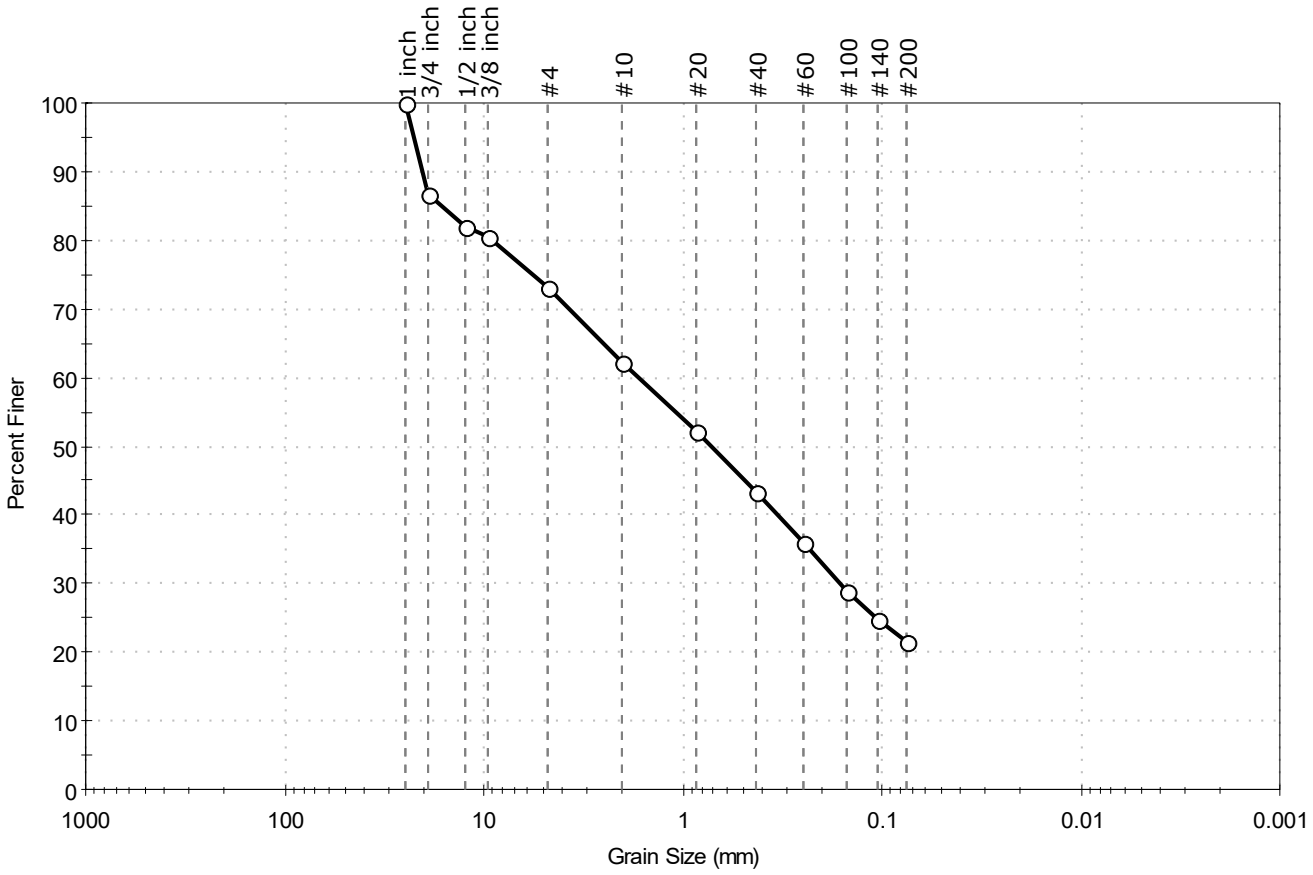
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	WSP USA, Inc.				
Project:	MassDOT Rail Retaining Wall				
Location:	Rochester, MA			Project No:	GTX-320886
Boring ID:	B-7	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S7	Test Date:	04/24/25	Checked By:	ank
Depth :	29-31 ft	Test Id:	811843		
Test Comment:	---				
Visual Description:	Moist, very pale brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	26.8	51.6	21.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	87		
1/2 inch	12.50	82		
3/8 inch	9.50	81		
#4	4.75	73		
#10	2.00	62		
#20	0.85	52		
#40	0.42	43		
#60	0.25	36		
#100	0.15	29		
#140	0.11	25		
#200	0.075	22		

Coefficients

D_{85} = 16.3379 mm	D_{30} = 0.1616 mm
D_{60} = 1.6593 mm	D_{15} = N/A
D_{50} = 0.7183 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

APPENDIX D

Culvert Calculations

CALCULATIONS

Date:	2/13/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	LDN
Subject:	Lateral Earth Pressure	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP44.27 and MP44.29 Culvert Replacement		

OBJECTIVE

Determine coefficients of lateral earth pressure acting on the proposed culvert wingwalls.

REFERENCES

1. Das, Braja M. 2011. Principles of Foundation Engineering, 7th ed. Cengage Learning, Stamford, CT.
2. WSP geotechnical test boring logs (Appendix A, Preliminary Geotechnical Design Report, dated August 2025).
3. MassDOT 2024 Standard Specifications for Highways and Bridges: Division III: Material Specifications.

ASSUMPTIONS

1. The backfill surface behind the wingwalls is assumed to be horizontal.

2. The design friction angles for the in-situ soil layers, based on correlation (Reference 1, Equation 2.26) to the average of the N_{60}-values encountered in all borings for each layer (Reference 2), are:

ϕ_{Fill}	=	30	degrees
$\phi_{Silty\ Sand\ \&\ Peat}$	=	29	degrees
ϕ_{Silt}	=	32	degrees
$\phi_{Sands\ and\ Gravels}$	=	35	degrees
$\phi_{Crushed\ Stone}$	=	37	degrees

3. The design friction angles for the proposed fill construction materials are assumed, based on engineering experience:

CALCULATION

1. Calculate the at-rest lateral earth pressure coefficient.

$$K_o = 1 - \sin\phi$$ (Ref. 1, Eqn. 7.3)

where:
ϕ = internal friction angle of soil

K_0 =	0.50	Existing Fill
	0.52	Silty Sand and Peat - In Situ
	0.47	Silt - In Situ
	0.43	Sands and Gravels - In Situ
	0.40	Crushed Stone - Fill

2. Calculate the full active and full passive earth pressure coefficients using Rankine theory.

$$K_a = \tan^2\left(45° - \frac{\phi}{2}\right)$$ (Ref. 1, page 330)

$$K_p = \tan^2\left(45° + \frac{\phi}{2}\right)$$ (Ref. 1, Eqn. 7.61)

for horizontal backfill surface, where:
ϕ = internal friction angle of soil

K_a =	0.33	Existing Fill
	0.35	Silty Sand and Peat - In Situ
	0.31	Silt - In Situ
	0.27	Sands and Gravels - In Situ
	0.25	Crushed Stone - Fill

Date:	2/13/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	LDN
Subject:	Lateral Earth Pressure	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP44.27 and MP44.29 Culvert Replacement		

K_p =	3.00	Existing Fill
	2.88	Silty Sand and Peat - In Situ
	3.25	Silt - In Situ
	3.69	Sands and Gravels - In Situ
	4.02	Crushed Stone - Fill

CONCLUSIONS

For the recommended soil parameters, the calculated lateral earth pressure coefficients for the proposed culvert range from 0.40 to 0.52 for the at-rest conditions, 0.25 to 0.35 for the Rankine full active earth pressure coefficient, and 2.88 to 4.02 for the Rankine full passive earth pressure coefficient.

CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.27	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

OBJECTIVE

Calculate the bearing resistance of the proposed culvert at MP 44.27 at a location where the interpreted groundwater table is highest relative to the footing embedment depth (approximately 22 feet southwest of the Rochester Siding Track, at Station 44+23.20 along the Construction Baseline, and at Offset + 25 along the proposed culvert centerline).

REFERENCES

1. WSP interpreted subsurface profile A-A' (Figure 1, Preliminary Geotechnical Design Report, dated August 2025).
2. WSP geotechnical test boring logs (Appendix A, Preliminary Geotechnical Design Report, dated August 2025).
3. AREMA. 2019. Manual for Railway Engineering, Volume 2, Chapter 8 Concrete Structures and Foundations.
4. AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024.
5. FHWA. 2002. Geotechnical Engineering Circular No. 6: Shallow Foundations. Report No. FHWA-SA-02-054.
6. WSP for Massachusetts Department of Transportation Rail & Transit Divisition, Cape Main Culvert Replacements at MP 44.27 & MP 44.29, Rochester, Plymouth County. PS&E Submission, dated May 20, 2025.

ASSUMPTIONS

1. The friction angle for each soil layer beneath the proposed culvert, based on correlation to the average of the N_{60}-values encountered in all borings for each layer (Reference 2) is:

$\phi_{\text{Silty Sand and Peat}}$ =	29	degrees
$\phi_{\text{Sands and Gravels}}$ =	35	degrees

2. The proposed finish grade elevation and proposed culvert invert elevation at the location of analysis are (Reference 6, sheet 14):

El. finish grade =	72.4	ft
El. proposed invert =	64.9	ft

3. Based on the cross section in Reference 6, sheet 14, the proposed culvert wall thickness and the proposed thickness of crushed stone pad beneath the culvert are estimated to be:

Proposed culvert wall thickness =	0.42	ft
Proposed crushed stone thickness beneath culvert =	1	ft

4. The interpreted water table elevation, based on measurements taken during the subsurface exploration program and mean high water (MHW) elevation (Reference 1):

WL elev. =	67.7	ft

5. Per Reference 6 sheet 14, a 1-foot-thick bed of Crushed Stone will be placed beneath the proposed culvert. This analysis considers the bearing resistance of the in-situ soil layers beneath the proposed crushed stone, consisting of Silty Sand, Peat, and Sand and Gravel. The Silty Sand and Peat are treated as a single soil layer for the purpose of this analysis since they have the same interpreted material properties.

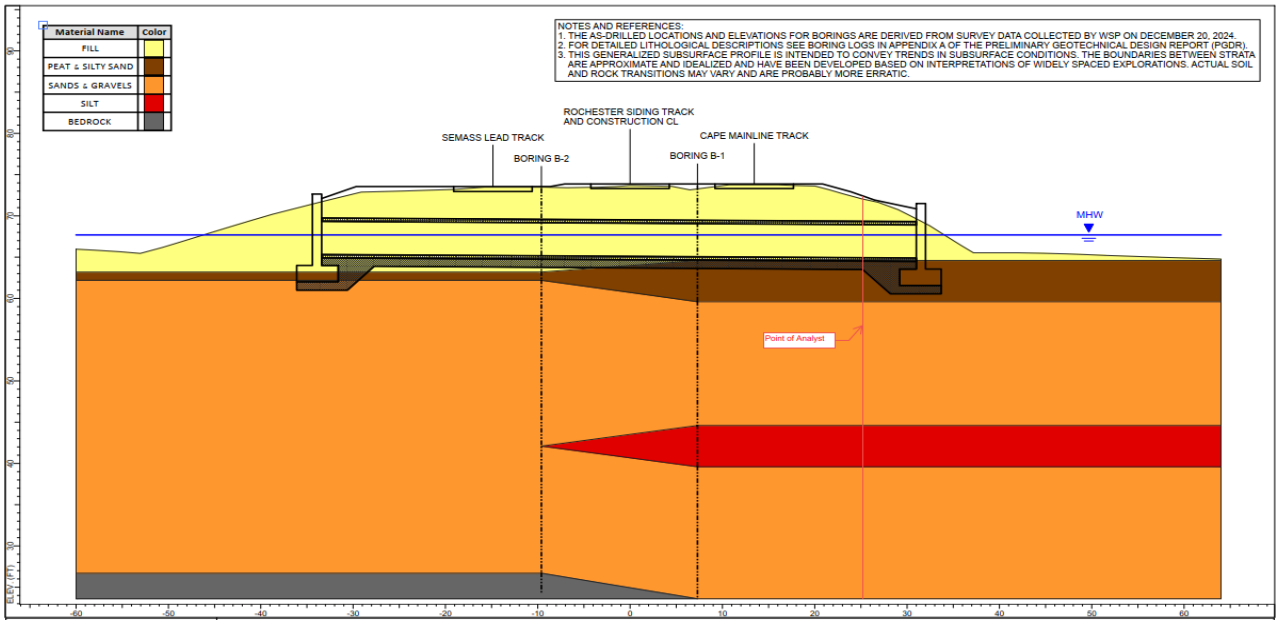
6. Per the AREMA Manual for Railway Engineering (Ref. 3, Section 3.4.3.1.b), the groundwater level will affect the bearing capacity and should be considered in the analysis. Since the AREMA manual only provides reduction factors for water tables located below the footing, this analysis will use reduction factors taken from FHWA GEC-6 (Ref. 5, Section 5.2.3.2) for water tables located above the footing.

7. The allowable settlement (s) is assumed to be 1 inch for this analysis.

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.27	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

8. The AREMA Manual for Railway Engineering (Ref. 3, Section 3.4.6) requires that footings on stratified non-homogeneous soils be analyzed assuming the most unfavorable condition, unless detailed conditions below the footing are obtained. This analysis will use our detailed subsurface profile below the footing from Refs. 1 and 2. The critical depth procedure from AASHTO LRFD (Ref. 4, Article 10.6.3.1.2d) will be used to identify which soil layers from the detailed profile will affect the estimated bearing capacity.

Location of Analysis:



(Reference 1)

CALCULATION

A. Determine the ultimate and allowable bearing capacity using Section 3.4.3, Footings on Granular Material, from the AREMA Manual for Railway Engineering.

Based on Reference 1, the proposed culvert will be bearing on the silty sand/peat layer. Since the same design properties are used for the silty sand layer and the peat layer, the two layers will be treated as one layer for the purpose of this calculation.

1. Calculate the net ultimate bearing capacity of a continuous strip footing (Q_{u1}) for the existing silty sand/peat layer (Layer

$$Q_u = 0.5\gamma B N_\gamma C_{w\gamma} + D_f\gamma(N_q - 1)C_{wq}$$ (Ref. 3, Eqn 3.4.3.2 (1), modified with groundwater reduction factors from Ref. 5, Section 5.2.3.2)

where:

B = footing width, ft (Ref. 6, Sheet 14) B = 4.8 ft

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.27	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

D_f = footing depth, ft — D_{f1} = 8.9 ft

γ = unit weight of the granular material, kilopound/cubic foot — γ = 0.120 kcf

N_γ and N_q = dimensionless bearing capacity factors which are a function of the internal angle of friction, φ (Ref. 3, Figure 8-3-3) — N_γ = 13, N_q = 16

$$C_{wq} = 0.5 + 0.5\left(\frac{D_w}{D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-10) — C_{wq} = 0.8 (Assumption 6)

$$C_{w\gamma} = 0.5 + 0.5\left(\frac{D_w}{1.5B_f + D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-9) — $C_{w\gamma}$ = 0.6 (Assumption 6)

D_w = groundwater depth, ft — D_w = 4.7 ft (Assumption 4)

Q_{u1} = 15 ksf

2. Calculate the net ultimate bearing capacity of a continuous footing (Q_{u2}) for the existing sands and gravels layer (Layer 2).

$$Q_u = 0.5\gamma B N_\gamma C_{w\gamma} + D_f\gamma(N_q - 1)C_{wq}$$ (Ref. 3, Eqn 3.4.3.2 (1), modified with groundwater reduction factors from Ref. 5, Section 5.2.3.2)

where:

B = footing width, ft (Ref. 6, Sheet 14) — B = 4.8 ft

D_f = footing depth, ft — D_{f2} = 12.8 ft

γ = unit weight of the granular material, kilopound/cubic foot — γ = 0.130 kcf

N_γ and N_q = dimensionless bearing capacity factors which are a function of the internal angle of friction, φ (Ref. 3, Figure 8-3-3) — N_γ = 37, N_q = 33

$$C_{wq} = 0.5 + 0.5\left(\frac{D_w}{D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-10) — C_{wq} = 0.7 (Assumption 6)

$$C_{w\gamma} = 0.5 + 0.5\left(\frac{D_w}{1.5B_f + D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-9) — $C_{w\gamma}$ = 0.6 (Assumption 6)

D_w = groundwater depth, ft — D_w = 4.7 ft (Assumption 4)

Q_{u2} = 44 ksf

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.27	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

3. Calculate the critical depth below the footing for a two-layer system, H_{crit}, and compare to the depth below the footing of the second soil layer, H.

$$H_{crit} = \frac{(3B)\ln\left(\frac{q_1}{q_2}\right)}{2\left(1+\frac{B}{L}\right)}$$ (Ref. 4, Eqn. 10.6.3.1.2d-1)

L =	66.3	ft	(Ref. 6, sheet 14)
H_{crit} =	-7.3	ft	
H = depth of Layer 2 below the footing	H = 3.9	ft	(Assumption 5)

Since H > H_{crit}, a two-layer system does not apply, and thus $Q_u = Q_{u1}$.

Q_u = 15 ksf

4. Apply Factor of Safety to calculate allowable bearing capacity (Q_{all})

Q_{all} = The net ultimate bearing pressure divided by an appropriate factor of safety.

FOS = 3 (Ref. 3, Section 3.4.2)

Q_{all} = 5 ksf

B. Determine the allowable settlement pressure.

1. Use AREMA (Ref. 3 Section 3.4.3.3) to determine allowable settlement pressure, Q_{s1} for the silty sand layer.

For B > 4 feet (1220 mm):

$$Q_s = \left(\frac{Ns}{12}\right)\frac{(B+1)}{B}$$

where:

N =	the average standard penetration blowcount (N	N_{60} =	4	(Reference 2)
B =	the footing width, feet	B =	4.8	ft (Ref. 6, Sheet 14)
s =	the allowable settlement, inches	s =	1	in (Assumption 7)

A 50% reduction in the allowable settlement pressure is applied as the water table is at a depth above the footing.

Q_{s1} = 0.2 tsf

Q_{s1} = 0.4 ksf

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.27	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

2. Use AREMA (Ref. 3 Section 3.4.3.3) to determine allowable settlement pressure, Q_{s2} for the well graded sands and gravels layer.

For B > 4 feet (1220 mm):

$$Q_s = \left(\frac{Ns}{12}\right)\frac{(B+1)}{B}$$

where:

N =	the average standard penetration blowcount (N	N_{60} =	33	(Reference 2)
B =	the footing width, feet	B =	4.8	ft (Ref. 6, Sheet 14)
s =	the allowable settlement, inches	s =	1	in (Assumption 7)

A 50% reduction in the allowable settlement pressure is applied as the water table is at a depth above the footing.

Q_{s2} = 1.7 tsf

Q_{s2} = 3.3 ksf

CONCLUSIONS

For the proposed culvert, the estimated allowable bearing capacity for a continuous footing bearing on the silty sand and peat layer with a 1-foot-thick pad of crushed stone below the culvert is 5 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 0.4 ksf after a 50% reduction is applied due to the water table located above the footing. If the interpreted 4-foot-thickness of silty sand and peat below the proposed culvert footing elevation were excavated and replaced with gravel borrow or crushed stone, the estimated allowable bearing capacity for a continuous footing bearing on the in-situ sand and gravel layer is 15 ksf using a factor of safety of 3, and the estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to the water table located above the footing.

CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at MP 44.27 Proposed Outlet Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

OBJECTIVE

Calculate the bearing resistance beneath the largest wingwall (the southwestern wingwall) for the proposed culvert at MP 44.27.

REFERENCES

1. WSP interpreted subsurface profile A-A' (Figure 1, Preliminary Geotechnical Design Report, dated August 2025).
2. WSP geotechnical test boring logs (Appendix A, Preliminary Geotechnical Design Report, dated August 2025).
3. AREMA. 2019. Manual for Railway Engineering, Volume 2, Chapter 8 Concrete Structures and Foundations.
4. AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024.
5. FHWA. 2002. Geotechnical Engineering Circular No. 6: Shallow Foundations. Report No. FHWA-SA-02-054.
6. WSP for Massachusetts Department of Transportation Rail & Transit Divisition, Cape Main Culvert Replacements at MP 44.27 & MP 44.29, Rochester, Plymouth County. PS&E Submission, dated May 20, 2025.

ASSUMPTIONS

1. The friction angle for each soil layer beneath the proposed wingwall, based on correlation to the average of the N_{60}-values encountered in all borings for each layer (Reference 2) is:

$\phi_{\text{Silty Sand and Peat}}$ =	29	degrees
$\phi_{\text{Sands and Gravels}}$ =	35	degrees

2. The proposed finish grade elevation (top of wingwall) is to be the same as top of headwall at the location of analysis. The proposed invert elevation in front of the wall is taken from Reference 6, Sheet 14 & 16:

El. finish grade, top of wall =	71.5	ft
El. Invert =	64.9	ft

3. The interpreted water table elevation, based on measurements taken during the subsurface exploration program and mean high water (MHW) elevation (Reference 6, sheet 14):

WL elev. =	67.7	ft

4. Per Reference 6, sheet 16, the wingwall footing is to be embedded to an elevation of:

El. Bottom of Wingwall Footing Downstream =	61.6	ft

5. Per Reference 6 sheet 14, a 1-foot-thick bed of Crushed Stone will be placed beneath the proposed culvert and extend beneath the proposed wingwalls at the same thickness. This analysis considers the bearing resistance of the in-situ soil layers beneath the proposed crushed stone, consisting of Silty Sand and Sands and Gravels.

6. Per the AREMA Manual for Railway Engineering (Ref. 3, Section 3.4.3.1.b), the groundwater level will affect the bearing capacity and should be considered in the analysis. Since the AREMA manual only provides reduction factors for water tables located below the footing, this analysis will use reduction factors taken from FHWA GEC-6 (Ref. 5, Section 5.2.3.2) for water tables located above the footing.

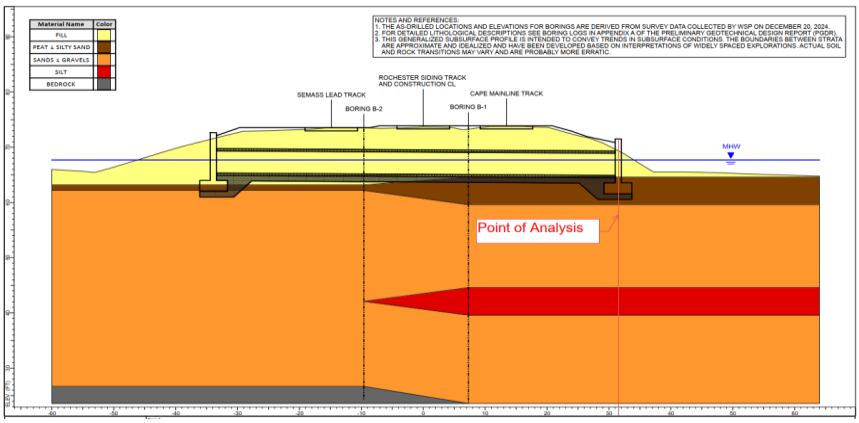
7. The allowable settlement (s) is assumed to be 1 inch for this analysis.

8. The AREMA Manual for Railway Engineering (Ref. 3, Section 3.4.6) requires that footings on stratified non-homogeneous soils be analyzed assuming the most unfavorable condition, unless detailed conditions below the footing are obtained. This analysis will use our detailed subsurface profile below the footing from Refs. 1 and 2. The critical depth procedure from AASHTO LRFD (Ref. 4, Article 10.6.3.1.2d) will be used to identify which soil layers from the detailed profile will affect the estimated bearing capacity.

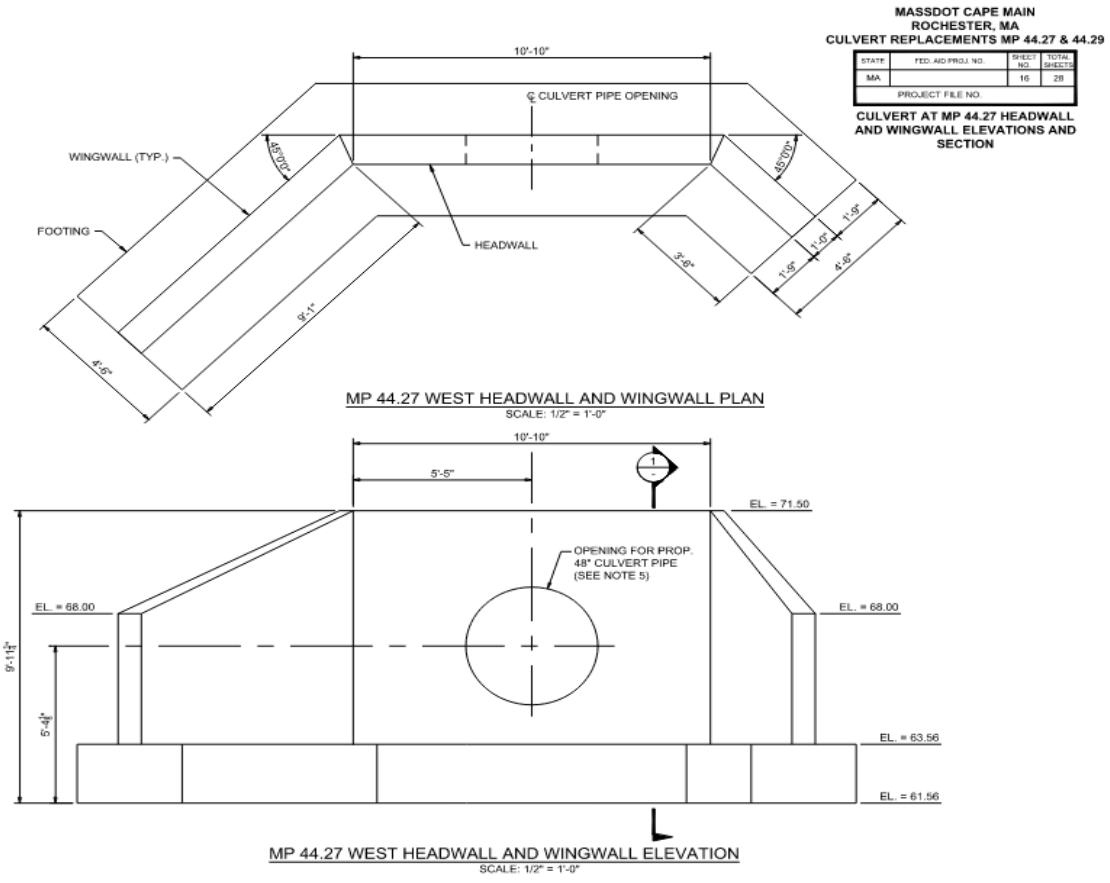
CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at MP 44.27 Proposed Outlet Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

Location of Analysis:



(Reference 1)



(Reference 6, sheet 16)

https://wsponlinenam.sharepoint.com/Sites/US-MASSGeotech/Shared Documents/MassDOT Rochester RR Culvert/05 Technical Work/Analysis/Culverts/Bearing resistance MP 44.27 proposed wingwalls US0035009.6582 Rochester

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at MP 44.27 Proposed Outlet Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

CALCULATION

A. Determine the ultimate and allowable bearing capacity using Section 3.4.3, Footings on Granular Material, from the AREMA Manual for Railway Engineering.

1. Calculate the net ultimate bearing capacity of a continuous strip footing (Q_{u1}) for the existing silty sand layer (Layer 1).

$$Q_u = 0.5\gamma B N_\gamma C_{w\gamma} + D_f\gamma(N_q - 1)C_{wq}$$ (Ref. 3, Eqn 3.4.3.2 (1), modified with groundwater reduction factors from Ref. 5, Section 5.2.3.2)

where:

B =	footing width, ft	(Ref. 6, Sheet 16)	B =	4.5	ft
D_f =	footing depth, ft		D_{f1} =	4.3	ft (Assumption 5)
γ =	unit weight of the granular material, kilopound/cubic foot		γ =	0.120	kcf
N_γ and N_q =	dimensionless bearing capacity factors which are a function of the internal angle of friction, φ (Ref. 3, Figure 8-3-3)		N_γ =	13	
			N_q =	16	

$$C_{wq} = 0.5 + 0.5\left(\frac{D_w}{D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-10) C_{wq} = 0.5 (Assumption 6)

$$C_{w\gamma} = 0.5 + 0.5\left(\frac{D_w}{1.5B_f + D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-9) $C_{w\gamma}$ = 0.5 (Assumption 6)

D_w = groundwater depth, ft — D_w = 0.0 ft (Assumption 4)

Q_{u1} = 6 ksf

2. Calculate the net ultimate bearing capacity of a continuous strip footing (Q_{u2}) for the existing sands and gravels layer (Layer 2).

$$Q_u = 0.5\gamma B N_\gamma C_{w\gamma} + D_f\gamma(N_q - 1)C_{wq}$$ (Ref. 3, Eqn 3.4.3.2 (1), modified with groundwater reduction factors from Ref. 5, Section 5.2.3.2)

where:

B =	footing width, ft	(Ref. 6, Sheet 16)	B =	4.5	ft
D_f =	footing depth, ft		D_{f2} =	5.3	ft
γ =	unit weight of the granular material, kilopound/cubic foot		γ =	0.130	kcf

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at MP 44.27 Proposed Outlet Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

N_γ and N_q = dimensionless bearing capacity factors which are a function of the internal angle of friction, φ (Ref. 3, Figure 8-3-3)

N_γ = 37

N_q = 33

$$C_{wq} = 0.5 + 0.5\left(\frac{D_w}{D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-10)

C_{wq} = 0.5 (Assumption 6)

$$C_{w\gamma} = 0.5 + 0.5\left(\frac{D_w}{1.5B_f + D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-9)

$C_{w\gamma}$ = 0.5 (Assumption 6)

D_w = groundwater depth, ft

D_w = 0.0 ft (Assumption 4)

Q_{u2} = 16 ksf

3. Calculate the critical depth below the footing for a two-layer system, H_{crit}, and compare to the depth below the footing of the second soil layer, H.

$$H_{crit} = \frac{(3B)\ln\left(\frac{q_1}{q_2}\right)}{2\left(1 + \frac{B}{L}\right)}$$ (Ref. 4, Eqn. 10.6.3.1.2d-1)

L = 9.1 ft (Reference 6, sheet 16

H_{crit} = -4.8 ft

H = depth of Layer 2 below the footing

H = 1.0 ft (Assumption 5)

Since H > H_{crit}, a two-layer system does not apply, and thus $Q_u = Q_{u1}$.

Q_u = 6 ksf

4. Apply Factor of Safety to calculate allowable bearing capacity (Q_{all})

FOS = 3 (Ref. 3, Section 3.4.2)

Q_{all} = The net ultimate bearing pressure divided by an appropriate factor of safety.

Q_{all} = 2 ksf

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at MP 44.27 Proposed Outlet Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

B. Determine the allowable settlement pressure.

1. Use AREMA (Ref. 3 Section 3.4.3.3) to determine allowable settlement pressure, Q_{s1} for the silty sand layer.

For B > 4 feet (1220 mm):

$$Q_s = \left(\frac{Ns}{12}\right)\frac{(B+1)}{B}$$

where:

N =	the average standard penetration blowcount (N60)	N_1 =	4	(Reference 2)
B =	the footing width, feet	B =	4.5	ft (Ref. 6, Sheet 16)
s =	the allowable settlement, inches	s =	1	in (Assumption 7)

A 50% reduction in the allowable settlement pressure is applied as the water table is at a depth above the footing.

Q_{s1} =	0.2	tsf
Q_{s1} =	0.4	ksf

2. Use AREMA (Ref. 3 Section 3.4.3.3) to determine allowable settlement pressure, Q_{s2} for the sands and gravels layer.

For B > 4 feet (1220 mm):

$$Q_s = \left(\frac{Ns}{12}\right)\frac{(B+1)}{B}$$

where:

N =	the average standard penetration blowcount (N60)	N_2 =	33	(Reference 2)
B =	the footing width, feet	B =	4.5	ft (Ref. 6, Sheet 16)
s =	the allowable settlement, inches	s =	1	in (Assumption 7)

A 50% reduction in the allowable settlement pressure is applied as the water table is at a depth above the footing.

Q_{s2} =	1.7	tsf
Q_{s2} =	3.4	ksf

CONCLUSIONS

For the proposed culvert, the estimated allowable bearing capacity for a continuous strip footing bearing on the silty sand layer with 1 foot of crushed stone below the wingwall is 2 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 0.4 ksf after a 50% reduction is applied due to the water table located above the footing. If the interpreted 2-foot-thickness of silty sand below the proposed wingwall footing elevation were excavated and replaced with gravel borrow or crushed stone, the estimated allowable bearing capacity for a continuous footing bearing on the in-situ sand and gravel layer is 5 ksf using a factor of safety of 3, and the estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to the water table located above the footing.

CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

OBJECTIVE

Calculate the bearing resistance of the proposed culvert MP 44.29 at a location where the interpreted groundwater table is highest relative to the footing embedment depth (approximately 22 feet southwest of the Rochester Siding Track, at approximately Station 45+14.10 along the Construction Baseline, and at approximately Offset + 23 along the proposed culvert centerline).

REFERENCES

1. WSP interpreted subsurface profile A-A' (Figure 1, Preliminary Geotechnical Design Report, dated August 2025).
2. WSP geotechnical test boring logs (Appendix A, Preliminary Geotechnical Design Report, dated August 2025).
3. AREMA. 2019. Manual for Railway Engineering, Volume 2, Chapter 8 Concrete Structures and Foundations.
4. AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024.
5. FHWA. 2002. Geotechnical Engineering Circular No. 6: Shallow Foundations. Report No. FHWA-SA-02-054.
6. WSP for Massachusetts Department of Transportation Rail & Transit Divisition, Cape Main Culvert Replacements at MP 44.27 & MP 44.29, Rochester, Plymouth County. PS&E Submission, dated May 20, 2025.

ASSUMPTIONS

1. The friction angle for each soil layer beneath the proposed culvert, based on correlation to the average of the N_{60}-values encountered in all borings for each layer (Reference 2) is:

$\phi_{\text{Sands and Gravels}}$ =	35	degrees

2. The proposed finish grade elevation and proposed culvert invert elevation at the location of analysis are (Reference 6, sheet 15):

El. finish grade =	73.8	ft
El. proposed invert =	62.1	ft

3. Based on the cross section in Reference 6, sheet 15, the proposed culvert wall thickness and the proposed thickness of crushed stone pad beneath the culvert are estimated to be:

Proposed culvert wall thickness =	0.42	ft
Proposed crushed stone thickness beneath culvert =	1	ft

4. The interpreted water table elevation, based on measurements taken during the subsurface exploration program and ordinary high water (OHW) elevation (Reference 6, Sheet 15):

WL elev. =	67.7	ft

5. Per Reference 6 sheet 15, a 1-foot-thick bed of Crushed Stone will be placed beneath the proposed culvert. This analysis considers the bearing resistance of the in-situ soil beneath the proposed crushed stone, consisting of Sands and Gravels.

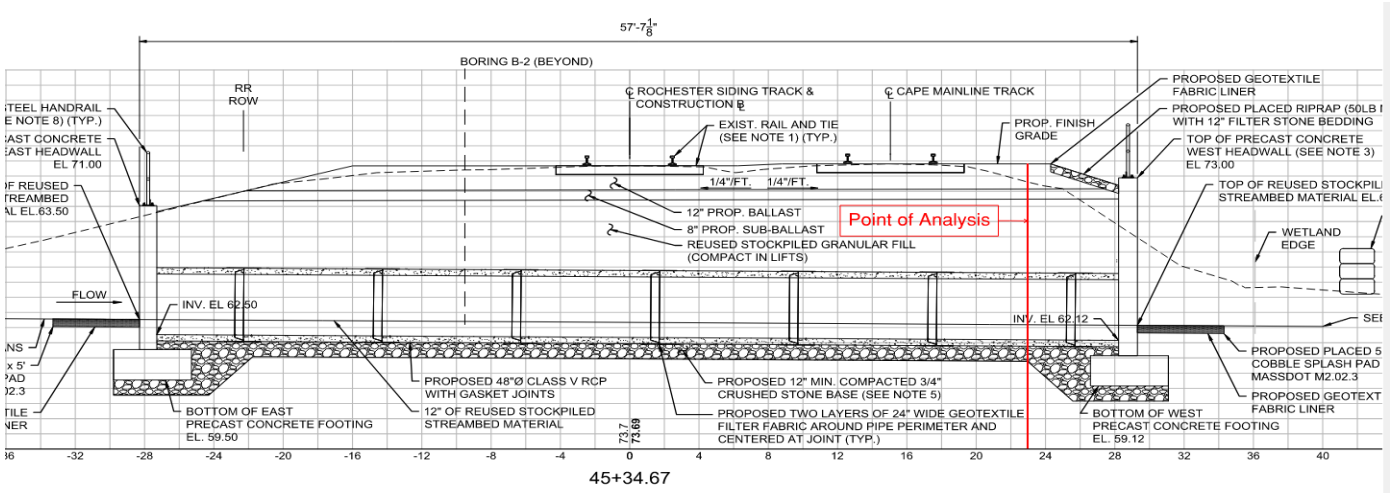
6. Per the AREMA Manual for Railway Engineering (Ref. 3, Section 3.4.3.1.b), the groundwater level will affect the bearing capacity and should be considered in the analysis. Since the AREMA manual only provides reduction factors for water tables located below the footing, this analysis will use reduction factors taken from FHWA GEC-6 (Ref. 5, Section 5.2.3.2) for water tables located above the footing.

7. The allowable settlement (s) is assumed to be 1 inch for this analysis.

CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

Location of Analysis:



(Reference 1)

CALCULATION

A. Determine the ultimate and allowable bearing capacity using Section 3.4.3, Footings on Granular Material, from the AREMA Manual for Railway Engineering.

The soil stratigraphy encountered in the nearest boring B-2 (Ref. 2) is used in this analysis. Based on this stratigraphy and the proposed culvert invert elevation from Ref. 6, the proposed culvert will be bearing on the sands and gravels layer. The existing fill and peat layers encountered in boring B-2 will be excavated during construction.

1. Calculate the net ultimate bearing capacity of a continuous footing (Q_u) for the existing sands and gravels layer.

$$Q_u = 0.5\gamma B N_\gamma C_{w\gamma} + D_f\gamma(N_q - 1)C_{wq}$$

(Ref. 3, Eqn 3.4.3.2 (1), modified with groundwater reduction factors from Ref. 5, Section 5.2.3.2)

where:

B =	footing width, ft (Ref. 6, Sheet 15)	B =	4.8	ft
D_f =	footing depth, ft	D_f =	13.1	ft
γ =	unit weight of the granular material, kilopound/cubic foot	γ =	0.130	kcf

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

N_γ and N_q = dimensionless bearing capacity factors which are a function of the internal angle of friction, φ (Ref. 3, Figure 8-3-3)

N_γ = 37
N_q = 33

$$C_{wq} = 0.5 + 0.5\left(\frac{D_w}{D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-10)

C_{wq} = 0.7 (Assumption 6)

$$C_{w\gamma} = 0.5 + 0.5\left(\frac{D_w}{1.5B_f + D_f}\right) \leq 1.0$$ (Ref. 5, Eqn. 5-9)

$C_{w\gamma}$ = 0.6 (Assumption 6)

D_w = groundwater depth, ft

D_w = 6.1 ft (Assumption 4)

Q_u = 48 ksf

2. Apply Factor of Safety to calculate allowable bearing capacity (Q_{all})

Q_{all} = The net ultimate bearing pressure divided by an appropriate factor of safety.

FOS = 3 (Ref. 3, Section 3.4.2)

Q_{all} = 16 ksf

B. Determine the allowable settlement pressure.

1. Use AREMA (Ref. 3 Section 3.4.3.3) to determine allowable settlement pressure, Q_s for the well-graded sands and gravels layer.

For B > 4 feet (1220 mm):

$$Q_s = \left(\frac{Ns}{12}\right)\frac{(B+1)}{B}$$

where:

N = average standard penetration blowcount (N60)

N_{60} = 33 (Reference 2)

B = the footing width, feet

B = 4.8 ft (Ref. 6, Sheet 15)

s = the allowable settlement, inches

s = 1 in (Assumption 7)

A 50% reduction in the allowable settlement pressure is applied as the water table is at a depth above the footing.

Q_s = 1.7 tsf

Q_s = 3.3 ksf

CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	JKW/KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

CONCLUSIONS

For the proposed culvert, the estimated allowable bearing capacity for a continuous footing bearing on the in-situ sands and gravels layer with 1 foot of crushed stone below the culvert is 16 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to the water table located above the footing.

CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29 Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

OBJECTIVE

Calculate the bearing resistance beneath the largest wingwall or headwall (East Headwall) for the proposed culvert at MP 44.29.

REFERENCES

1. WSP interpreted subsurface profile A-A' (Figure 1, Preliminary Geotechnical Design Report, dated August 2025).
2. WSP geotechnical test boring logs (Appendix A, Preliminary Geotechnical Design Report, dated August 2025).
3. AREMA. 2019. Manual for Railway Engineering, Volume 2, Chapter 8 Concrete Structures and Foundations.
4. AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024.
5. FHWA. 2002. Geotechnical Engineering Circular No. 6: Shallow Foundations. Report No. FHWA-SA-02-054.
6. WSP for Massachusetts Department of Transportation Rail & Transit Divisition, Cape Main Culvert Replacements at MP 44.27 & MP 44.29, Rochester, Plymouth County. PS&E Submission, dated May 20, 2025.

ASSUMPTIONS

1. The friction angle for each soil layer beneath the proposed wingwall, based on correlation to the average of the N_{60}-values encountered in all borings for each layer (Reference 2) is:

$\phi_{\text{Sands and Gravels}}$ =	35	degrees

2. The proposed finish grade elevation, invert elevation, and proposed bottom of headwall footing elevation at the location of analysis are (Reference 6, sheet 15 & 17):

El. finish grade =	71.0	ft
El. Invert =	62.5	ft
El. Bottom of footing =	59.5	ft

3. Per Reference 6 sheet 15, a 1-foot-thick bed of Crushed Stone will be placed beneath the proposed culvert and is to extend beneath the proposed headwall and wingwalls with the same thickness.

Proposed crushed stone thickness beneath headwall footing =	1	ft

4. The interpreted water table elevation, based on measurements taken during the subsurface exploration program and ordinary high water (OHW) elevation (Reference 6, sheet 15):

WL elev. =	67.7	ft

5. This analysis considers the bearing resistance of the in-situ soil beneath the proposed crushed stone, consisting of Sands and Gravels (Reference 1).

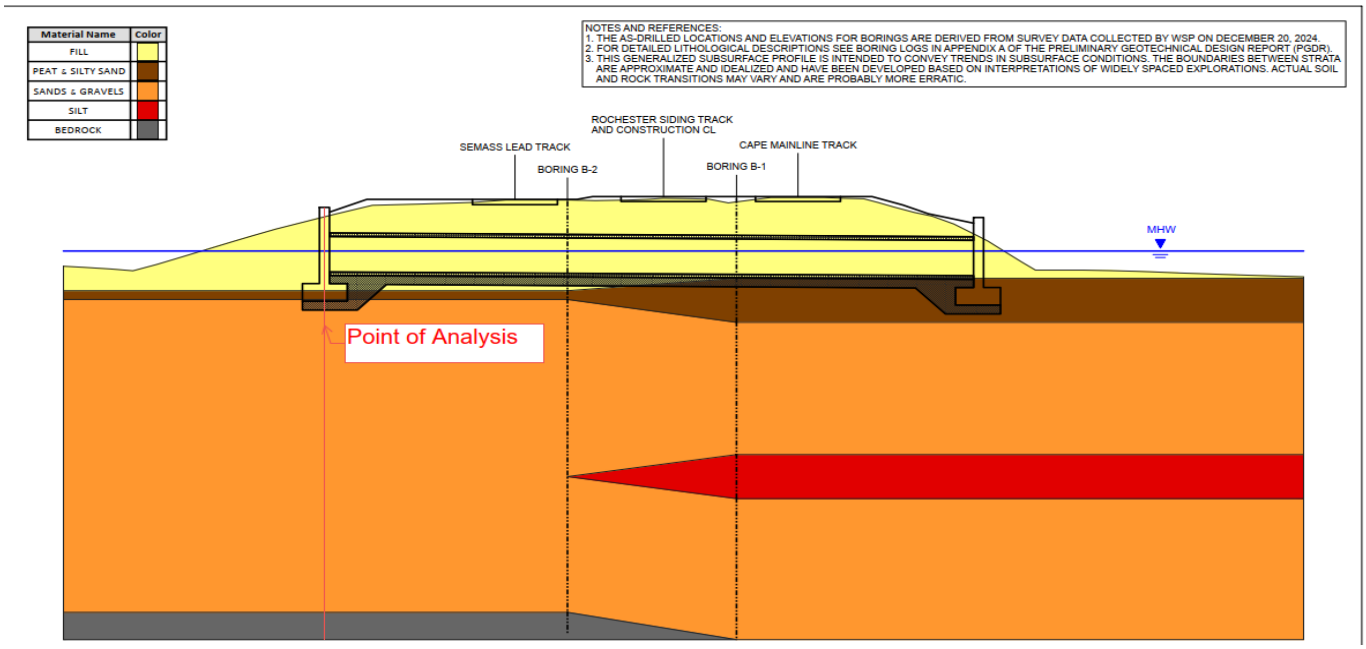
6. Per the AREMA Manual for Railway Engineering (Ref. 3, Section 3.4.3.1.b), the groundwater level will affect the bearing capacity and should be considered in the analysis. Since the AREMA manual only provides reduction factors for water tables located below the footing, this analysis will use reduction factors taken from FHWA GEC-6 (Ref. 5, Section 5.2.3.2) for water tables located above the footing.

7. The allowable settlement (s) is assumed to be 1 inch for this analysis.

CALCULATIONS

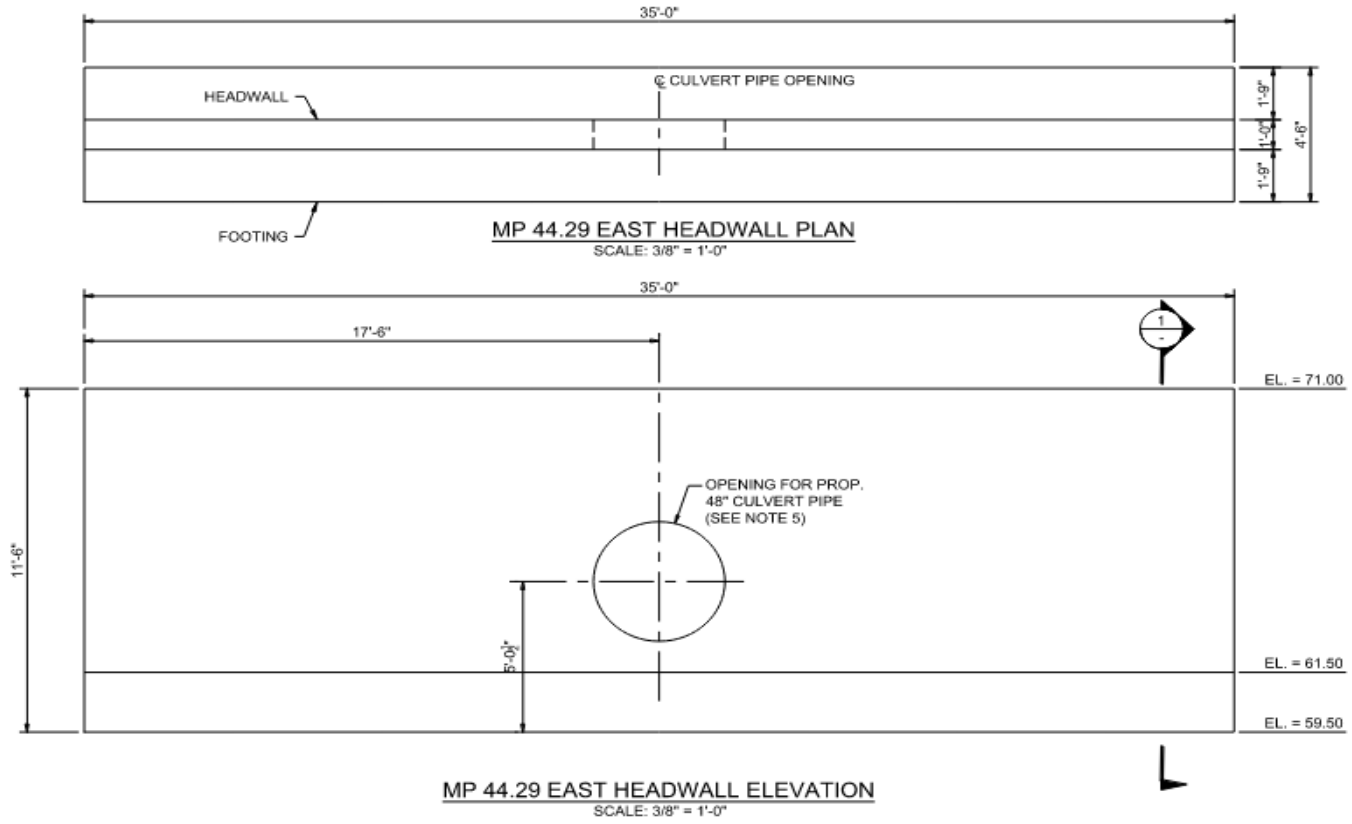
Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29 Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

Location of Analysis:



(Reference 1)

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29 Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		



(Reference 6, Sheet 17)

CALCULATIONS

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29 Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

CALCULATION

A. Determine the ultimate and allowable bearing capacity using Section 3.4.3, Footings on Granular Material, from the AREMA Manual for Railway Engineering.

The soil stratigraphy encountered in the nearest boring B-2 (Ref. 2) is used in this analysis. Based on this stratigraphy and the proposed bottom of wingwall elevation from Ref. 6, the proposed wingwall will be bearing on the well-graded sands and gravels layer. The existing fill and peat layers encountered in boring B-2 will be excavated during construction.

1. Calculate the net ultimate bearing capacity of a continuous footing (Q_u) for the existing well-graded sands and gravels layer.

$$Q_u = 0.5\gamma B N_\gamma C_{w\gamma} + D_f\gamma(N_q - 1)C_{wq}$$

(Ref. 3, Eqn 3.4.3.2 (1), modified with groundwater reduction factors from Ref. 5, Section 5.2.3.2)

where:

B =	footing width, ft	(Ref. 6, Sheet 17)	B =	4.5	ft
D_f =	footing depth, ft		D_f =	4.0	ft
γ =	unit weight of the granular material, kilopound/cubic foot		γ =	0.130	kcf
N_γ and N_q =	dimensionless bearing capacity factors which are a function of the internal angle of friction, φ (Ref. 3, Figure 8-3-3)		N_γ =	37	
			N_q =	33	

$$C_{wq} = 0.5 + 0.5\left(\frac{D_w}{D_f}\right) \le 1.0$$ (Ref. 5, Eqn. 5-10) C_{wq} = 0.5 (Assumption 6)

$$C_{w\gamma} = 0.5 + 0.5\left(\frac{D_w}{1.5B_f + D_f}\right) \le 1.0$$ (Ref. 5, Eqn. 5-9) $C_{w\gamma}$ = 0.5 (Assumption 6)

D_w = groundwater depth, ft — D_w = 0.0 ft (Assumption 4)

Q_u = 14 ksf

2. Apply Factor of Safety to calculate allowable bearing capacity (Q_{all})

Q_{all} = The net ultimate bearing pressure divided by an appropriate factor of safety.

FOS = 3 (Ref. 3, Section 3.4.2)

Q_{all} = 5 ksf

Date:	7/24/2025	**Made by:**	RJN
Project No.:	US0035009.6582	**Checked by:**	KAR
Subject:	Bearing Resistance at Proposed Culvert MP 44.29 Wingwalls	**Reviewed by:**	CCB
Project Short Title:	MassDOT Cape Main Railroad, MP 44.27 and MP 44.29 Culvert Replacement		

B. Determine the allowable settlement pressure.

1. Use AREMA (Ref. 3 Section 3.4.3.3) to determine allowable settlement pressure, Q_s for the well-graded sands and gravels layer.

For B > 4 feet (1220 mm):

$$Q_s = \left(\frac{Ns}{12}\right)\frac{(B+1)}{B}$$

where:

N =	average standard penetration blowcount (N60)	N =	33	(Reference 2)
B =	the footing width, feet	B =	4.5	ft (Ref. 6, Sheet 17)
s =	the allowable settlement, inches	s =	1	in (Assumption 7)

A 50% reduction in the allowable settlement pressure is	Q_s =	1.7	tsf
applied as the water table is at a depth above the	Q_s =	3.4	ksf

CONCLUSIONS

For the proposed culvert's wingwalls, the estimated allowable bearing capacity for a continuous strip footing bearing on the well-graded sands and gravels layer with 1 foot of crushed stone below the wingwall is 5 ksf using a factor of safety of 3 per the AREMA Manual for Railway Engineering. The estimated allowable settlement pressure is 3 ksf after a 50% reduction is applied due to the water table located above the footing.

APPENDIX E

Retaining Wall Calculations

CALCULATIONS

Date:	5/27/2025	**Made by:**	KAR
Project No.:	US0035009.6582	**Checked by:**	BK
Subject:	Proposed Anchored Sheetpile Retaining Wall Design	**Reviewed by:**	CCB
Project Title:	MassDOT Rochester Cape Main Railroad		

OBJECTIVE

Determine the required sheetpile size, H-pile deadmen anchorage, and pile embedment to support construction loading and track loading for the proposed retaining wall along the Cape Mainline and Rochester Siding railroad embankment in Rochester, MA.

METHOD

Use the shoring software *DeepEX* (Ref. 1) to analyze cross-section models of the interpreted soil stratigraphy and proposed retaining wall geometry.

REFERENCES

1. Deep Excavation LLC. DeepEX software package, version 24.03.
2. WSP USA Inc. for Massachusetts Department of Transportation, Rail & Transit Division. Draft PS&E Submission: Cape Main Culvert Replacements at MP 44.27 & MP 44.29 in the town of Rochester, Plymouth County. Dated May 5, 2025.
3. Boring logs from WSP's subsurface investigation, dated February 10, 2025 (B-1 and B-2) and May 9, 2025 (B-3 through B-7).
4. American Railway Engineering and Maintenance-of-Way Association (AREMA). 2019 Manual for Railway Engineering. Chapter 8 Concrete Structures and Foundations; Chapter 15 Steel Structures.
5. Das, Braja M. 2011. Principles of Foundation Engineering, 7th ed.
6. Bridge Software Institute. FB-MultiPier Soil Parameter Table (US Customary Units). Dated 2018.
7. American Association of State Highway and Transportation Officials (AASHTO). 2024 LRFD Bridge Design Specifications, 10th Edition.

ATTACHMENTS

1. Model output for proposed sheetpile wall at Station 46+25 (exposed wall height 8.5 feet)
2. Model output for proposed sheetpile wall at Station 54+00 (exposed wall height 6.5 feet)
3. Model output for proposed sheetpile wall at Station 49+00 (exposed wall height 4.5 feet)

ASSUMPTIONS

1. Each construction stage was analyzed in the DeepEX software using both limit equilibrium and non-linear soil spring methods. During the model computation process, each stage was first analyzed using the limit equilibrium method to calculate the external factor of safety against wall overturning. Each stage was then re-analyzed using the non-linear method to calculate the wall flexural capacity, lateral deflection, and tierod tensile load.

2. The sheetpile design was assessed using a minimum allowable design factor of safety (FS) of 1.5 for wall horizontal forces and overturning moments per AREMA Chapter 8 Section 5.4.2 (Ref. 4); a minimum allowable design FS of 2 for flexural capacity per AREMA Chapter 8 Section 4.2.3 (Ref. 4); and a minimum allowable design FS of 1.8 (i.e., $0.55F_y$) for tensile capacity per AREMA Table 15-1-11 (Ref. 4).

3. Sacrificial steel corrosion loss of 1/16 inch per steel face over a design life of 75 years was assumed for the sheetpiles and H-pile deadmen.

4. Interface friction was assumed to occur on the back of the retaining wall using $\delta = 0.33\phi_f$ for soil against steel, per AASHTO LRFD Article C3.11.5.3 (Ref. 7).

5. Borings B-1, B-2, B-3, and B-6 encountered a thin layer of peat grading to silty sand with organics beneath the embankment fill. Since the peat and silty sand materials were sampled within the same SPT interval in all four borings, the materials were modeled as a single layer with material properties correlated from these combined N_{60} values. Borings B-1 and B-6 encountered a deep layer of sandy silt and silty sand within the sand and gravel layer. Due to the high percentage of sand and the low plasticity, the sandy silt / silty sand was modeled as a cohesionless material with a friction angle correlated from N_{60} values.

6. The H-pile deadmen were assumed to be installed in weak axis bending orientation to facilitate tierod connections through the pile web.

CALCULATION

1. Summarize the stages of construction.

WSP understands that MassDOT wishes to construct an anchored sheetpile wall at the northeastern edge of the Cape Mainline right-of-way adjacent to the MBTA Rochester facility in order to backfill the northeastern embankment slope to create a travel lane for construction equipment used in the culvert replacements at mileposts 44.27 and 44.29. After completion of culvert construction, the backfilled area behind the sheetpile wall will be used for a third railroad track. WSP analyzed cross-sections through the proposed wall to identify required design parameters for the sheetpiles and the H-pile deadmen anchors. Locations along the wall are identified using the stationing of the Rochester Siding track / construction centerline alignment.

Since MassDOT proposes to install the tierods connecting the sheetpiles and the H-pile deadman after completion of culvert construction, the sheetpile wall will act as a cantilever wall during the construction travel lane stage. Thus, WSP plotted the existing ground surface elevation in front of the proposed wall and the proposed top-of-wall elevation along the length of the wall (Ref. 2) to identify the range of exposed wall heights. The exposed wall height along the proposed sheetpile wall will range from 2.5 feet to 8.5 feet.

The analyzed stages of construction are as follows:

Stage 0: Install sheetpiles and H-pile deadmen.

Stage 1: Backfill sheetpiles to the tierod elevation to create the construction travel lane. The sheetpile wall will be cantilever during this stage and will support surcharge loading from construction equipment on the travel lane and trains on the existing Rochester Siding and Cape Mainline tracks.

Stage 2: Excavate trenches to install tierods between sheetpiles and H-pile deadmen.

Stage 3: Install tierods and connect to waler welded to front of sheetpiles.

Stage 4: Backfill tierods to final ground surface elevation and construct third railroad track. The sheetpile wall will be anchored during this stage and will support surcharge loading from trains on the existing Rochester Siding and Cape Mainline tracks and the proposed third track.

Stage 5: End of design life including sacrificial steel corrosion loss.

2. Identify the cross-sections for analysis.

Three cross-section models through the proposed retaining wall at different exposed wall heights were analyzed.

a. Station 46+25 with an exposed wall height of 8.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 6.5 feet to 8.5 feet.

b. Station 49+00 with an exposed wall height of 4.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 2.5 feet to 4.5 feet.

c. Station 54+00 with an exposed wall height of 6.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 4.5 feet to 6.5 feet.

3. Determine soil profile and material parameters for each cross-section model.

The soil profile at each analyzed location was based on the closest boring drilled during the subsurface investigation in January and April 2025 (Ref. 3). The groundwater elevation at each analyzed location was based on the water surface measured in this closest boring during the drilling.

a. The soil profile and groundwater elevation at Station 46+25 were based on boring B-2.

b. The soil profile and groundwater elevation at Station 49+00 were based on boring B-4.

c. The soil profile and groundwater elevation at Station 54+00 were based on boring B-6.

The in-situ soil layers were modeled using Mohr-Coulomb conditions. The bedrock layer was modeled using Hoek-Brown rock mass conditions.

The friction angles for the in-situ soil layers were correlated from SPT N_{60} values encountered in all seven borings performed at site (B-1 through B-7), based on the Peck, Hanson, and Thornburn (1974) correlation as provided in Ref. 5, Eqn. 2.26. The unit weight parameters were selected based on local engineering experience. The subgrade modulus and Poisson's ratio were correlated from the design friction angle for each layer using recommendations in the FB-MultiPier (Ref. 6) and DeepEX (Ref. 1, input menu) software documentation, respectively. The reloading subgrade modulus was assumed to equal one-third of the subgrade modulus as recommended in the DeepEX software documentation (Ref. 1, input menu). The active and passive earth pressure coefficients were calculated by the DeepEX software during each model analysis using Coulomb theory.

Soil Layer	Friction Angle (°)	Unit Weight (pcf)	Subgrade Modulus (pci)	Reloading Subgrade Modulus (pci)	(kcf)	Poisson's Ratio
Fill	30	125	30	10	17	0.40
Peat and Silty Sand	29	120	20	7	12	0.33
Sandy Silt & Silty Sand	32	120	53	18	31	0.33
Sand and Gravel	35	130	88	29	51	0.30

4. Estimate surcharge loading on the sheetpile wall.

Cooper E80 train loading was assumed on each existing track for all stages and on the proposed third track for Stages 4 and 5. The train load on each track was implemented in the DeepEX model as a distributed load of 1882 psf acting over the tie width, based on AREMA Figure 8-2-1 (Ref. 4) and assuming a tie width of 8.5 feet as shown in Ref. 2. The resulting live load surcharge pressure acting on the sheetpile wall was calculated by the DeepEX software during each model analysis.

Construction equipment loading of 400 psf was assumed on the construction travel lane for Stage 1 and on the tierod work area for Stages 2 and 3. The resulting live load surcharge pressure acting on the sheetpile wall was calculated by the DeepEX software during each model analysis.

Date:	5/27/2025	**Made by:**	KAR
Project No.:	US0035009.6582	**Checked by:**	BK
Subject:	Proposed Anchored Sheetpile Retaining Wall Design	**Reviewed by:**	CCB
Project Title:	MassDOT Rochester Cape Main Railroad		

RESULTS

The cross-sections listed above were analyzed using the subsurface geometry and material parameters listed above to determine the minimum pile embedment length, deadmen anchor spacing, pile sizing, and tierod elevation to satisfy the required factors of safety from Assumption 2. Analysis results are shown in Attachments 1 through 3 and are discussed below.

Backfill for the construction travel lane was modeled to the proposed tierod elevation (elev. 70 feet), in order to reduce earth pressure loading on the cantilever wall and reduce fill excavation for tierod installation. Due to the existing embankment slope, the travel lane width at elev. 70 feet was approximately 8.3 feet. Construction surcharge loading of 400 psf was modeled on this travel lane width.

The H-pile deadmen anchor location was modeled at the northeastern edge of the existing embankment slope, between the existing Rochester Siding track and the proposed third track. Although this location places the deadmen anchors within the active soil wedge of the sheetpile wall, it permits installation of the tierods without removal of the existing Rochester Siding track, and it permits maintenance of train traffic on the existing tracks during construction.

Analysis Location		Station 46+25	Station 54+00	Station 49+00
Exposed Wall Height at Analysis Location		8.5 feet	6.5 feet	4.5 feet
Recommended Exposed Wall Height Range		6.5 feet to 8.5 feet	4.5 feet to 6.5 feet	2.5 feet to 4.5 feet
Sheetpiles	*Pile Size*	NZ 19, Grade 50	NZ 19, Grade 50	NZ 19, Grade 50
	Total Length	35 feet	28 feet	18 feet
	Embedment Length	26.5 feet	21.5 feet	13.5 feet
H-Pile Deadmen	*Pile Size*	HP 12x84, Grade 50	HP 12x84, Grade 50	N/A
	Total Length	25 feet	20 feet	N/A
	Center-to-Center Spacing	8 feet	8 feet	N/A
	Orientation	Weak axis	Weak axis	N/A
Tierods	*Tierod Size*	#8 bar, Grade 60	#8 bar, Grade 60	N/A
	Installation Location	Elevation 70 feet	Elevation 70 feet	N/A
	Tensile Load	8.6 kips per bar	6.7 kips per bar	N/A
Waler	*Waler Size*	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall	N/A
Deflection at Top of Wall		0.44 inches	0.24 inches	0.16 inches

Date:	5/27/2025	**Made by:**	KAR
Project No.:	US0035009.6582	**Checked by:**	BK
Subject:	Proposed Anchored Sheetpile Retaining Wall Design	**Reviewed by:**	CCB
Project Title:	MassDOT Rochester Cape Main Railroad		

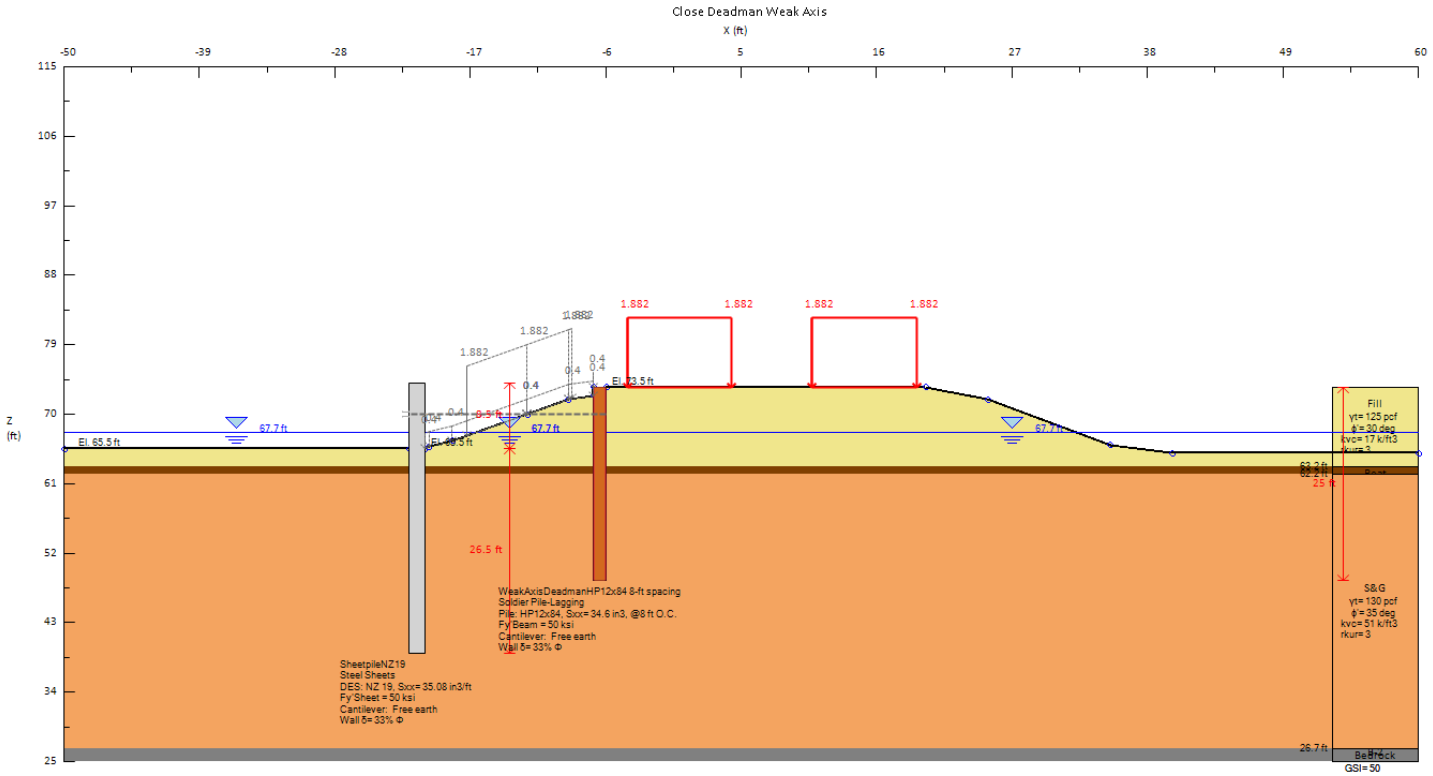
The analysis at Station 46+25 represented the tallest exposed wall height and thus was the critical section. To meet the minimum factor of safety against overturning during the cantilever wall scenario with construction travel lane (Stage 1), the analysis indicated that a sheetpile embedment of 26.5 feet (total sheetpile length of 35 feet) would be needed. This embedment length would result in a sheetpile toe at approximately elevation 39 feet. The borings performed at site (Ref. 3) encountered boulders at elevations ranging from 33.6 feet to 31.5 feet, and encountered bedrock at elevations ranging from 39.2 feet to 26.7 feet. Thus, we anticipate that the sheetpiles can be driven to the required minimum embedment without refusing on boulders or bedrock. The analysis indicated that H-pile deadmen and tierods spaced at 8 feet center-to-center with deadman embedment of 25 feet would be needed for the anchored wall scenario with proposed railroad track (Stages 4 and 5).

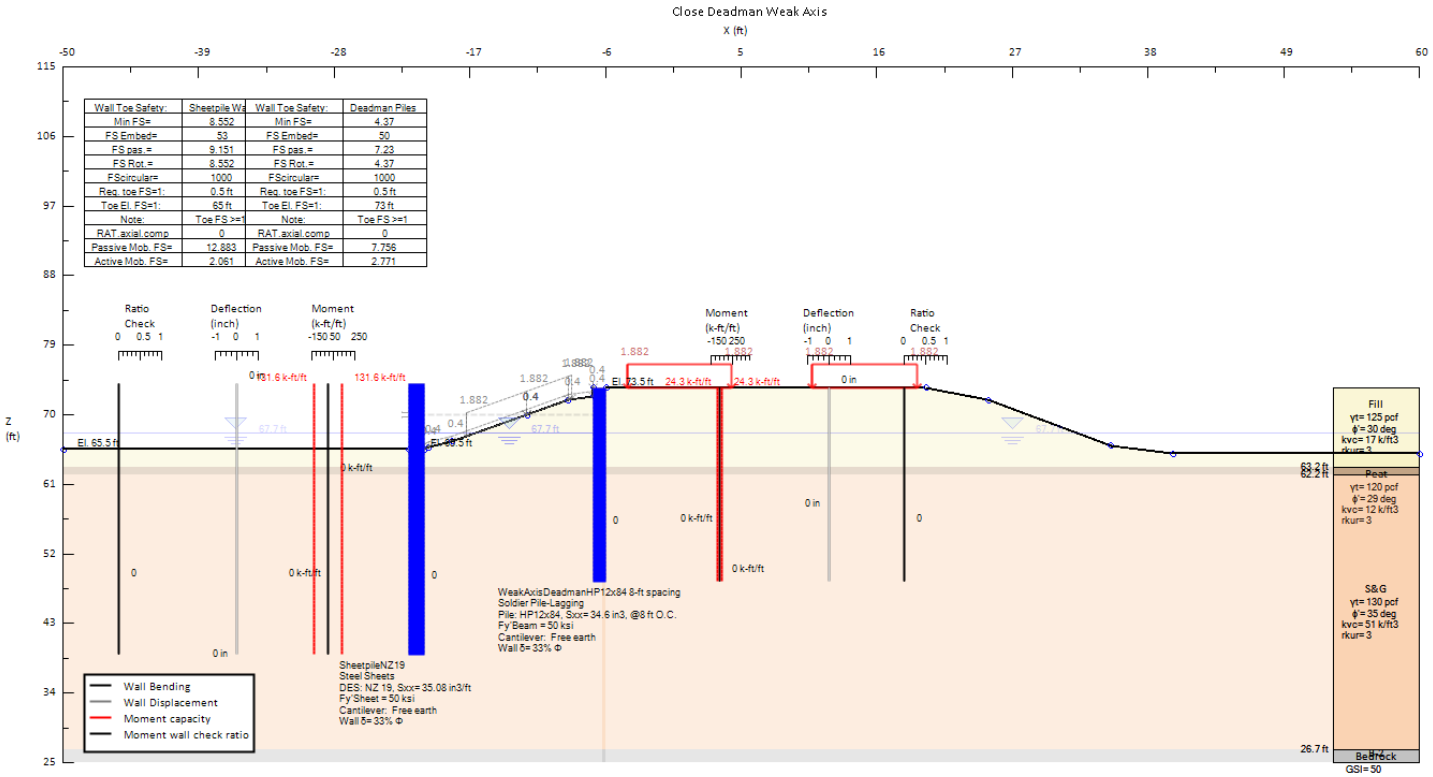
The analysis at Station 54+00 represented an intermediate exposed wall height. Due to this reduced wall height, the analysis indicated that the sheetpile embedment could be reduced to 21.5 feet (total sheetpile length of 28 feet), and the deadman embedment could be reduced to 20 feet. The sheetpile size, deadman size, and deadman spacing were not varied in order to standardize construction.

The analysis at Station 49+00 represented one of the shortest exposed wall heights. Due to this reduced wall height, the analysis indicated that the deadmen anchors could be eliminated at locations with exposed wall heights shorter than 4.5 feet. The sheetpile size was not varied in order to standardize construction.

Attachment 1: Station 46+25

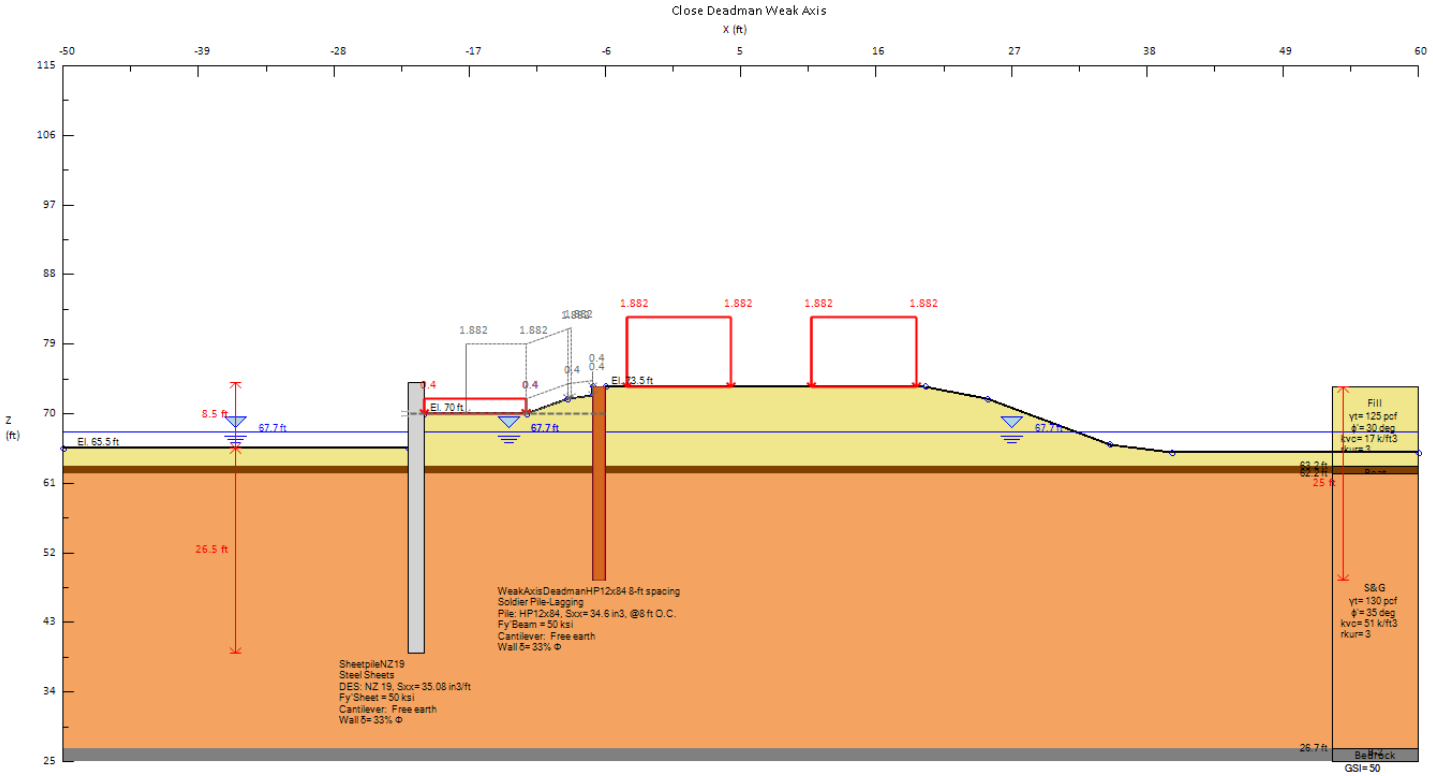
Stage 0: Install Piles						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 25 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

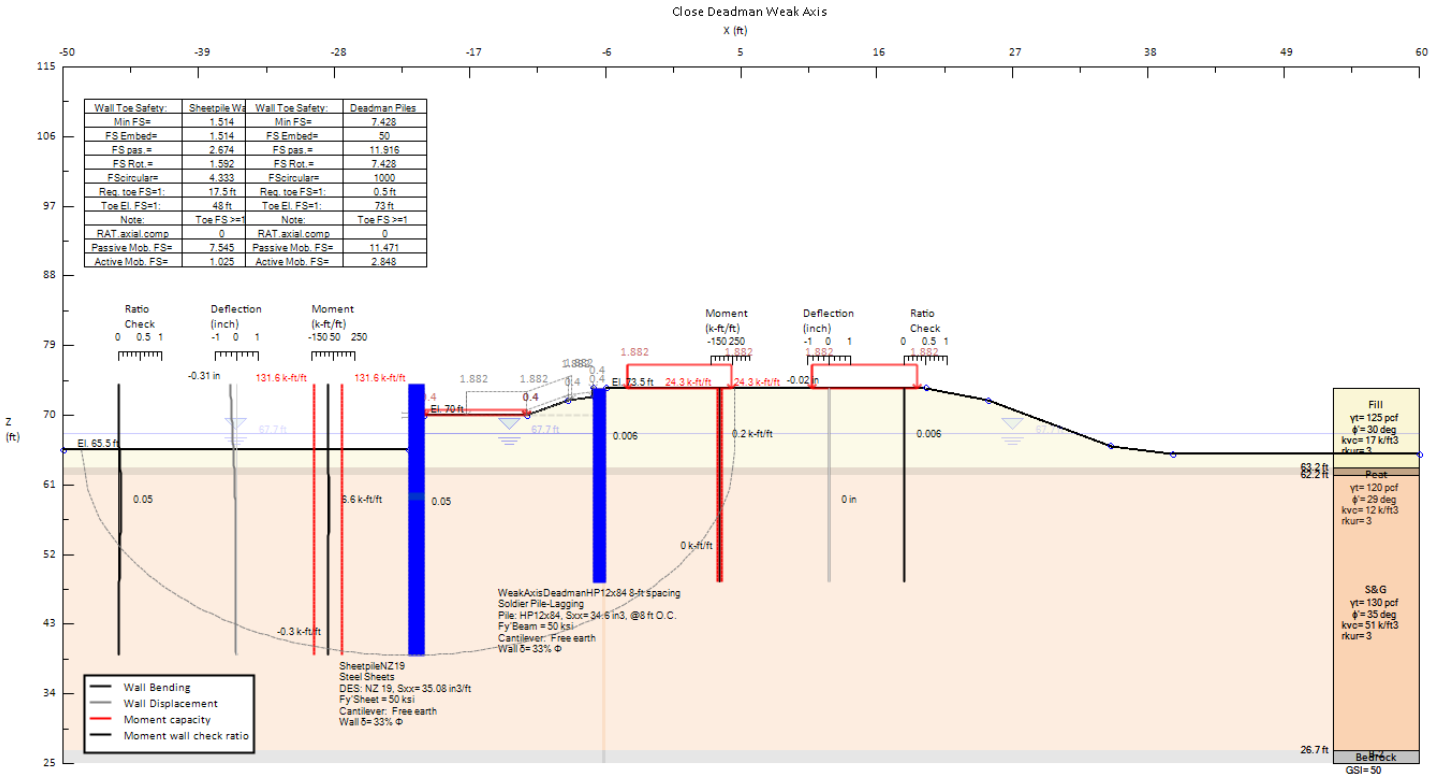




Attachment 1: Station 46+25

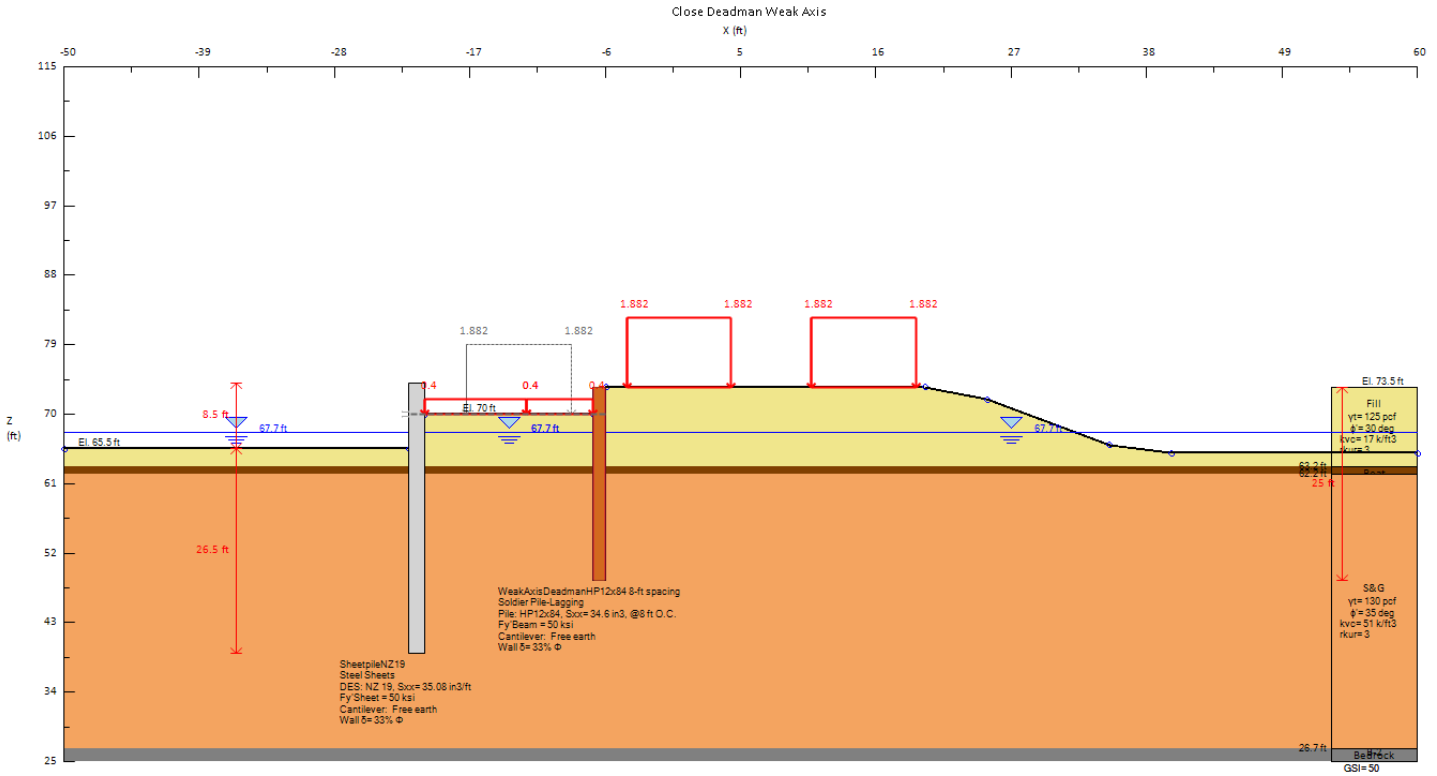
Stage 1: Backfill Sheetpiles to create Construction Travel Lane						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 25 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

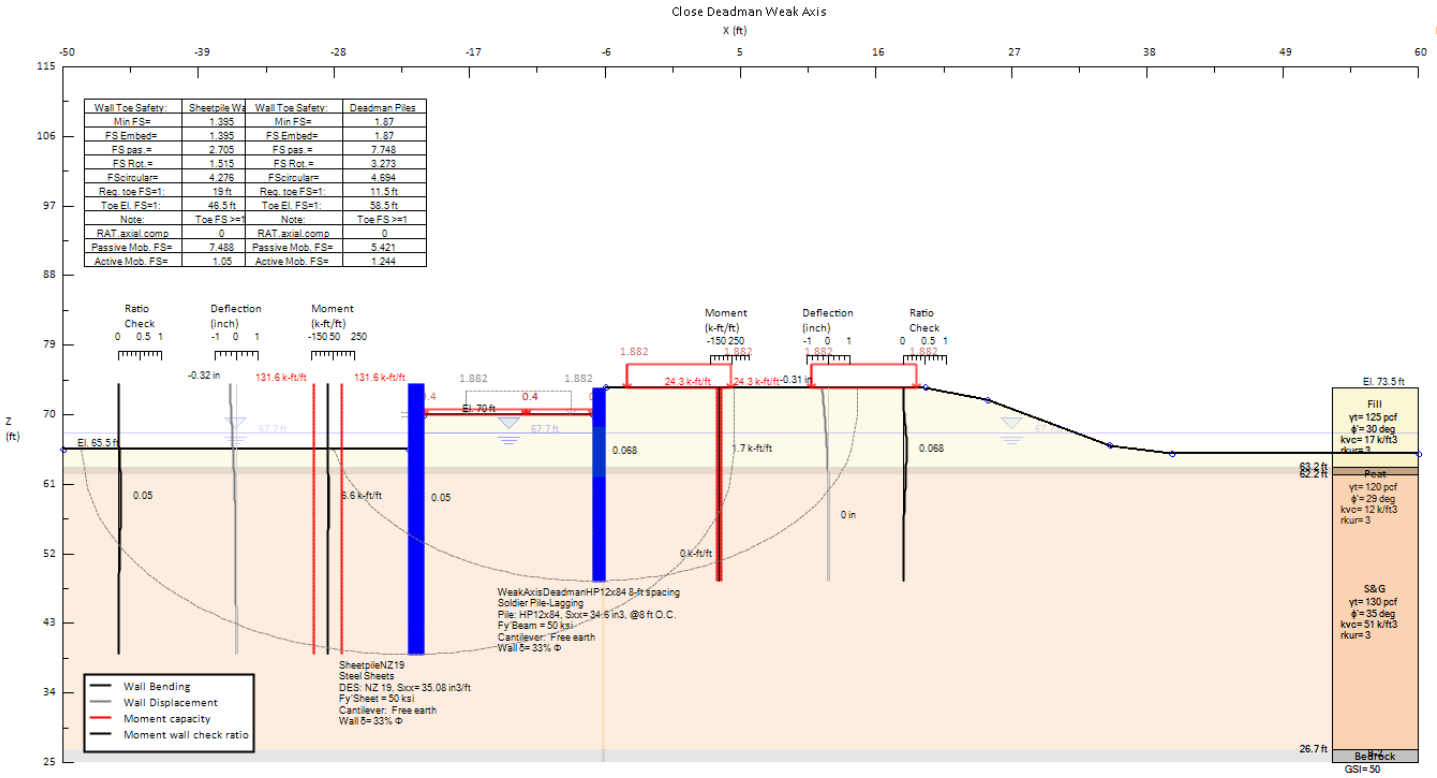




Attachment 1: Station 46+25

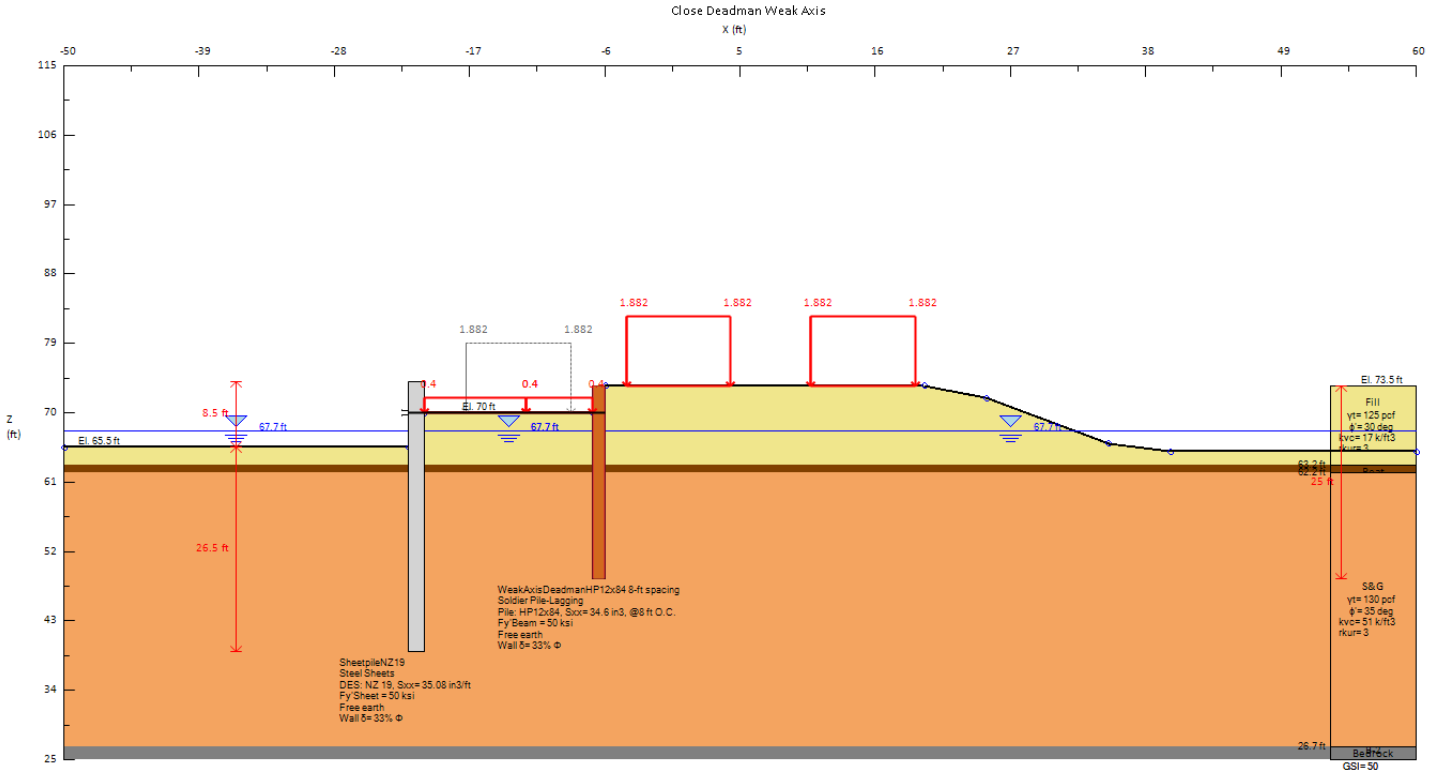
Stage 2: Excavate Trench for Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 25 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

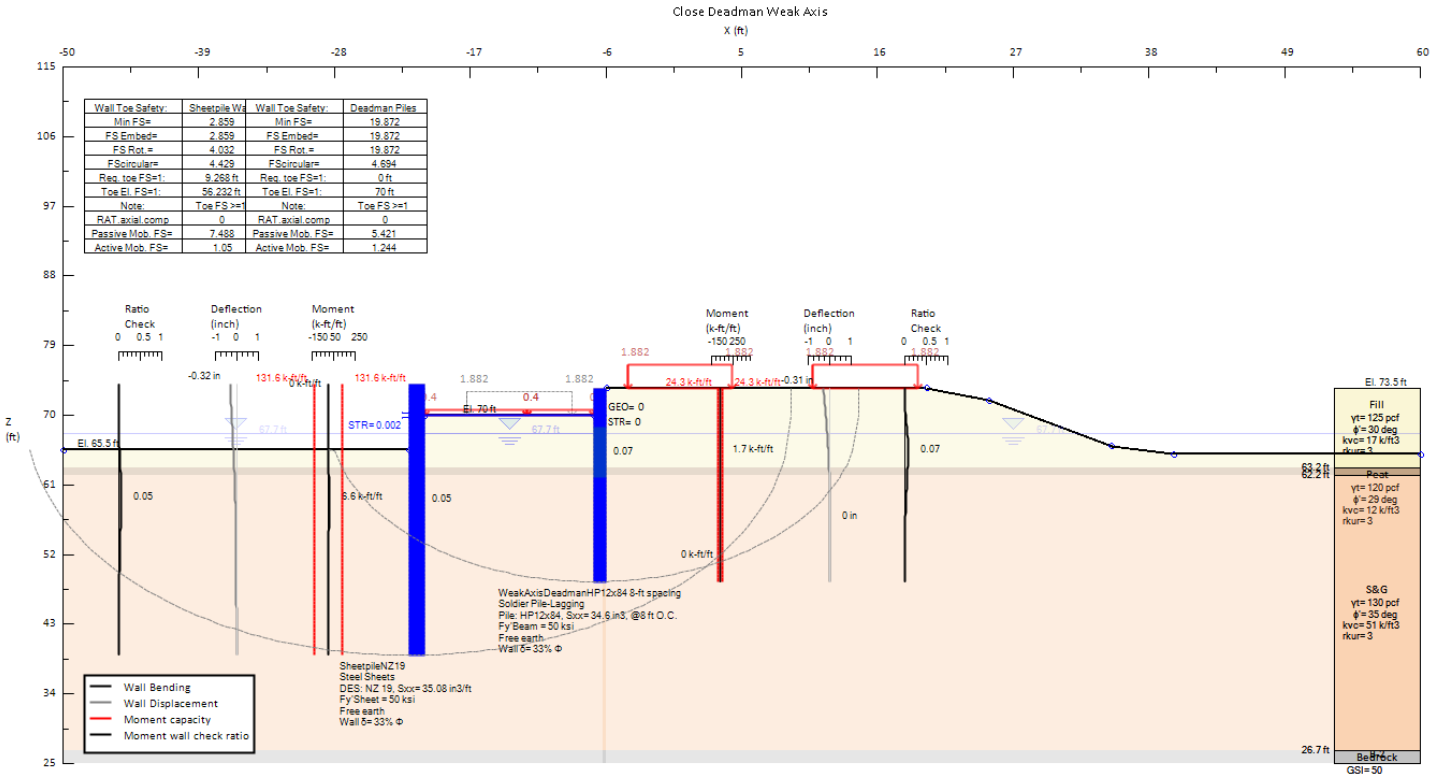




Attachment 1: Station 46+25

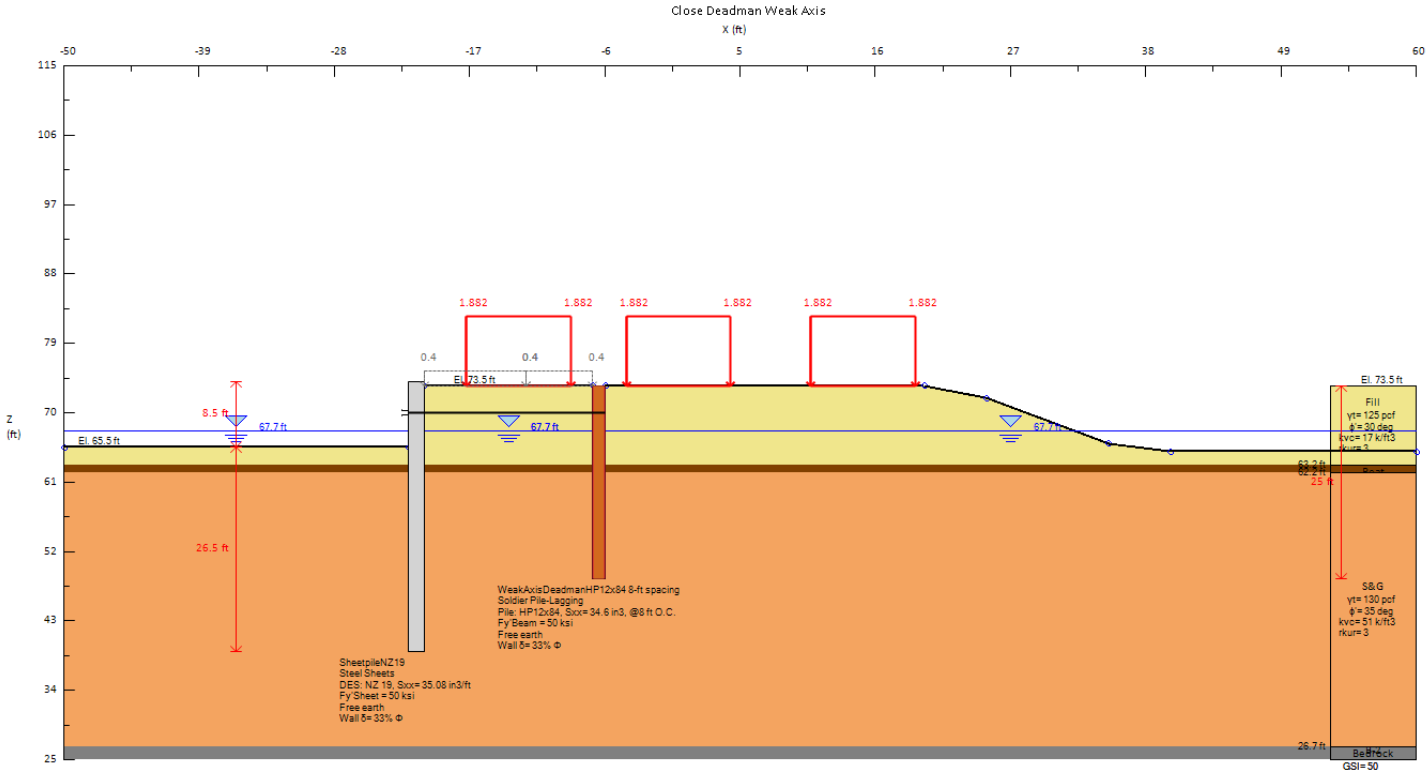
Stage 3: Install Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 25 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

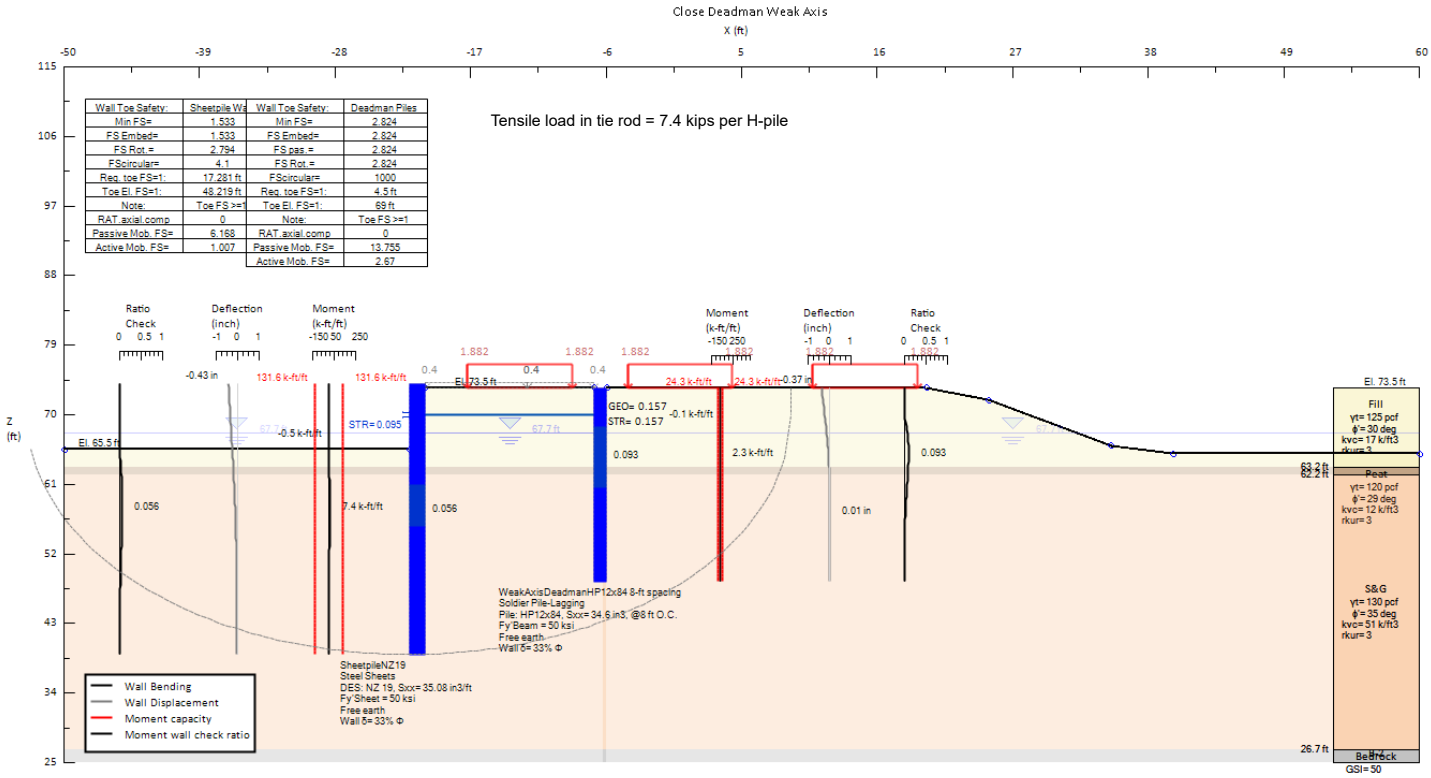




Attachment 1: Station 46+25

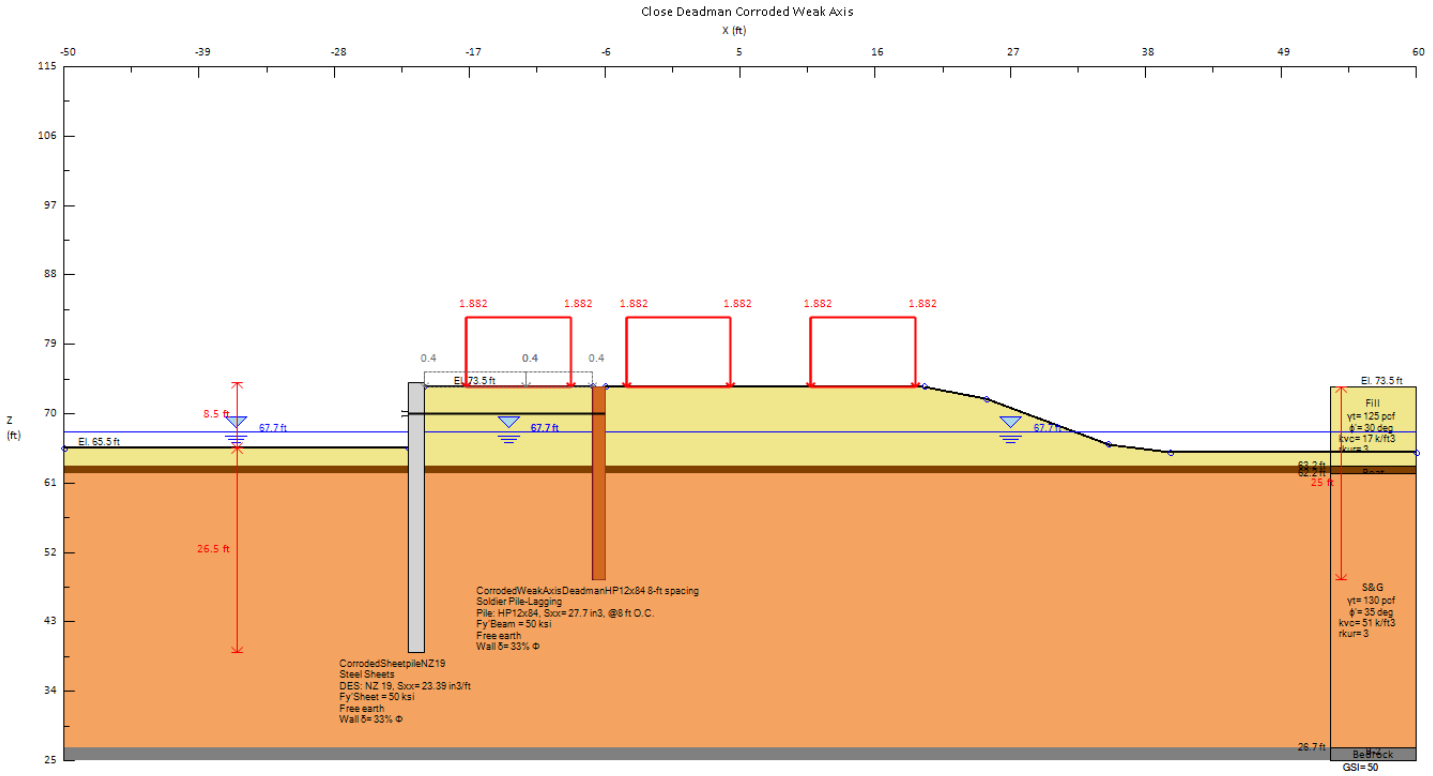
Stage 4: Backfill Tierod to Final Conditions (No Corrosion)						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 25 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

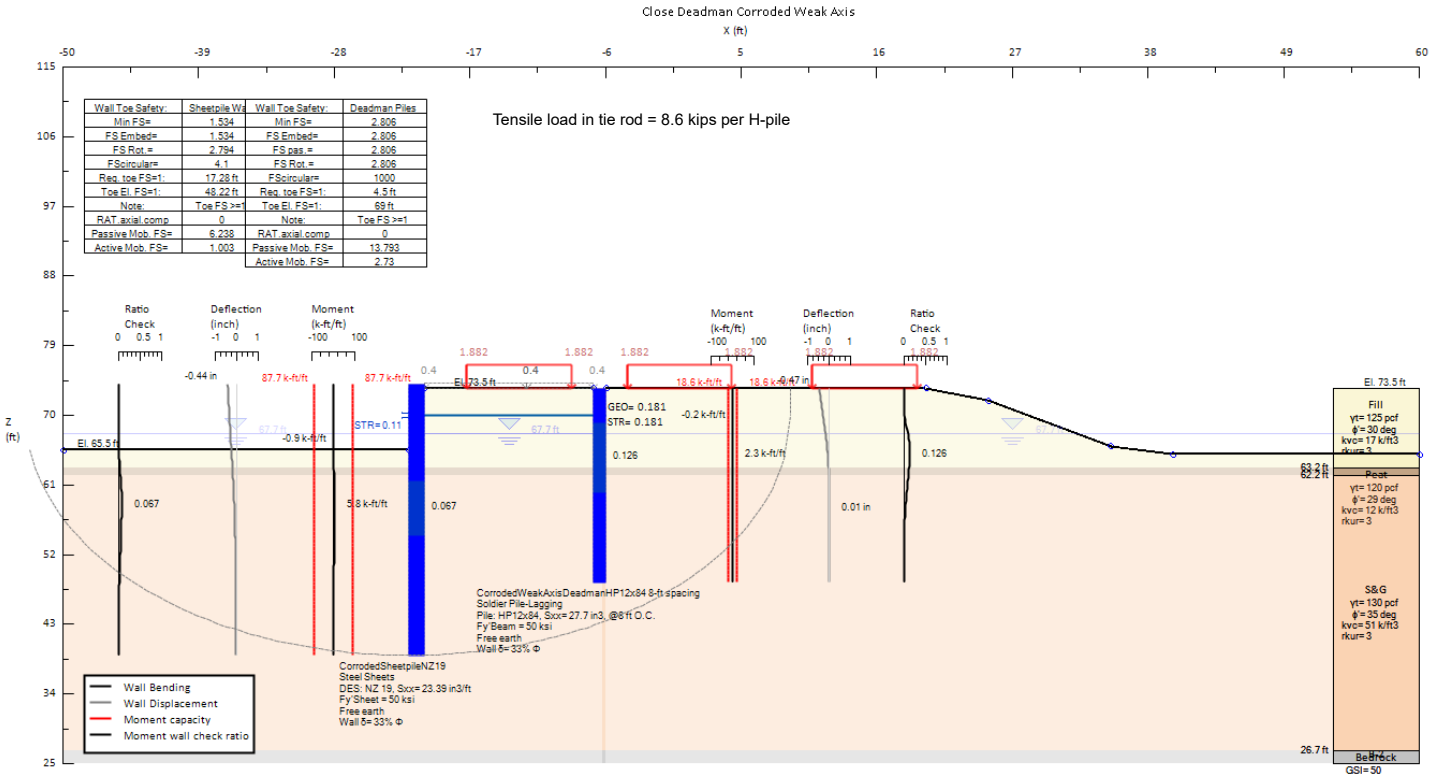




Attachment 1: Station 46+25

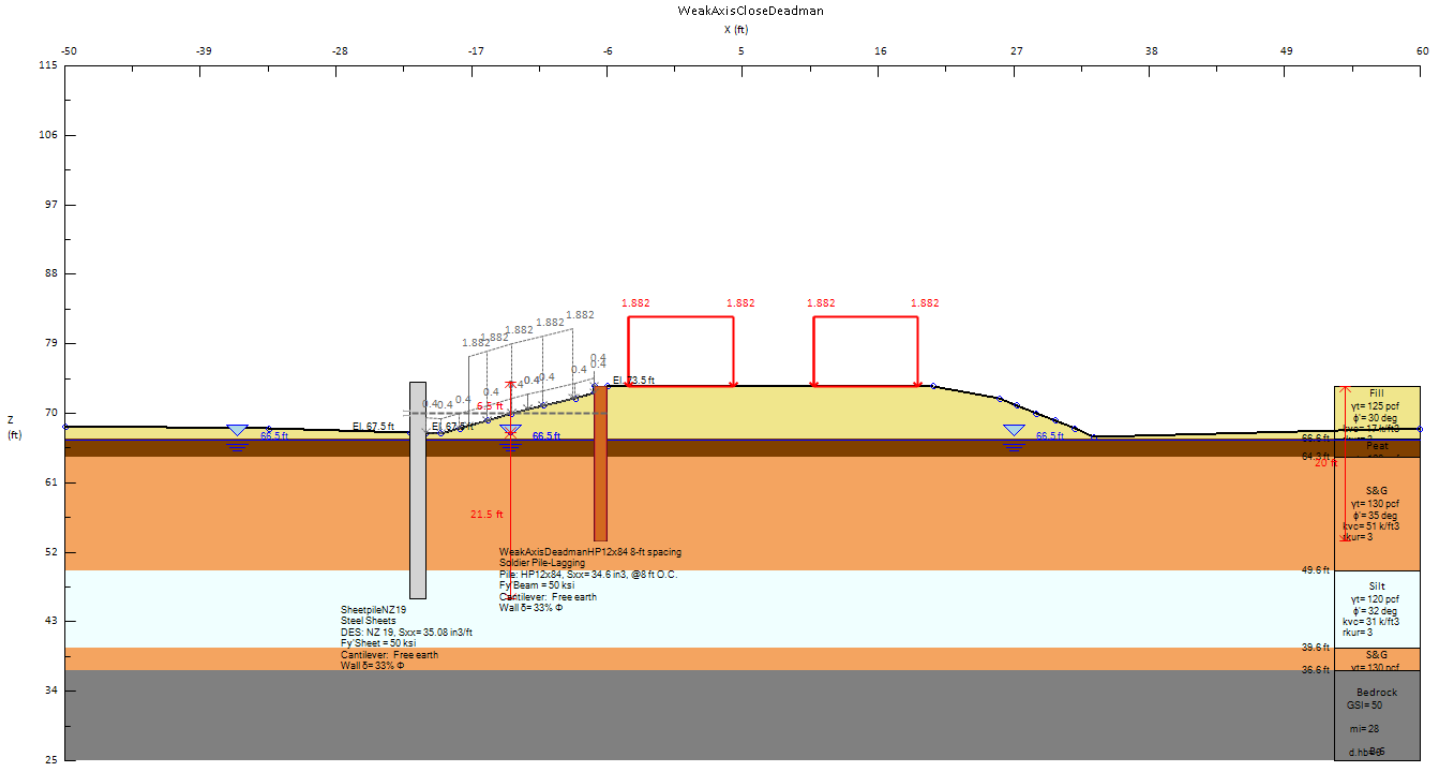
Stage 5: Corrosion Loss (Steel Loss of 1/16 inch per face over 75 Years)						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 25 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

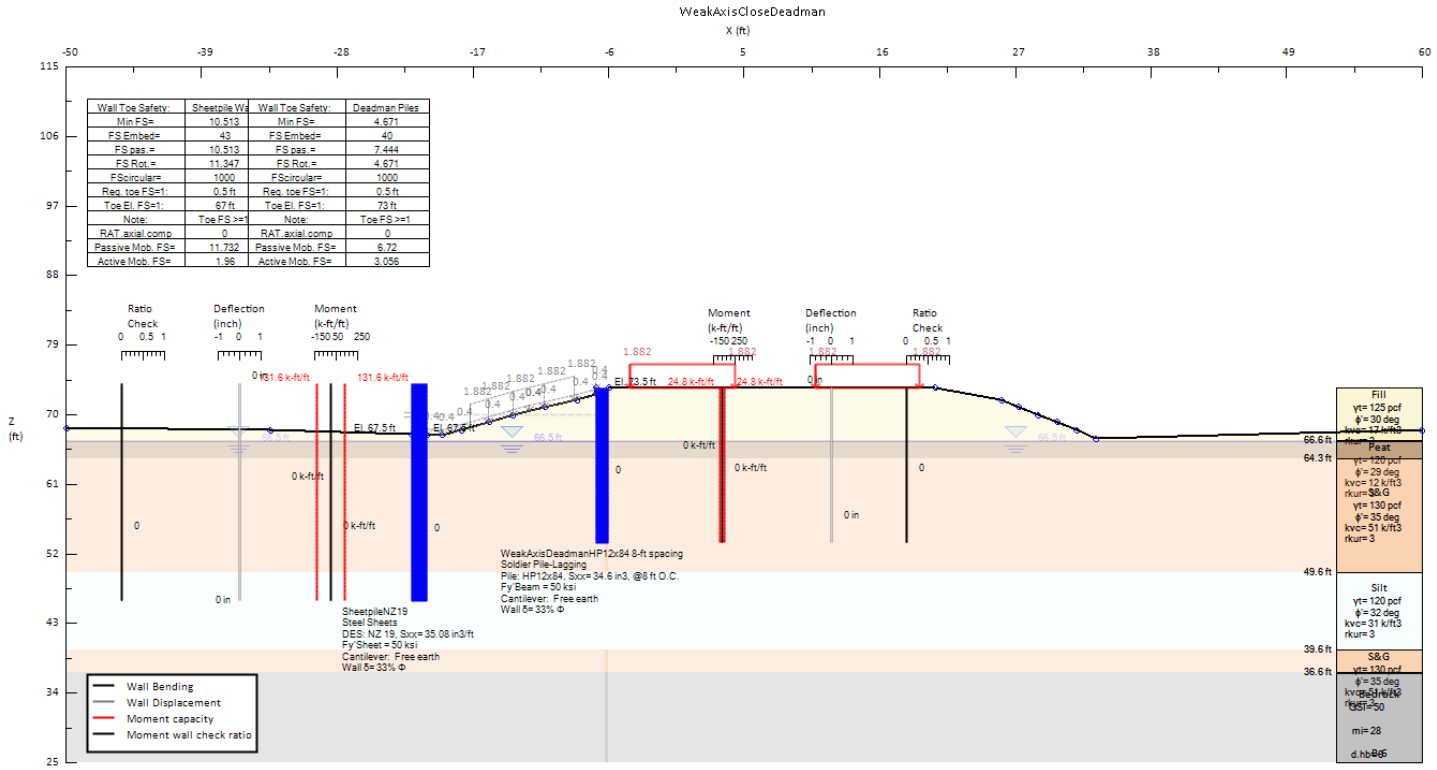




Attachment 2: Station 54+00

Stage 0: Install Piles						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 20 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

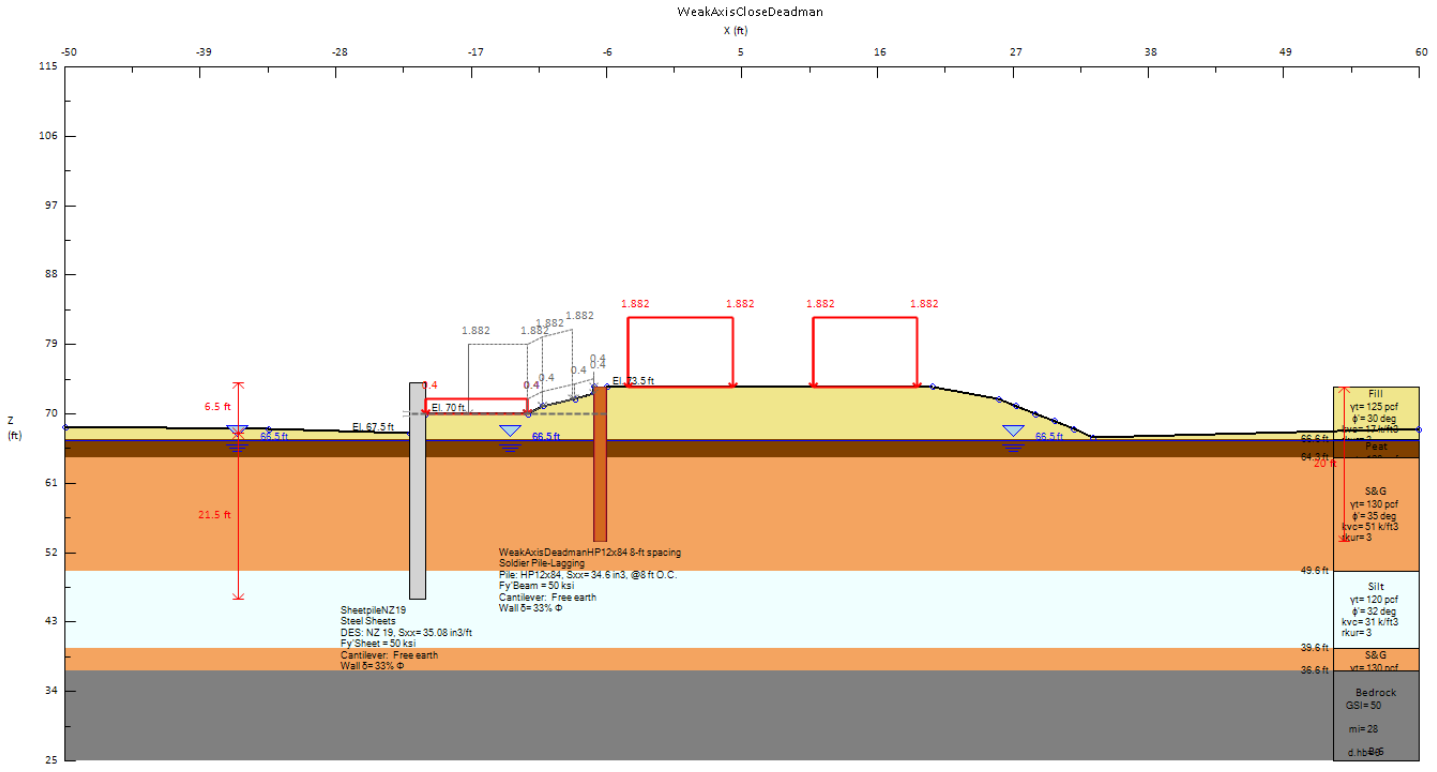


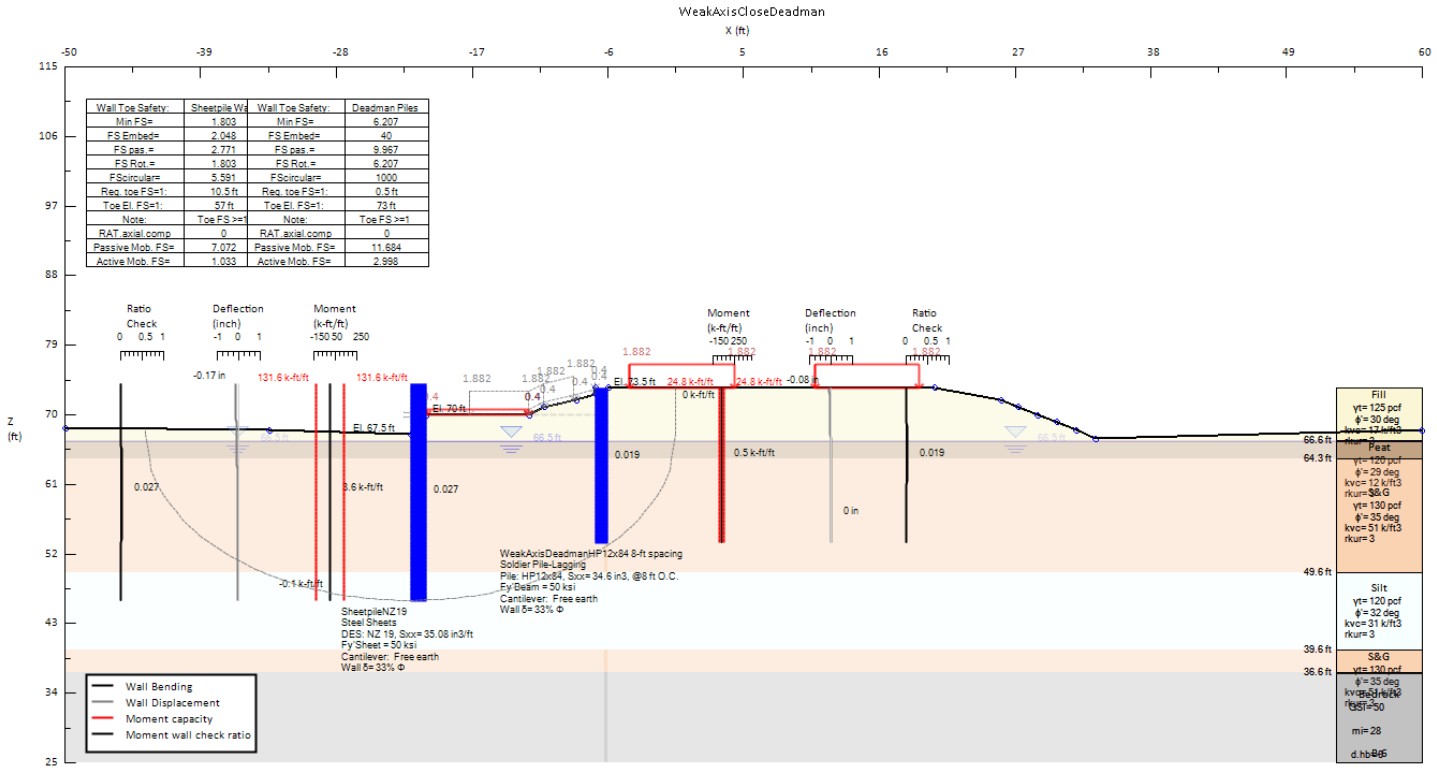


Wall Toe Safety:	Sheetpile Ws	Wall Toe Safety:	Deadman Piles
Min FS=	10.513	Min FS=	4.671
FS Embed=	43	FS Embed=	40
FS pas.=	10.513	FS pas.=	7.444
FS Rot.=	11.347	FS Rot.=	4.671
FScircular=	1000	FScircular=	1000
Req. toe FS=1:	0.5 ft	Req. toe FS=1:	0.5 ft
Toe El. FS=1:	67 ft	Toe El. FS=1:	73 ft
Note:	Toe FS >=1	Note:	Toe FS >=1
RAT.axial.comp	0	RAT.axial.comp	0
Passive Mob. FS=	11.732	Passive Mob. FS=	6.72
Active Mob. FS=	1.96	Active Mob. FS=	3.056

Attachment 2: Station 54+00

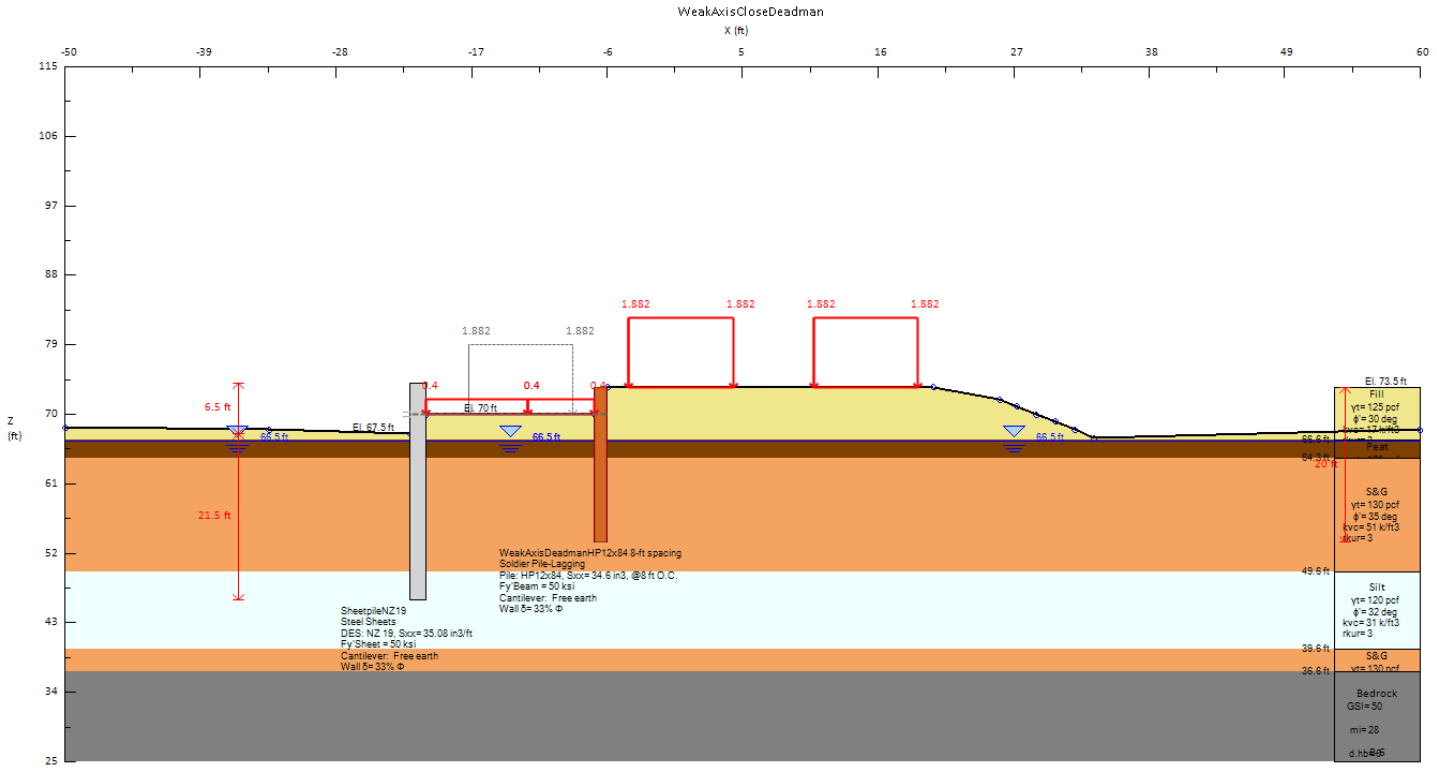
Stage 1: Backfill Sheetpiles to create Construction Travel Lane						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 20 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

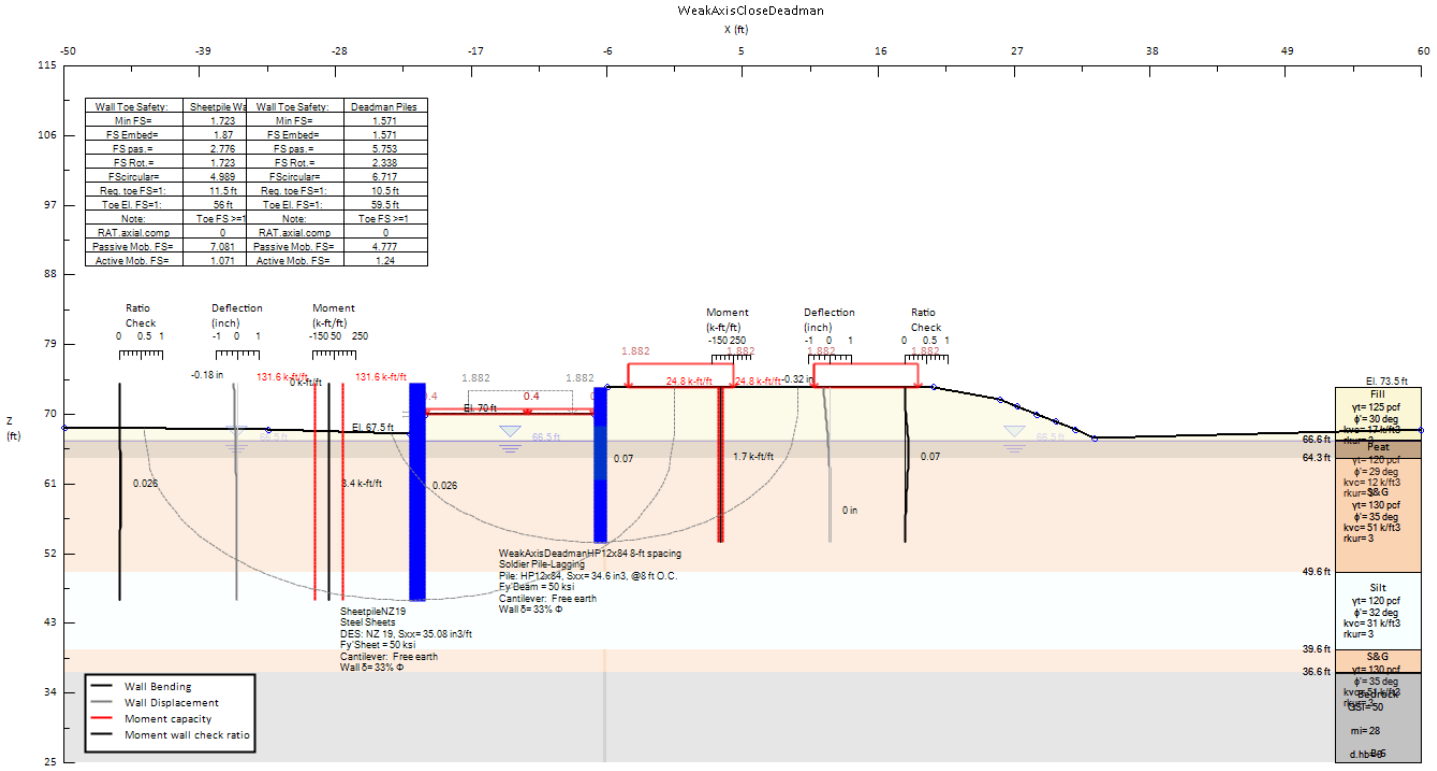




Attachment 2: Station 54+00

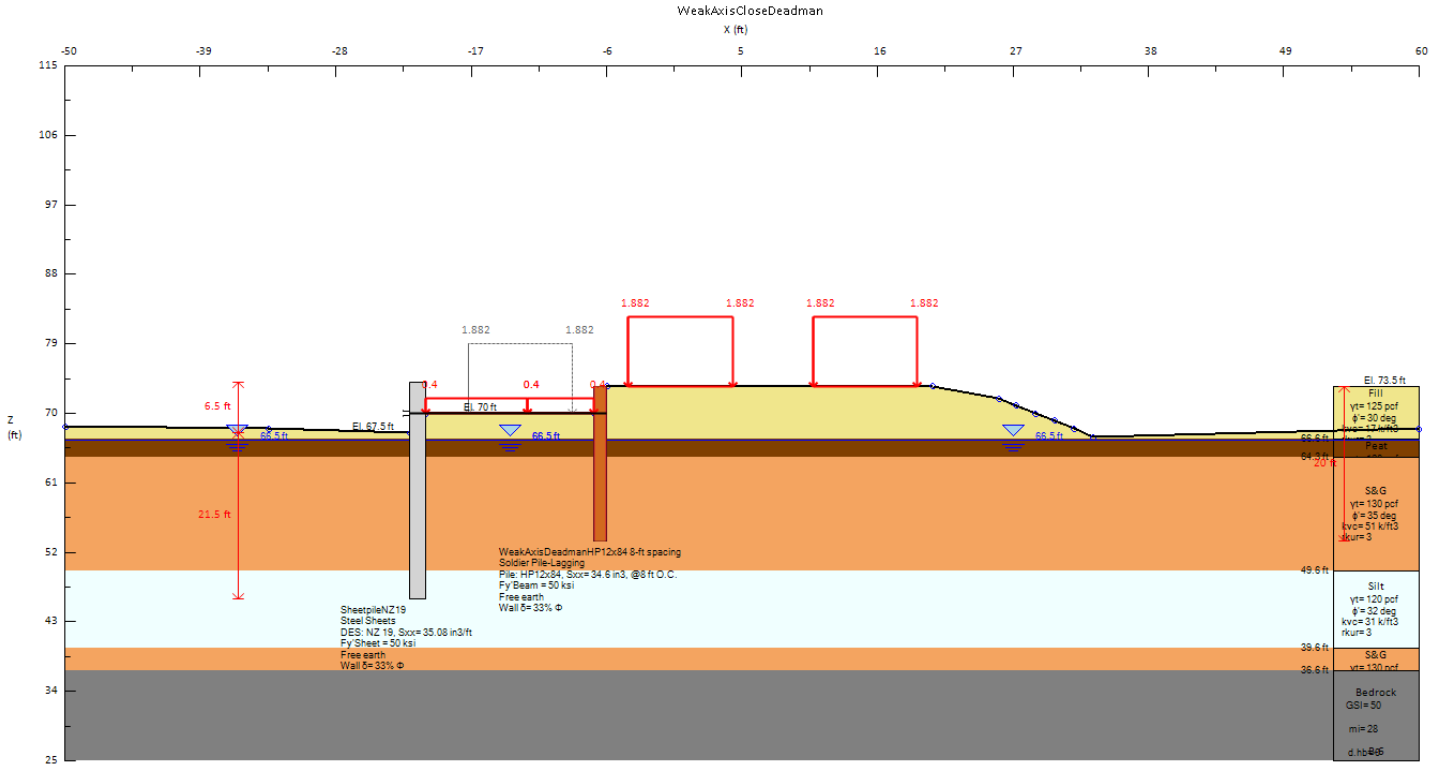
Stage 2: Excavate Trench for Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 20 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

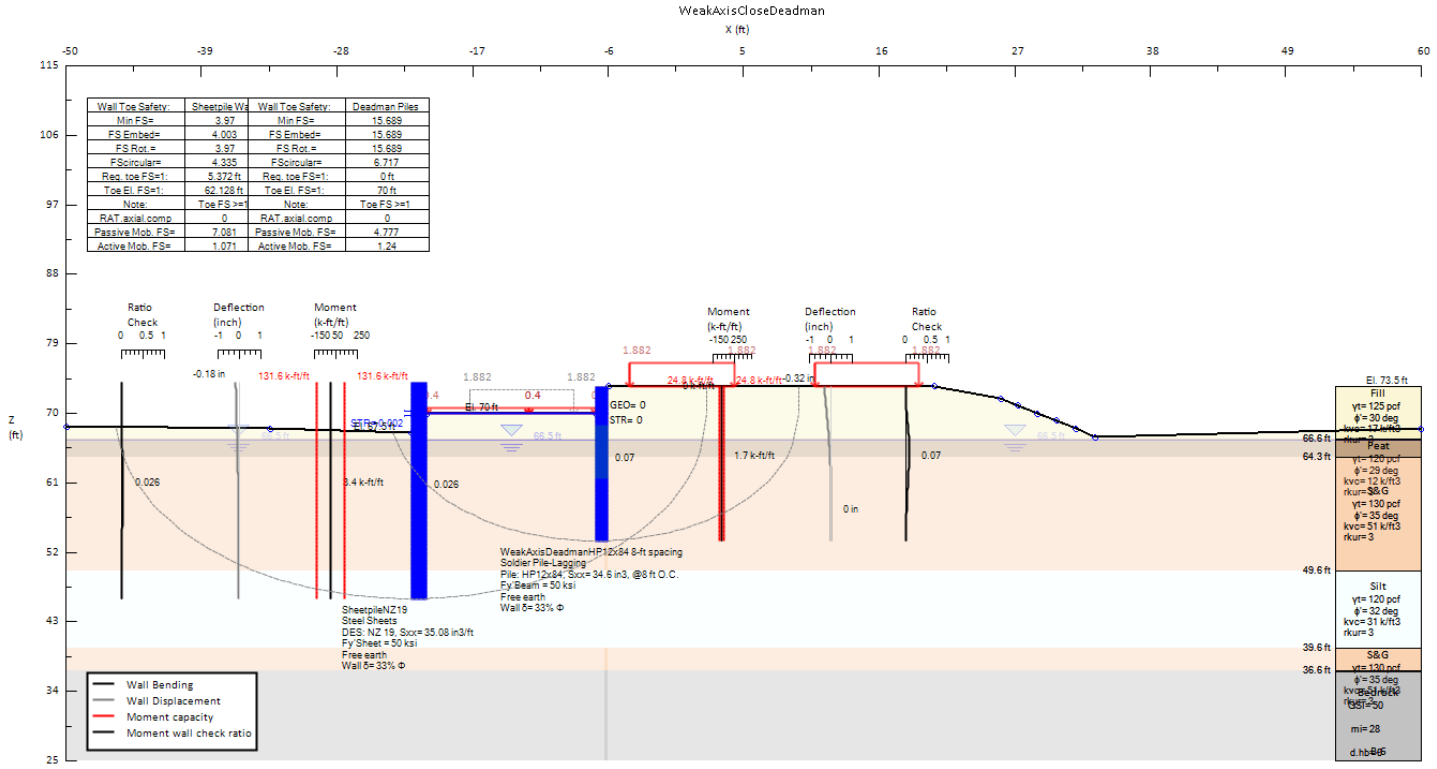




Attachment 2: Station 54+00

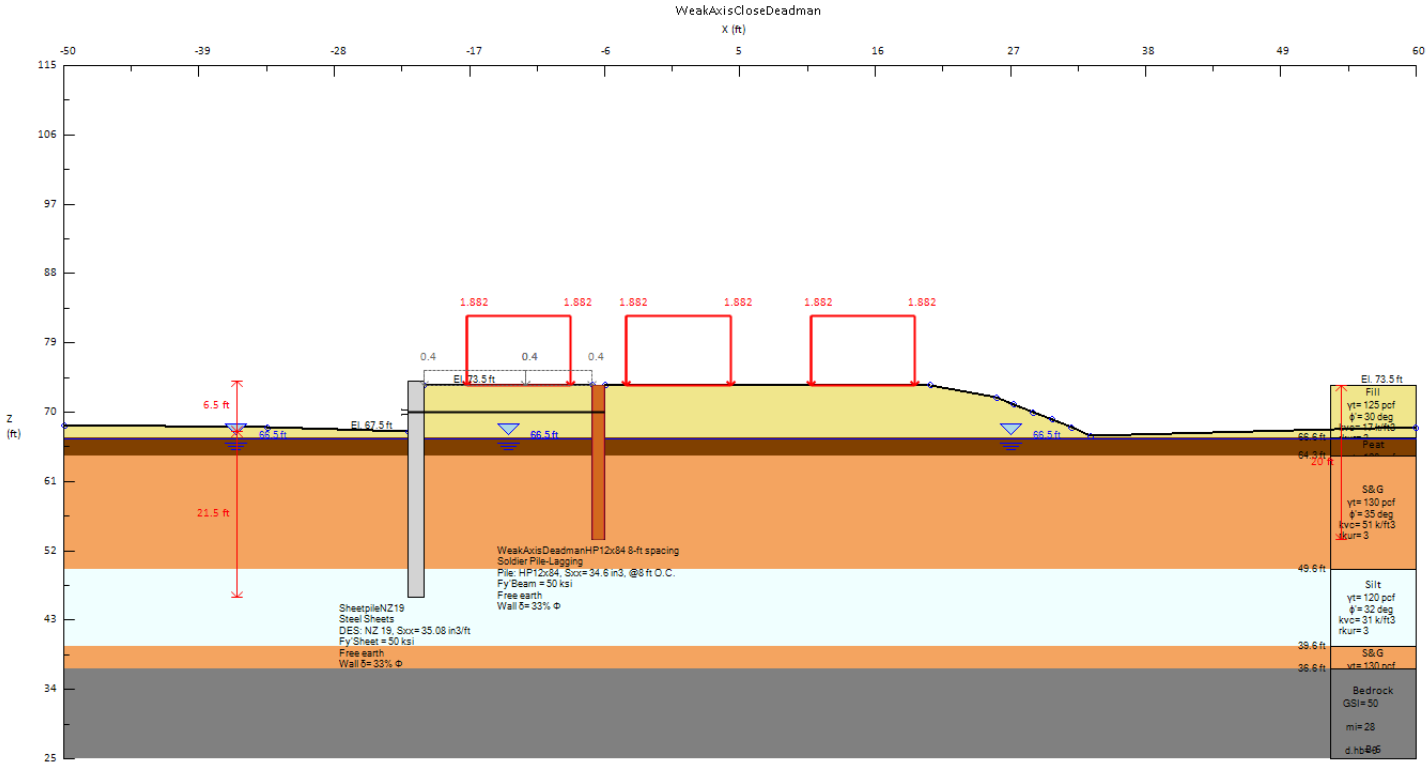
Stage 3: Install Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 20 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

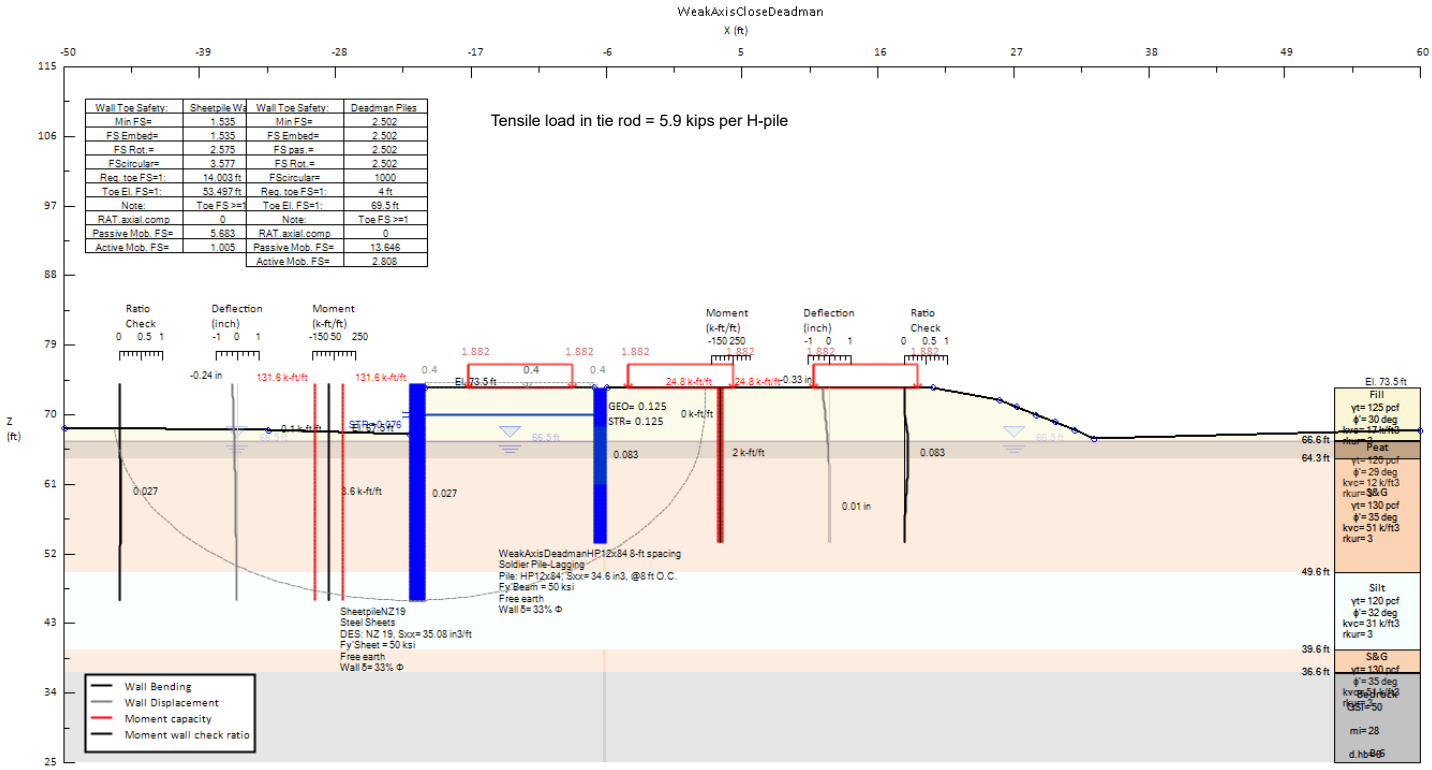




Attachment 2: Station 54+00

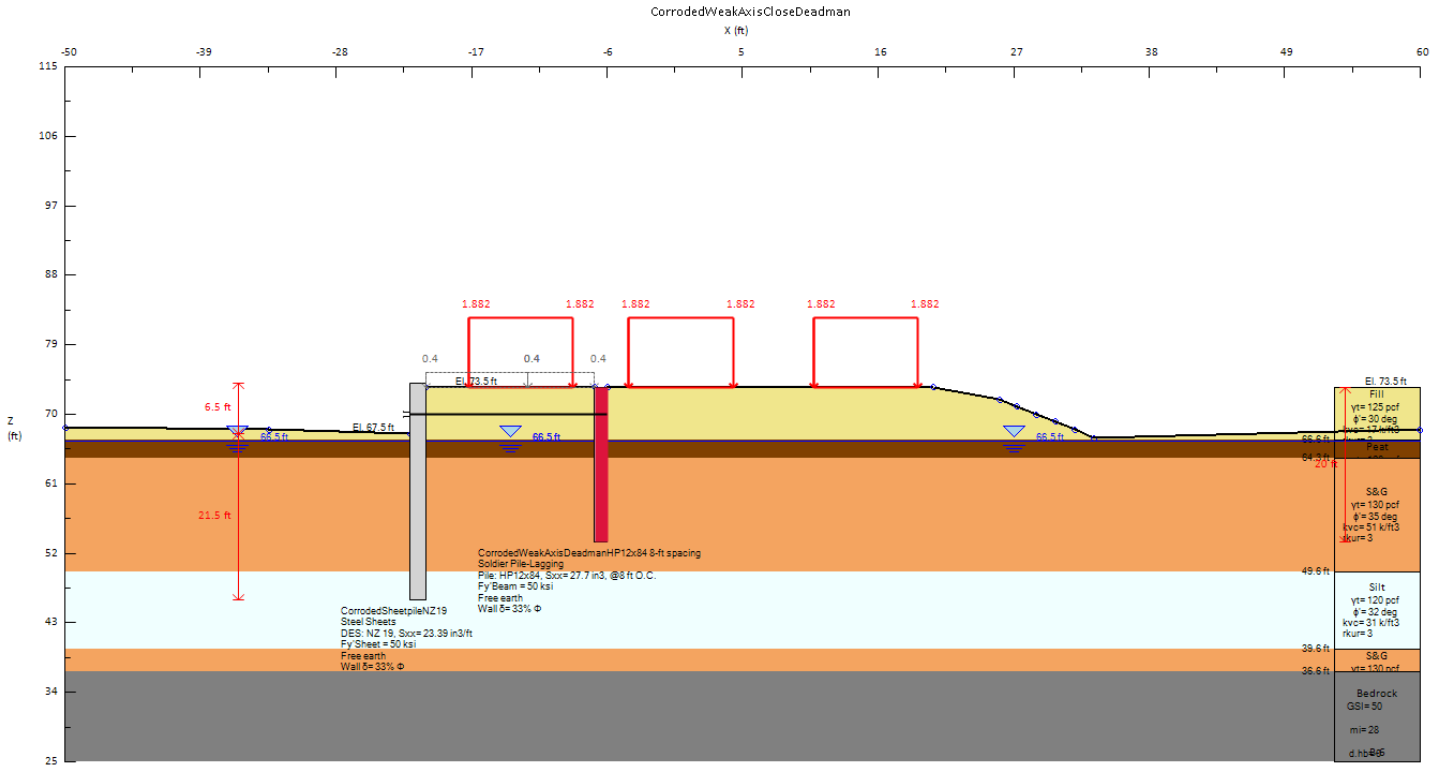
Stage 4: Backfill Tierod to Final Conditions (No Corrosion)						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 20 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

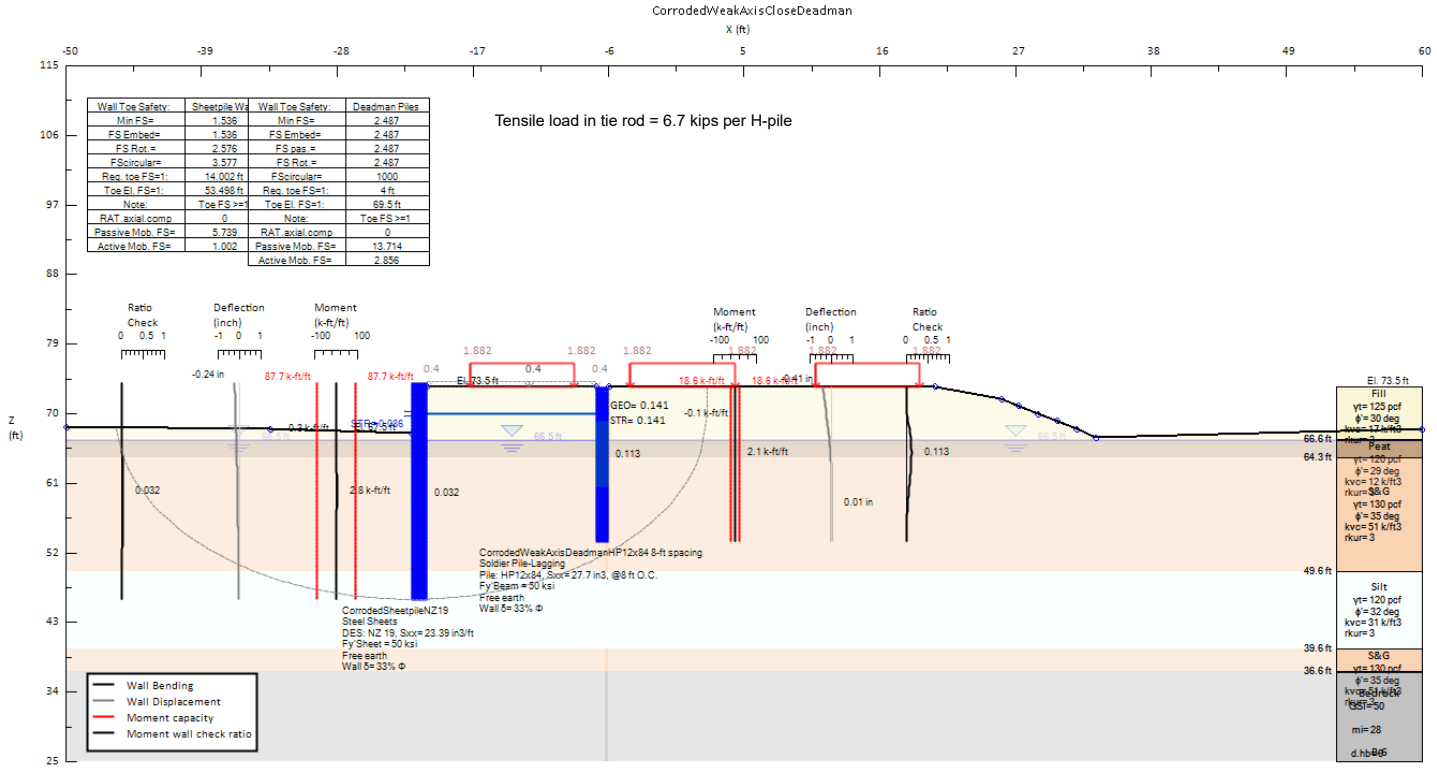




Attachment 2: Station 54+00

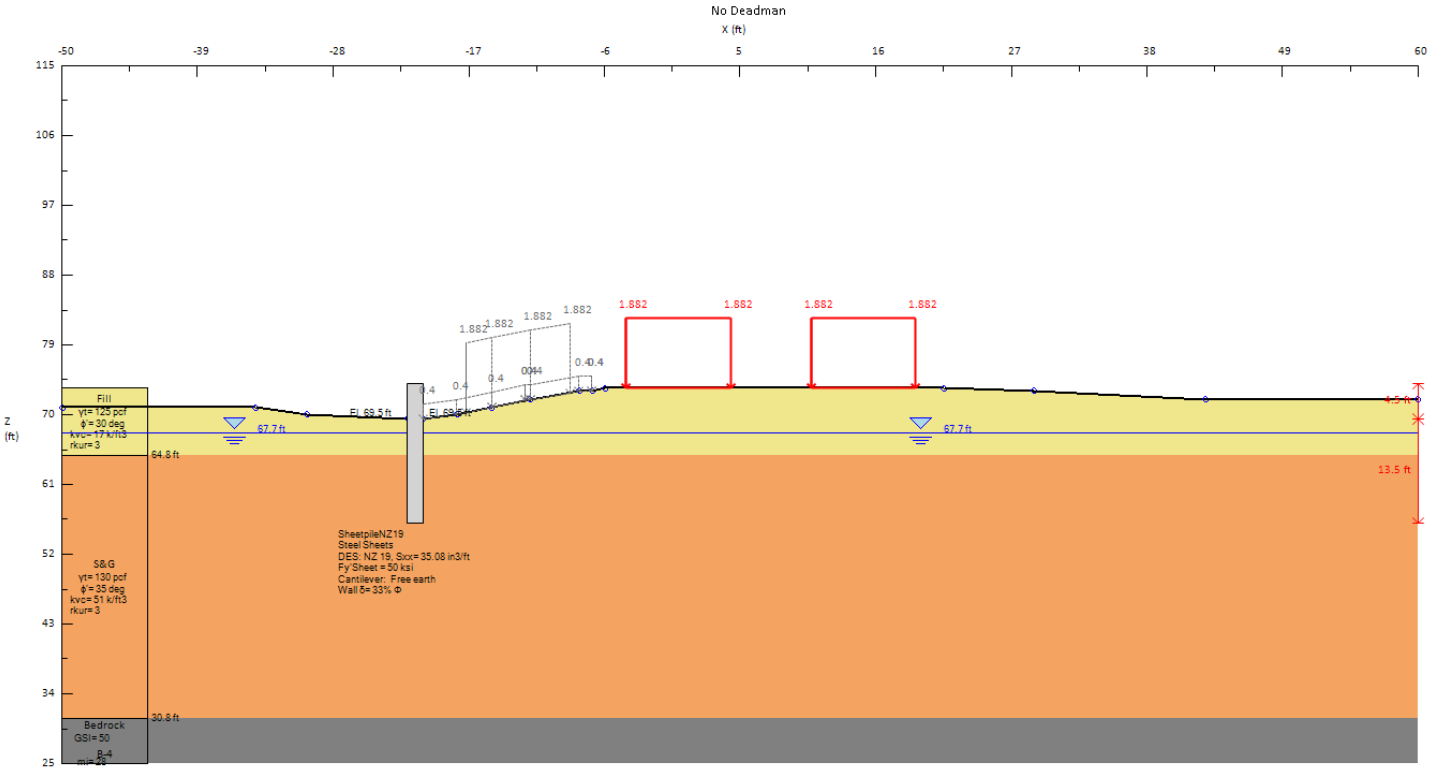
Stage 5: Corrosion Loss (Steel Loss of 1/16 inch per face over 75 Years)						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 8-ft spacing, weak axis orientation		Total length 20 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 8-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, welded to front face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

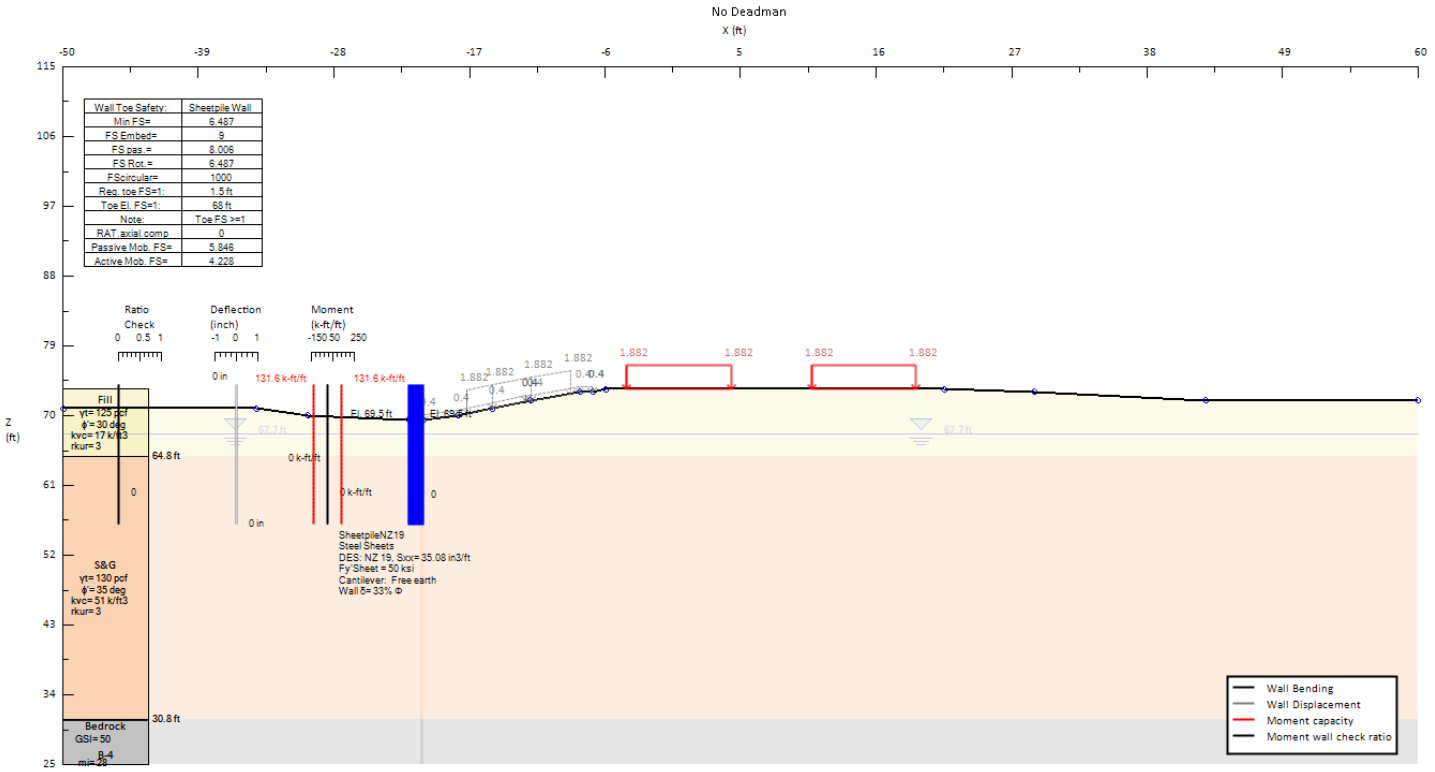




Attachment 3: Station 49+00

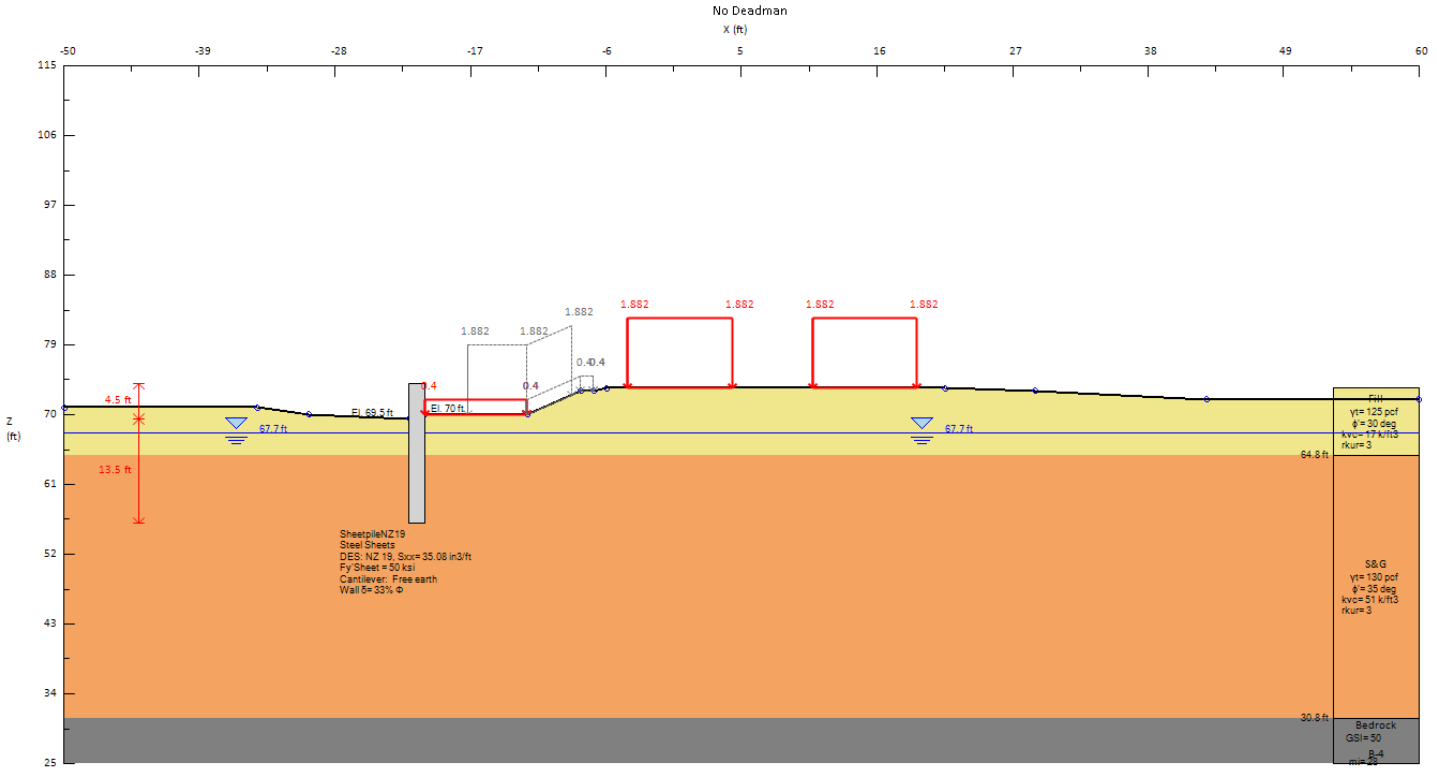
Stage 0: Install Piles						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

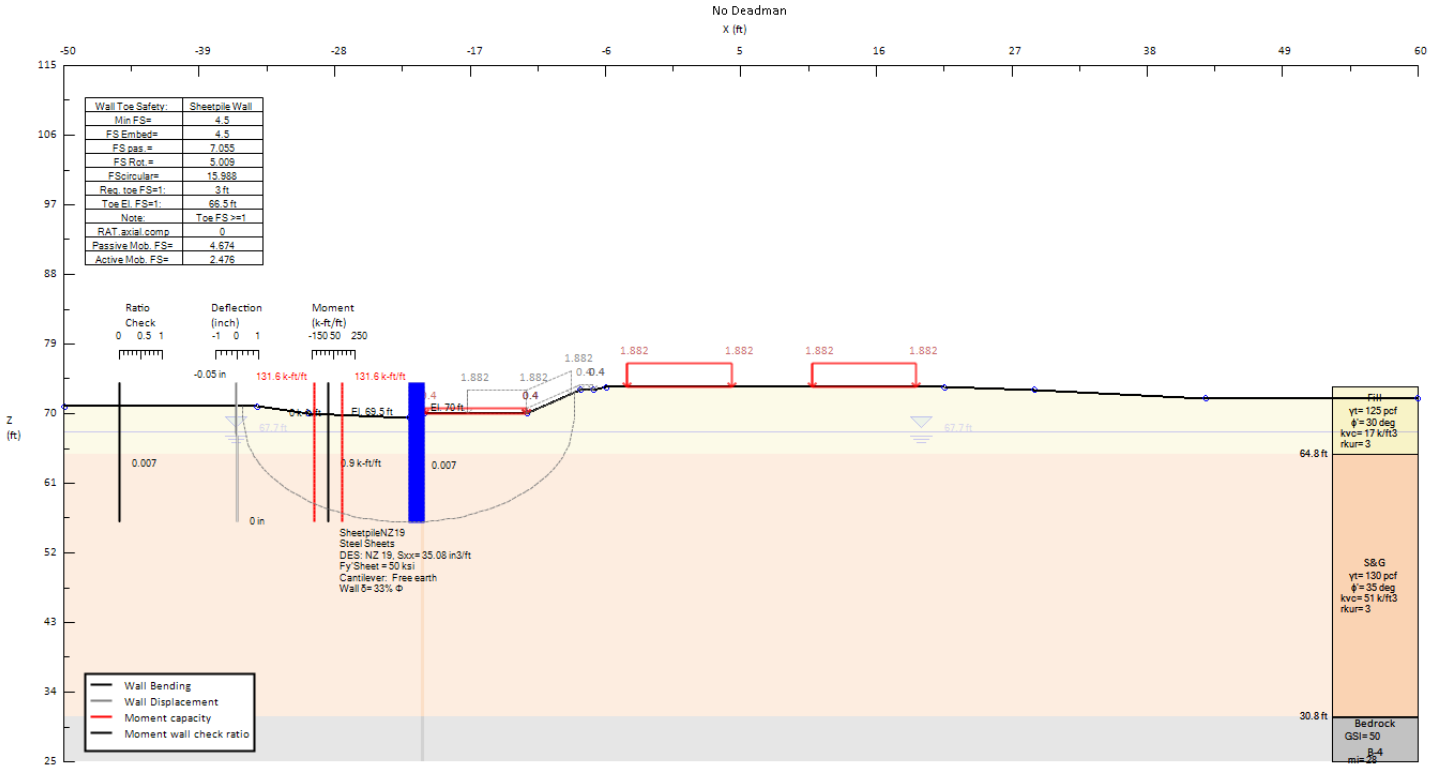




Attachment 3: Station 49+00

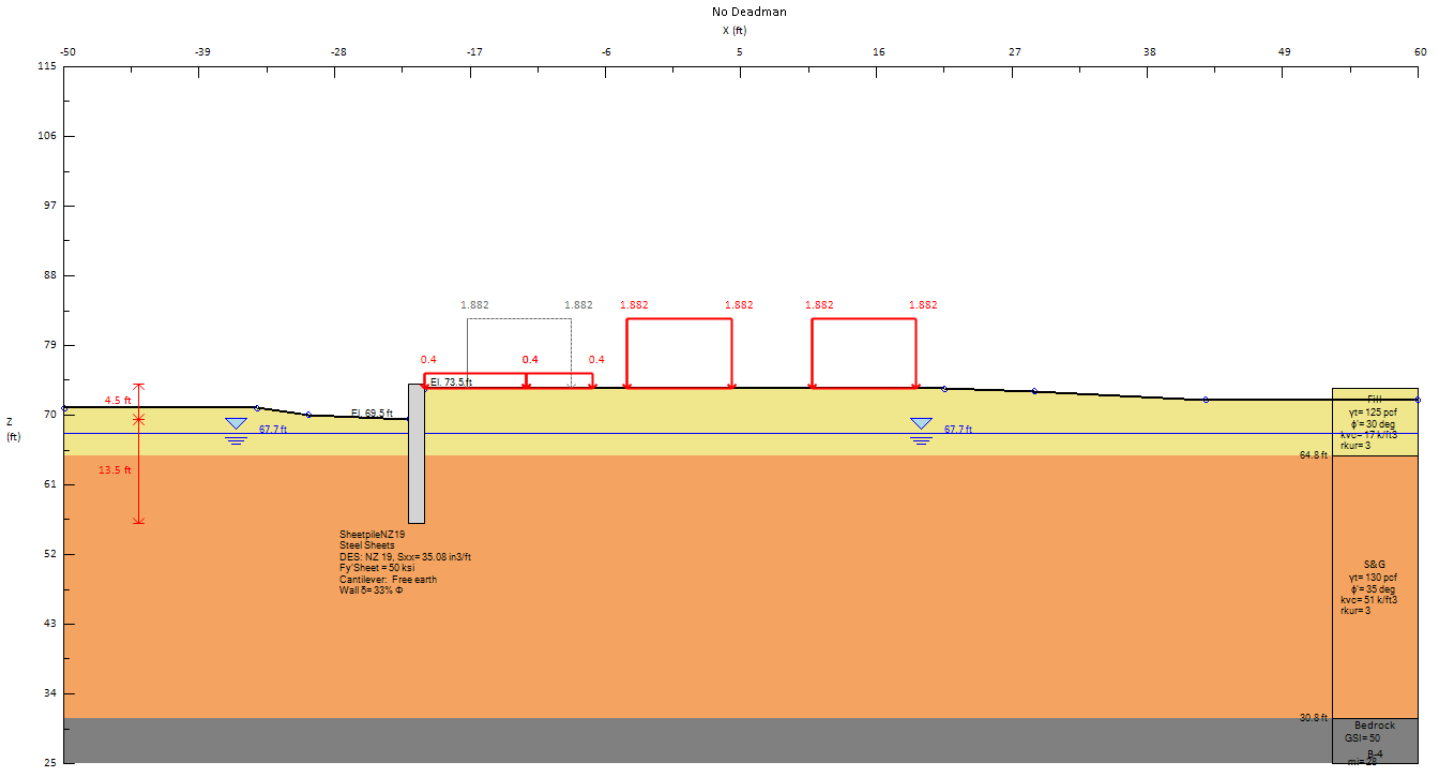
Stage 1: Backfill Sheetpiles to create Construction Travel Lane						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

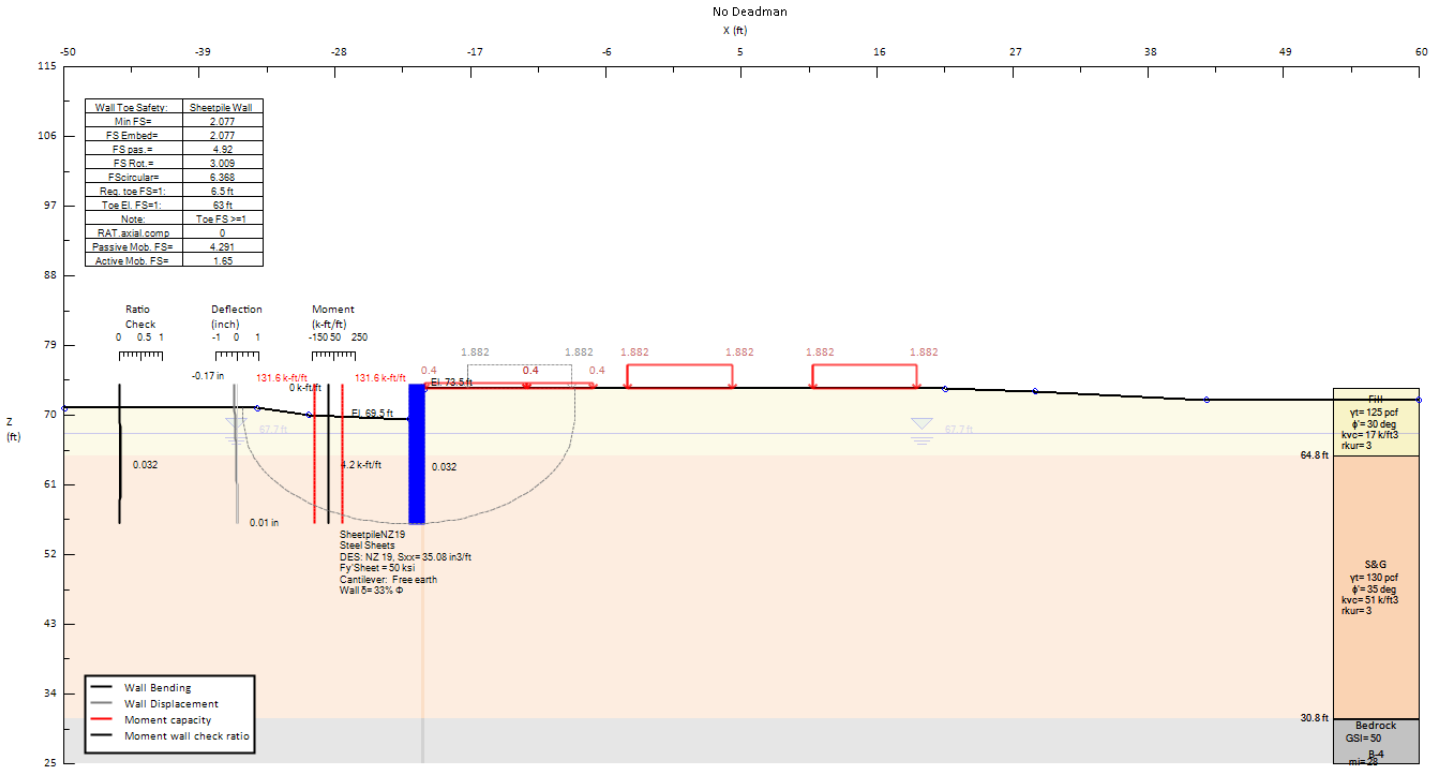




Attachment 3: Station 49+00

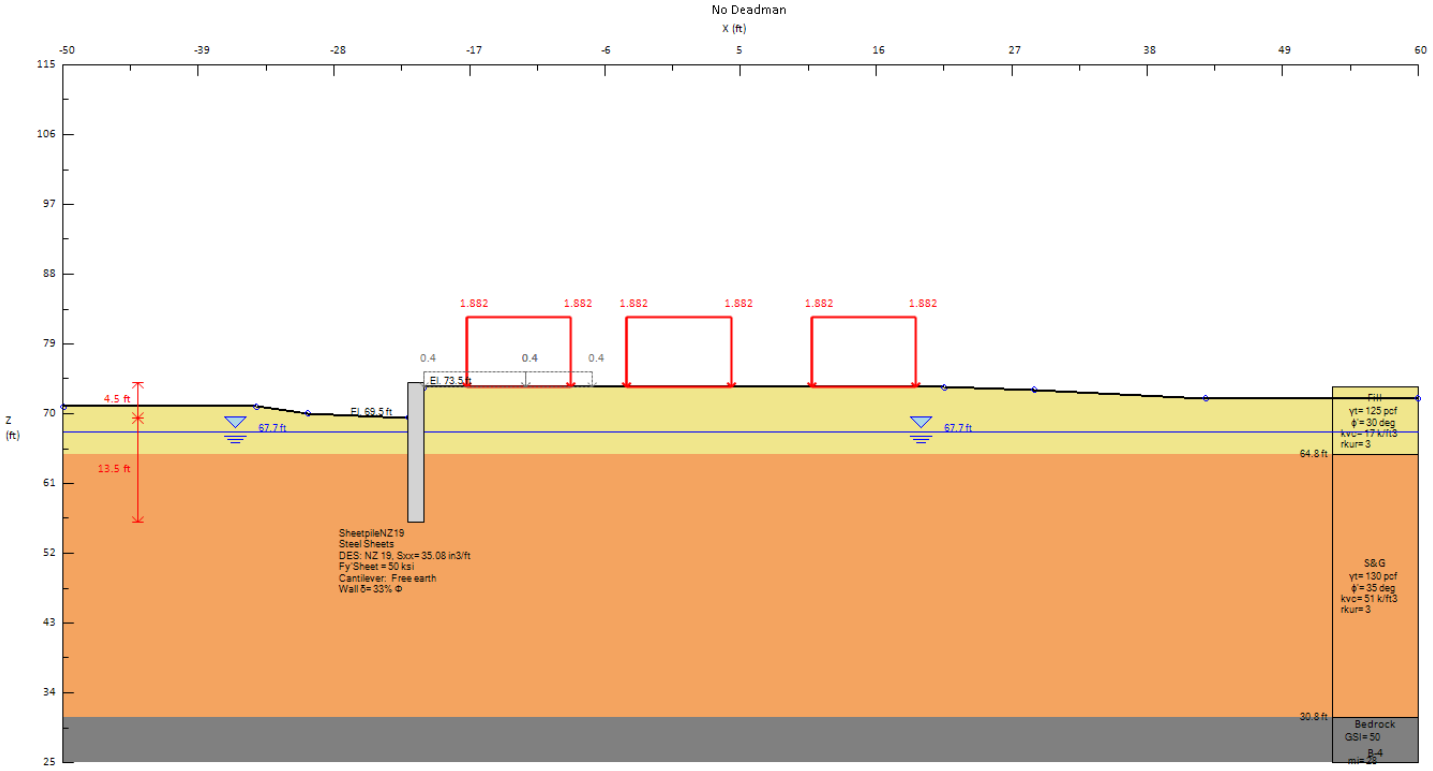
Stages 2 and 3: Construction Loading while Installing Tierods at Nearby Wall Segments						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

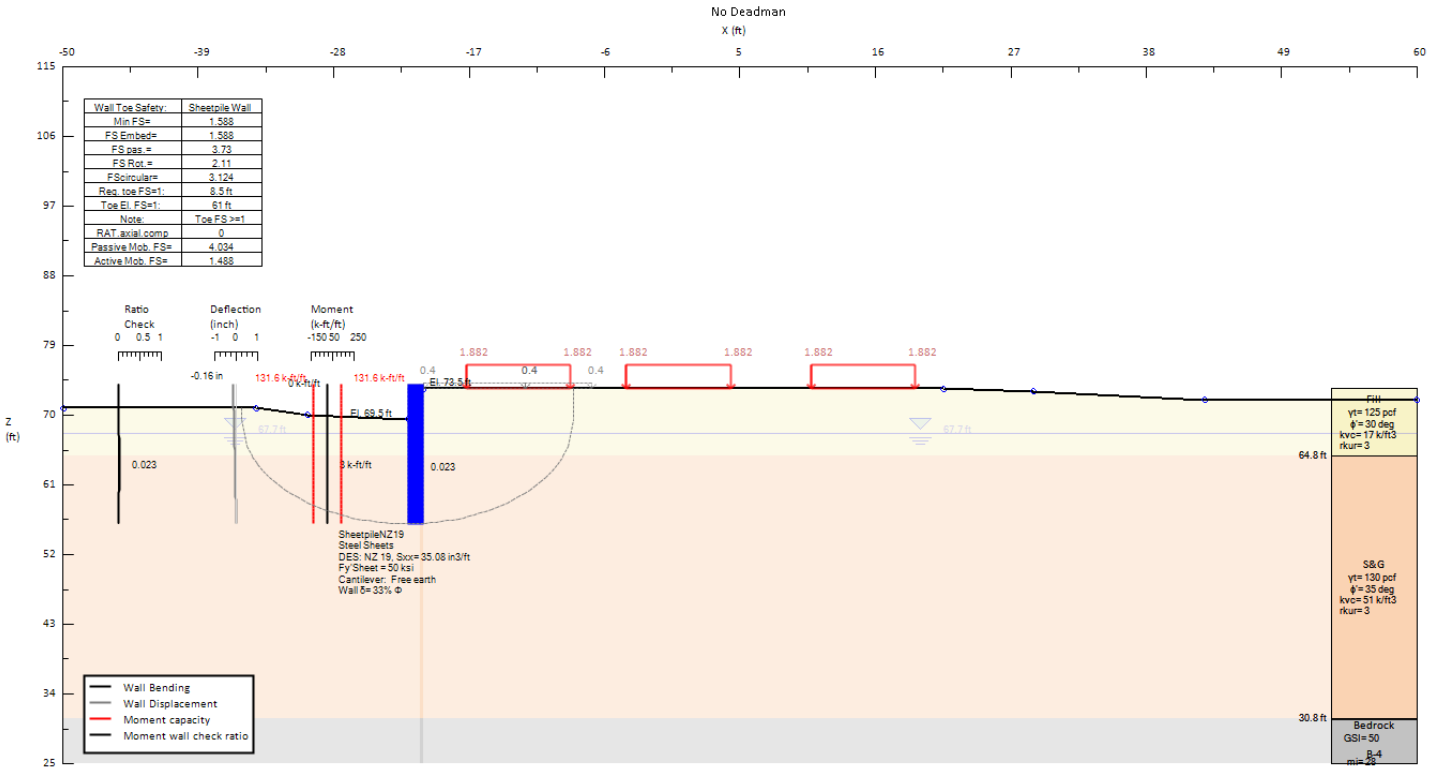




Attachment 3: Station 49+00

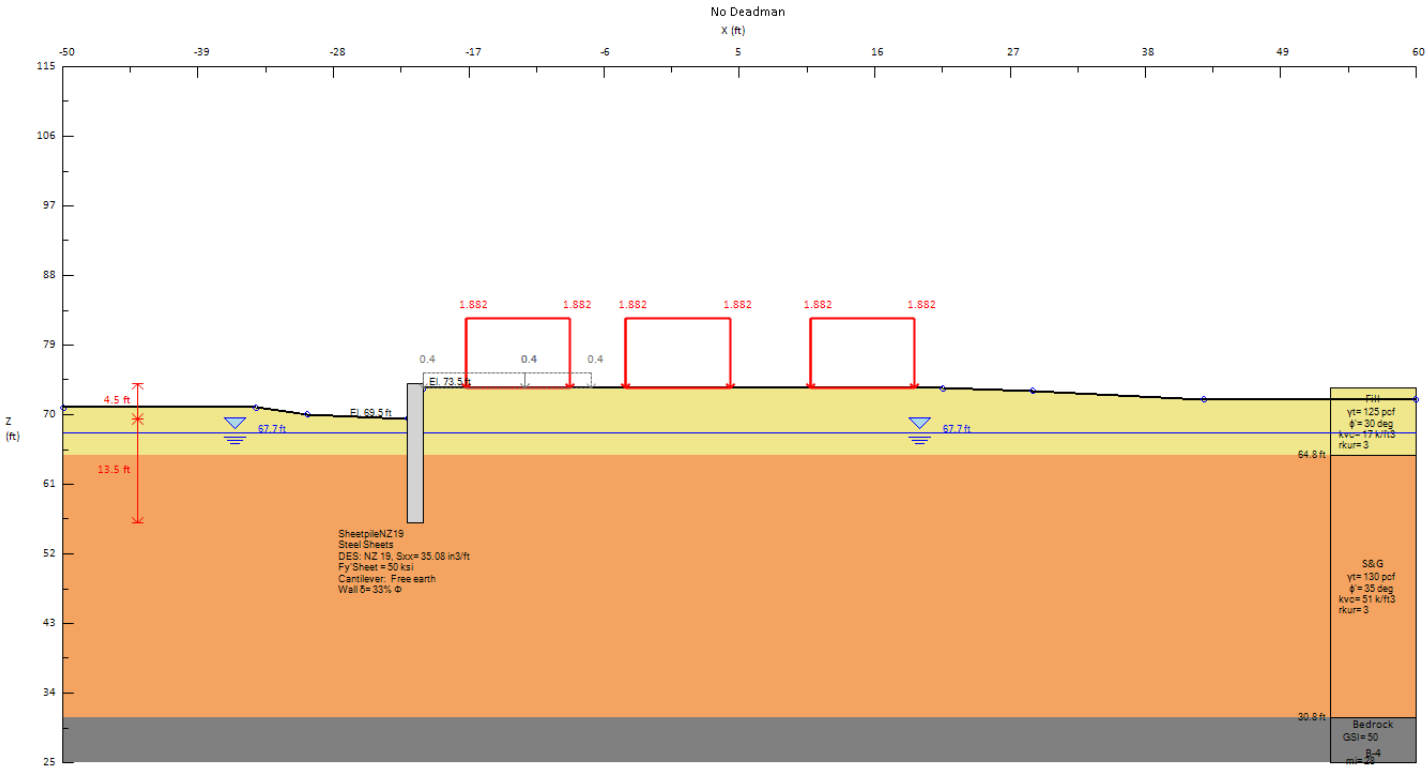
Stage 4: Final Conditions (No Corrosion)						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

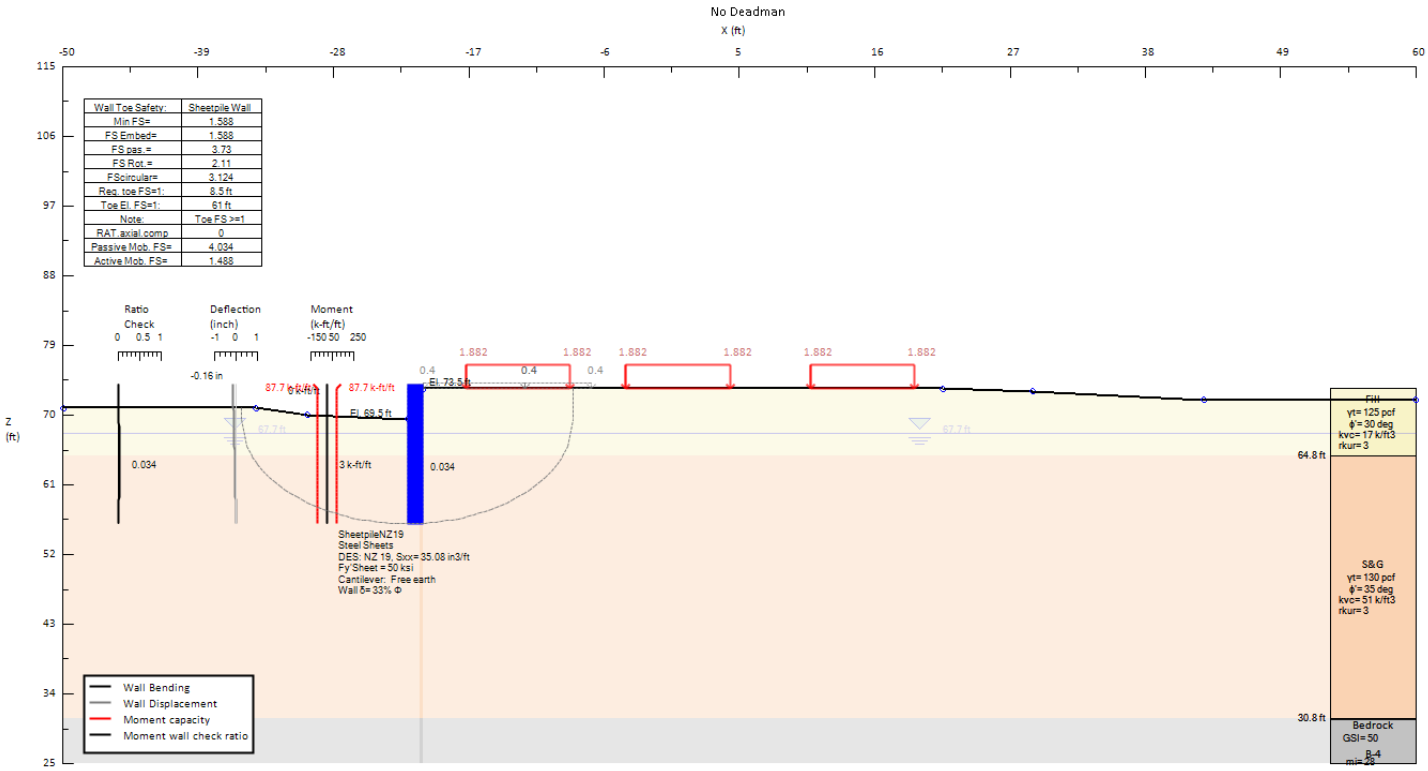




Attachment 3: Station 49+00

Stage 5: Corrosion Loss (Steel Loss of 1/16 inch per face over 75 Years)						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$







wsp.com

CALCULATIONS

Date:	5/27/2025, revised 9/12/2025	**Made by:**	KAR
Project No.:	US0035009.6582	**Checked by:**	BK
Subject:	Proposed Anchored Sheetpile Retaining Wall Design	**Reviewed by:**	CCB
Project Title:	MassDOT Rochester Cape Main Railroad		

OBJECTIVE

Determine the required sheetpile size, H-pile deadmen anchorage, and pile embedment to support construction loading and track loading for the proposed retaining wall along the Cape Mainline and Rochester Siding railroad embankment in Rochester, MA.

METHOD

Use the shoring software *DeepEX* (Ref. 1) to analyze cross-section models of the interpreted soil stratigraphy and proposed retaining wall geometry.

REFERENCES

1. Deep Excavation LLC. DeepEX software package, version 24.03.
2. WSP USA Inc. for Massachusetts Department of Transportation, Rail & Transit Division. Draft PS&E Submission: Cape Main Culvert Replacements at MP 44.27 & MP 44.29 in the town of Rochester, Plymouth County. Dated May 5, 2025.
3. Boring logs from WSP's subsurface investigation, dated February 10, 2025 (B-1 and B-2) and May 9, 2025 (B-3 through B-7).
4. American Railway Engineering and Maintenance-of-Way Association (AREMA). 2019 Manual for Railway Engineering. Chapter 8 Concrete Structures and Foundations; Chapter 15 Steel Structures.
5. Das, Braja M. 2011. Principles of Foundation Engineering, 7th ed.
6. Bridge Software Institute. FB-MultiPier Soil Parameter Table (US Customary Units). Dated 2018.
7. American Association of State Highway and Transportation Officials (AASHTO). 2024 LRFD Bridge Design Specifications, 10th Edition.

ATTACHMENTS

1. Model output for proposed sheetpile wall at Station 46+25 (exposed wall height 8.5 feet)
2. Model output for proposed sheetpile wall at Station 54+00 (exposed wall height 6.5 feet)
3. Model output for proposed sheetpile wall at Station 49+00 (exposed wall height 4.5 feet)

ASSUMPTIONS

1. Each construction stage was analyzed in the DeepEX software using both limit equilibrium and non-linear soil spring methods. During the model computation process, each stage was first analyzed using the limit equilibrium method to calculate the external factor of safety against wall overturning. Each stage was then re-analyzed using the non-linear method to calculate the wall flexural capacity, lateral deflection, and tierod tensile load.

2. The sheetpile design was assessed using a minimum allowable design factor of safety (FS) of 1.5 for wall horizontal forces and overturning moments per AREMA Chapter 8 Section 5.4.2 (Ref. 4); a minimum allowable design FS of 2 for flexural capacity per AREMA Chapter 8 Section 4.2.3 (Ref. 4); and a minimum allowable design FS of 1.8 (i.e., $0.55F_y$) for tensile capacity per AREMA Table 15-1-11 (Ref. 4).

3. Sacrificial steel corrosion loss of 1/16 inch per steel face over a design life of 75 years was assumed for the sheetpiles and H-pile deadmen.

4. Interface friction was assumed to occur on the back of the retaining wall using $\delta = 0.33\phi_f$ for soil against steel, per AASHTO LRFD Article C3.11.5.3 (Ref. 7).

5. Borings B-1, B-2, B-3, and B-6 encountered a thin layer of peat grading to silty sand with organics beneath the embankment fill. Since the peat and silty sand materials were sampled within the same SPT interval in all four borings, the materials were modeled as a single layer with material properties correlated from these combined N_{60} values. Borings B-1 and B-6 encountered a deep layer of sandy silt and silty sand within the sand and gravel layer. Due to the high percentage of sand and the low plasticity, the sandy silt / silty sand was modeled as a cohesionless material with a friction angle correlated from N_{60} values.

6. The H-pile deadmen were assumed to be installed in weak axis bending orientation to facilitate tierod connections through the pile web.

7. The H-pile deadmen were assumed to be cut off 1 foot below the proposed finish grade after installation in order to accommodate the railroad ballast. Thus the proposed final pile length is 1 foot shorter than the proposed pile embedment depth for the H-piles.

CALCULATION

1. Summarize the stages of construction.

WSP understands that MassDOT wishes to construct an anchored sheetpile wall at the northeastern edge of the Cape Mainline right-of-way adjacent to the MBTA Rochester facility in order to backfill the northeastern embankment slope to create a travel lane for construction equipment used in the culvert replacements at mileposts 44.27 and 44.29. After completion of culvert construction, the backfilled area behind the sheetpile wall will be used for a third railroad track. WSP analyzed cross-sections through the proposed wall to identify required design parameters for the sheetpiles and the H-pile deadmen anchors. Locations along the wall are identified using the stationing of the Rochester Siding track / construction centerline alignment.

Since MassDOT proposes to install the tierods connecting the sheetpiles and the H-pile deadman after completion of culvert construction, the sheetpile wall will act as a cantilever wall during the construction travel lane stage. Thus, WSP plotted the existing ground surface elevation in front of the proposed wall and the proposed top-of-wall elevation along the length of the wall (Ref. 2) to identify the range of exposed wall heights. The exposed wall height along the proposed sheetpile wall will range from 2.5 feet to 8.5 feet.

The analyzed stages of construction are as follows:

Stage 0: Install sheetpiles and H-pile deadmen.

Stage 1: Backfill sheetpiles to the tierod elevation to create the construction travel lane. The sheetpile wall will be cantilever during this stage and will support surcharge loading from construction equipment on the travel lane and trains on the existing Rochester Siding and Cape Mainline tracks.

Stage 2: Excavate trenches to install tierods between sheetpiles and H-pile deadmen.

Stage 3: Install tierods and bolt waler to rear face of sheetpiles.

Stage 4: Backfill tierods to final ground surface elevation and construct third railroad track. The sheetpile wall will be anchored during this stage and will support surcharge loading from trains on the existing Rochester Siding and Cape Mainline tracks and the proposed third track.

Stage 5: End of design life including sacrificial steel corrosion loss.

2. Identify the cross-sections for analysis.

Three cross-section models through the proposed retaining wall at different exposed wall heights were analyzed.

a. Station 46+25 with an exposed wall height of 8.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 6.5 feet to 8.5 feet.

b. Station 49+00 with an exposed wall height of 4.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 2.5 feet to 4.5 feet.

c. Station 54+00 with an exposed wall height of 6.5 feet was analyzed to represent segments of the wall with exposed heights ranging from 4.5 feet to 6.5 feet.

3. Determine soil profile and material parameters for each cross-section model.

The soil profile at each analyzed location was based on the closest boring drilled during the subsurface investigation in January and April 2025 (Ref. 3). The groundwater elevation at each analyzed location was based on the water surface measured in this closest boring during the drilling.

a. The soil profile and groundwater elevation at Station 46+25 were based on boring B-2.

b. The soil profile and groundwater elevation at Station 49+00 were based on boring B-4.

c. The soil profile and groundwater elevation at Station 54+00 were based on boring B-6.

The in-situ soil layers were modeled using Mohr-Coulomb conditions. The bedrock layer was modeled using Hoek-Brown rock mass conditions.

The friction angles for the in-situ soil layers were correlated from SPT N_{60} values encountered in all seven borings performed at site (B-1 through B-7), based on the Peck, Hanson, and Thornburn (1974) correlation as provided in Ref. 5, Eqn. 2.26. The unit weight parameters were selected based on local engineering experience. The subgrade modulus and Poisson's ratio were correlated from the design friction angle for each layer using recommendations in the FB-MultiPier (Ref. 6) and DeepEX (Ref. 1, input menu) software documentation, respectively. The reloading subgrade modulus was assumed to equal one-third of the subgrade modulus as recommended in the DeepEX software documentation (Ref. 1, input menu). The active and passive earth pressure coefficients were calculated by the DeepEX software during each model analysis using Coulomb theory.

Soil Layer	Friction Angle (°)	Unit Weight (pcf)	Subgrade Modulus (pci)	Reloading Subgrade Modulus (pci)	Reloading Subgrade Modulus (kcf)	Poisson's Ratio
Fill	30	125	30	10	17	0.40
Peat and Silty Sand	29	120	20	7	12	0.33
Sandy Silt & Silty Sand	32	120	53	18	31	0.33
Sand and Gravel	35	130	88	29	51	0.30

4. Estimate surcharge loading on the sheetpile wall.

Cooper E80 train loading was assumed on each existing track for all stages and on the proposed third track for Stages 4 and 5. The train load on each track was implemented in the DeepEX model as a distributed load of 1882 psf acting over the tie width, based on AREMA Figure 8-2-1 (Ref. 4) and assuming a tie width of 8.5 feet as shown in Ref. 2. The resulting live load surcharge pressure acting on the sheetpile wall was calculated by the DeepEX software during each model analysis.

Construction equipment loading of 400 psf was assumed on the construction travel lane for Stage 1 and on the tierod work area for Stages 2 and 3. The resulting live load surcharge pressure acting on the sheetpile wall was calculated by the DeepEX software during each model analysis.

Date:	5/27/2025, revised 9/12/2025	**Made by:**	KAR
Project No.:	US0035009.6582	**Checked by:**	BK
Subject:	Proposed Anchored Sheetpile Retaining Wall Design	**Reviewed by:**	CCB
Project Title:	MassDOT Rochester Cape Main Railroad		

RESULTS

The cross-sections listed above were analyzed using the subsurface geometry and material parameters listed above to determine the minimum pile embedment length, deadmen anchor spacing, pile sizing, and tierod elevation to satisfy the required factors of safety from Assumption 2. Analysis results are shown in Attachments 1 through 3 and are discussed below.

Backfill for the construction travel lane was modeled to the proposed tierod elevation (elev. 70 feet), in order to reduce earth pressure loading on the cantilever wall and reduce fill excavation for tierod installation. Due to the existing embankment slope, the travel lane width at elev. 70 feet was approximately 8.3 feet. Construction surcharge loading of 400 psf was modeled on this travel lane width.

The H-pile deadmen anchor location was modeled at the northeastern edge of the existing embankment slope, between the existing Rochester Siding track and the proposed third track. Although this location places the deadmen anchors within the active soil wedge of the sheetpile wall, it permits installation of the tierods without removal of the existing Rochester Siding track, and it permits maintenance of train traffic on the existing tracks during construction.

Due to track clearance requirements, the sheetpile wall is proposed to be installed at the edge of the railroad right-of-way. Thus the waler was modeled as attached to the rear face of the sheetpiles rather than the front face, in order to keep it within the ROW. The tierods were modeled as connecting through the sheetpiles to the front face. Tierod and H-pile deadman spacing was selected to align with the sheetpile unit width. The waler and tierod connections will be designed by others.

Analysis Location		Station 46+25	Station 54+00	Station 49+00
Exposed Wall Height at Analysis Location		8.5 feet	6.5 feet	4.5 feet
Recommended Exposed Wall Height Range		6.5 feet to 8.5 feet	4.5 feet to 6.5 feet	2.5 feet to 4.5 feet
Sheetpiles	*Pile Size*	NZ 19, Grade 50	NZ 19, Grade 50	NZ 19, Grade 50
	Total Length	35 feet	28 feet	18 feet
	Embedment Length	26.5 feet	21.5 feet	13.5 feet
H-Pile Deadmen	*Pile Size*	HP 12x84, Grade 50	HP 12x84, Grade 50	N/A
	Total Length	24 feet	19 feet	N/A
	Embedment Length	25 feet	20 feet	N/A
	Center-to-Center Spacing	9.2 feet	9.2 feet	N/A
	Orientation	Weak axis	Weak axis	N/A
Tierods	*Tierod Size*	#8 bar, Grade 60	#8 bar, Grade 60	N/A
	Installation Location	Elevation 70 feet	Elevation 70 feet	N/A
	Tensile Load	9.2 kips per bar	7.1 kips per bar	N/A
Waler	*Waler Size*	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall	N/A
Deflection at Top of Wall		0.47 inches	0.27 inches	0.16 inches

Date:	5/27/2025, revised 9/12/2025	**Made by:**	KAR
Project No.:	US0035009.6582	**Checked by:**	BK
Subject:	Proposed Anchored Sheetpile Retaining Wall Design	**Reviewed by:**	CCB
Project Title:	MassDOT Rochester Cape Main Railroad		

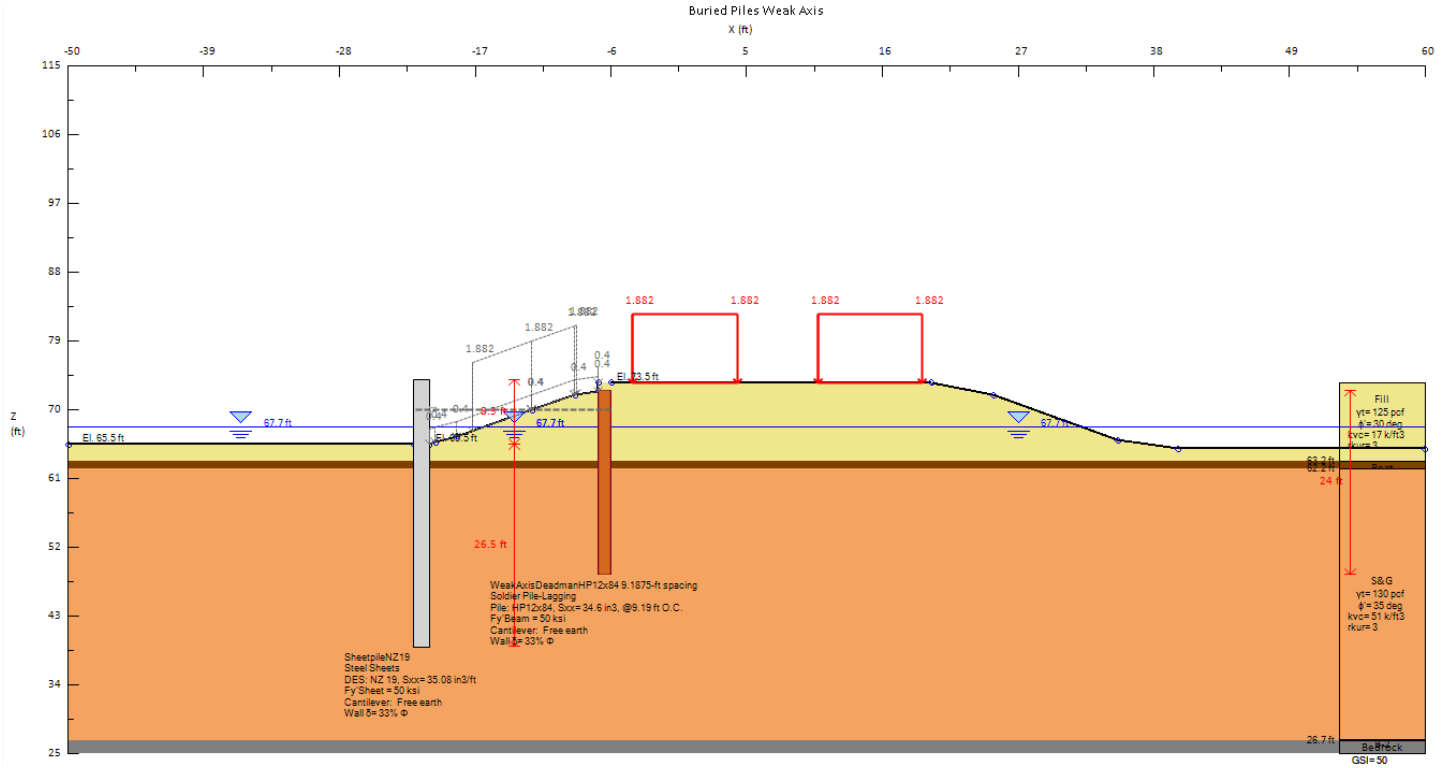
The analysis at Station 46+25 represented the tallest exposed wall height and thus was the critical section. To meet the minimum factor of safety against overturning during the cantilever wall scenario with construction travel lane (Stage 1), the analysis indicated that a sheetpile embedment of 26.5 feet (total sheetpile length of 35 feet) would be needed. This embedment length would result in a sheetpile toe at approximately elevation 39 feet. The borings performed at site (Ref. 3) encountered boulders at elevations ranging from 33.6 feet to 31.5 feet, and encountered bedrock at elevations ranging from 39.2 feet to 26.7 feet. Thus, we anticipate that the sheetpiles can be driven to the required minimum embedment without refusing on boulders or bedrock. The analysis indicated that H-pile deadmen and tierods spaced at 9.2 feet center-to-center with deadman embedment of 25 feet would be needed for the anchored wall scenario with proposed railroad track (Stages 4 and 5).

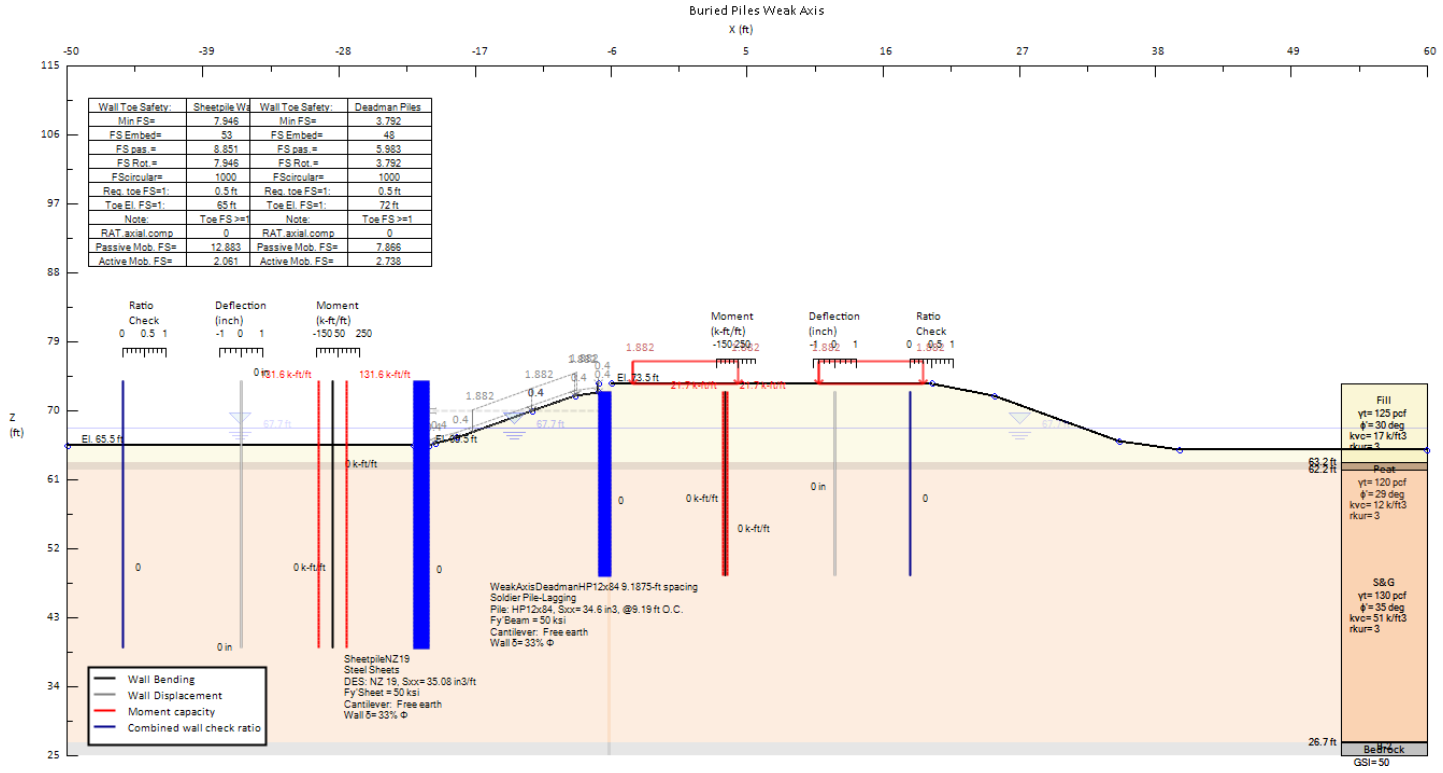
The analysis at Station 54+00 represented an intermediate exposed wall height. Due to this reduced wall height, the analysis indicated that the sheetpile embedment could be reduced to 21.5 feet (total sheetpile length of 28 feet), and the deadman embedment could be reduced to 20 feet. The sheetpile size, deadman size, and deadman spacing were not varied in order to standardize construction.

The analysis at Station 49+00 represented one of the shortest exposed wall heights. Due to this reduced wall height, the analysis indicated that the deadmen anchors could be eliminated at locations with exposed wall heights shorter than 4.5 feet. The sheetpile size was not varied in order to standardize construction.

Attachment 1: Station 46+25

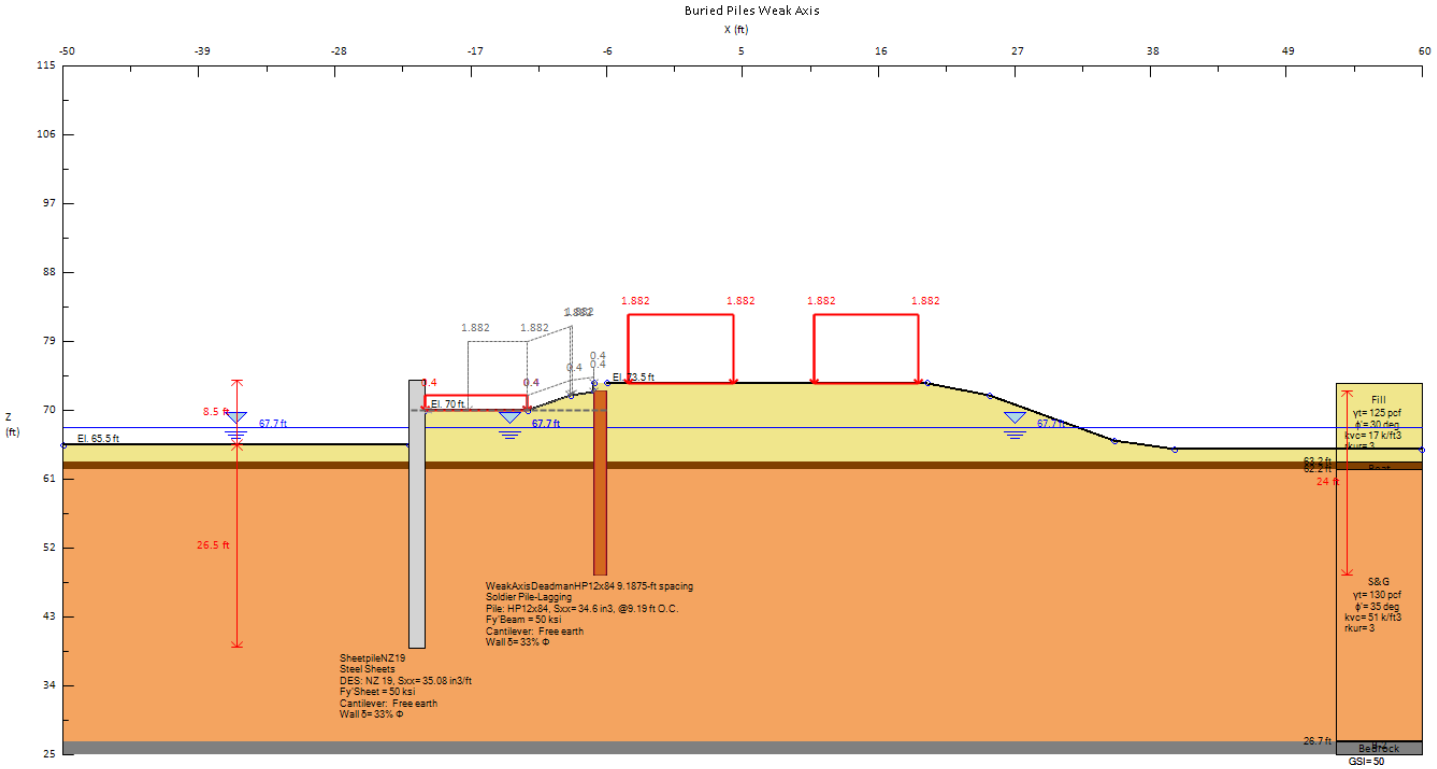
Stage 0: Install Piles						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 24 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

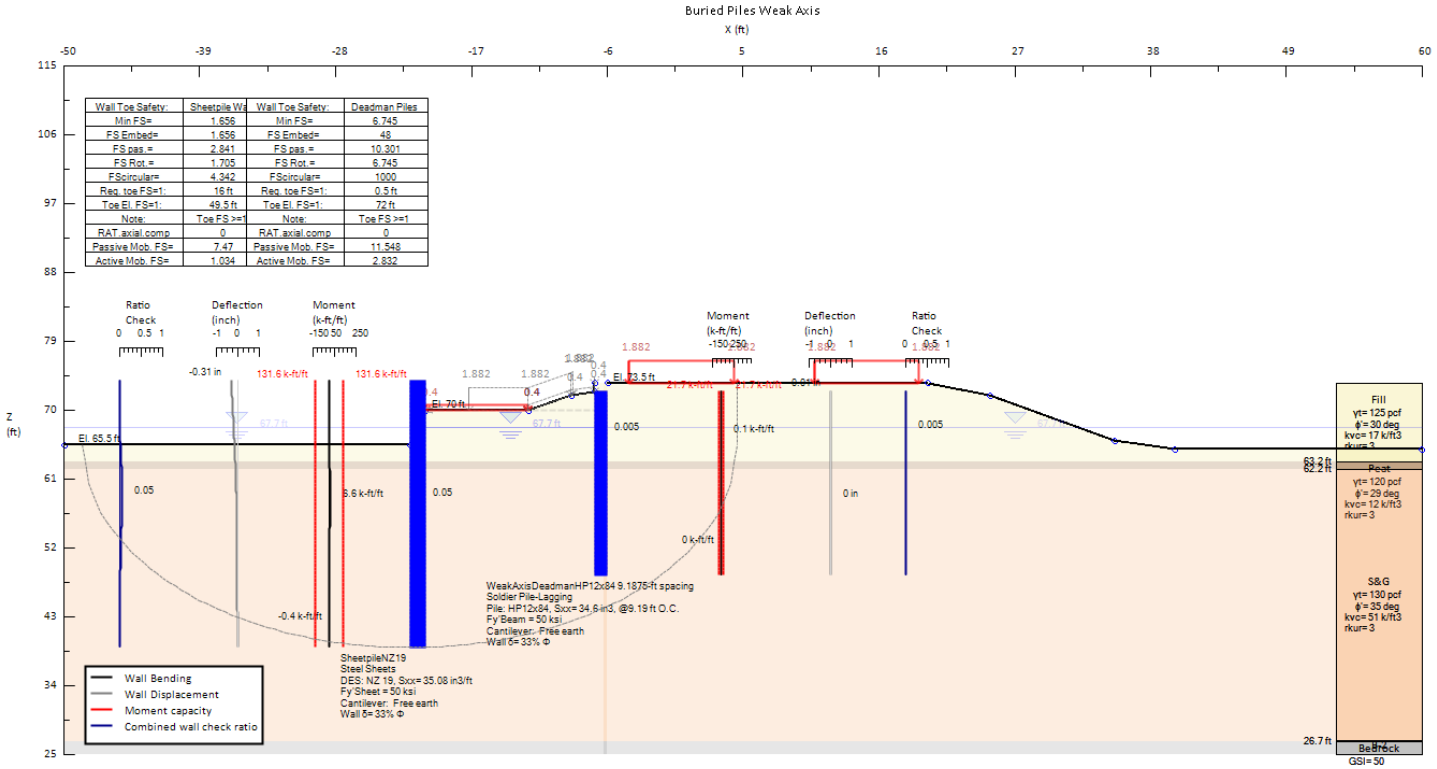




Attachment 1: Station 46+25

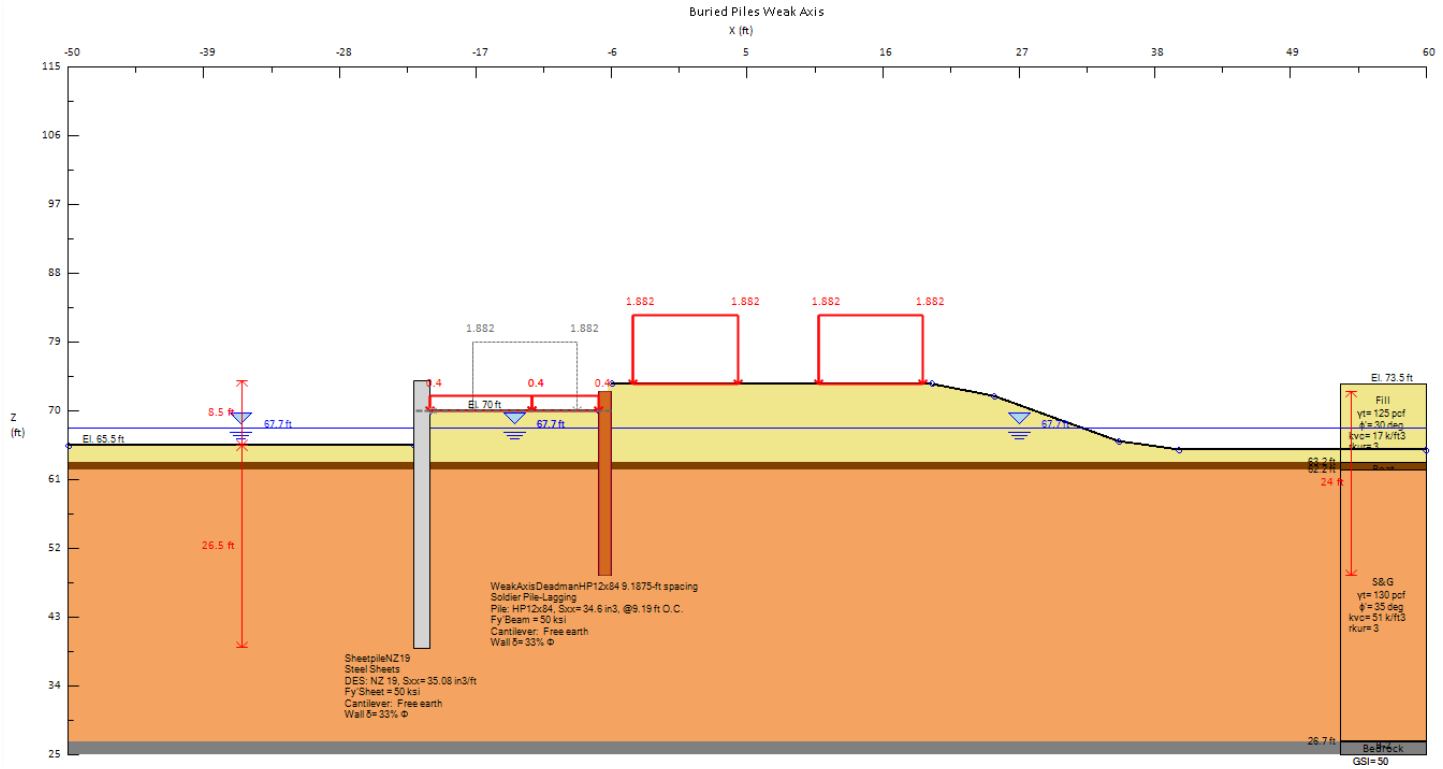
Stage 1: Backfill Sheetpiles to create Construction Travel Lane						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 24 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

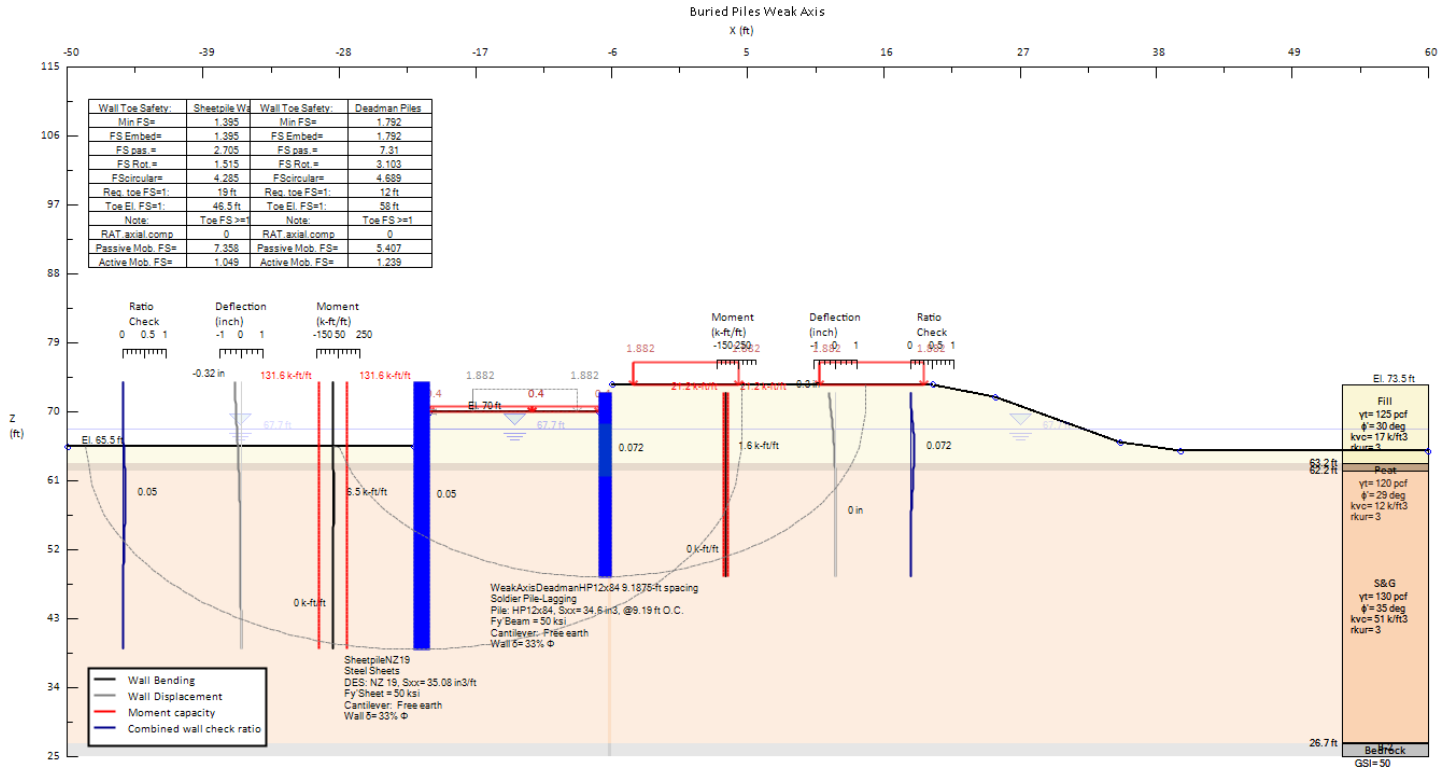




Attachment 1: Station 46+25

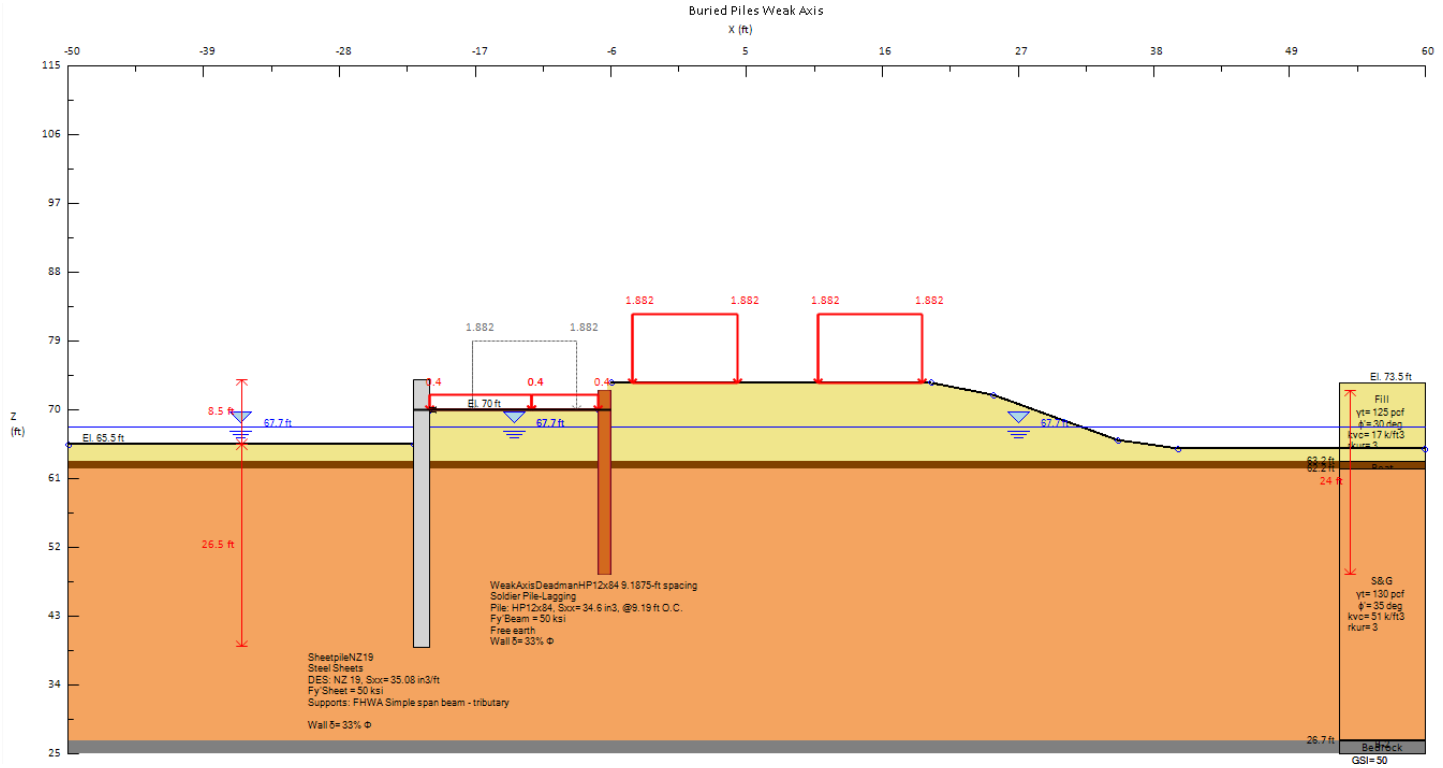
Stage 2: Excavate Trench for Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 24 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

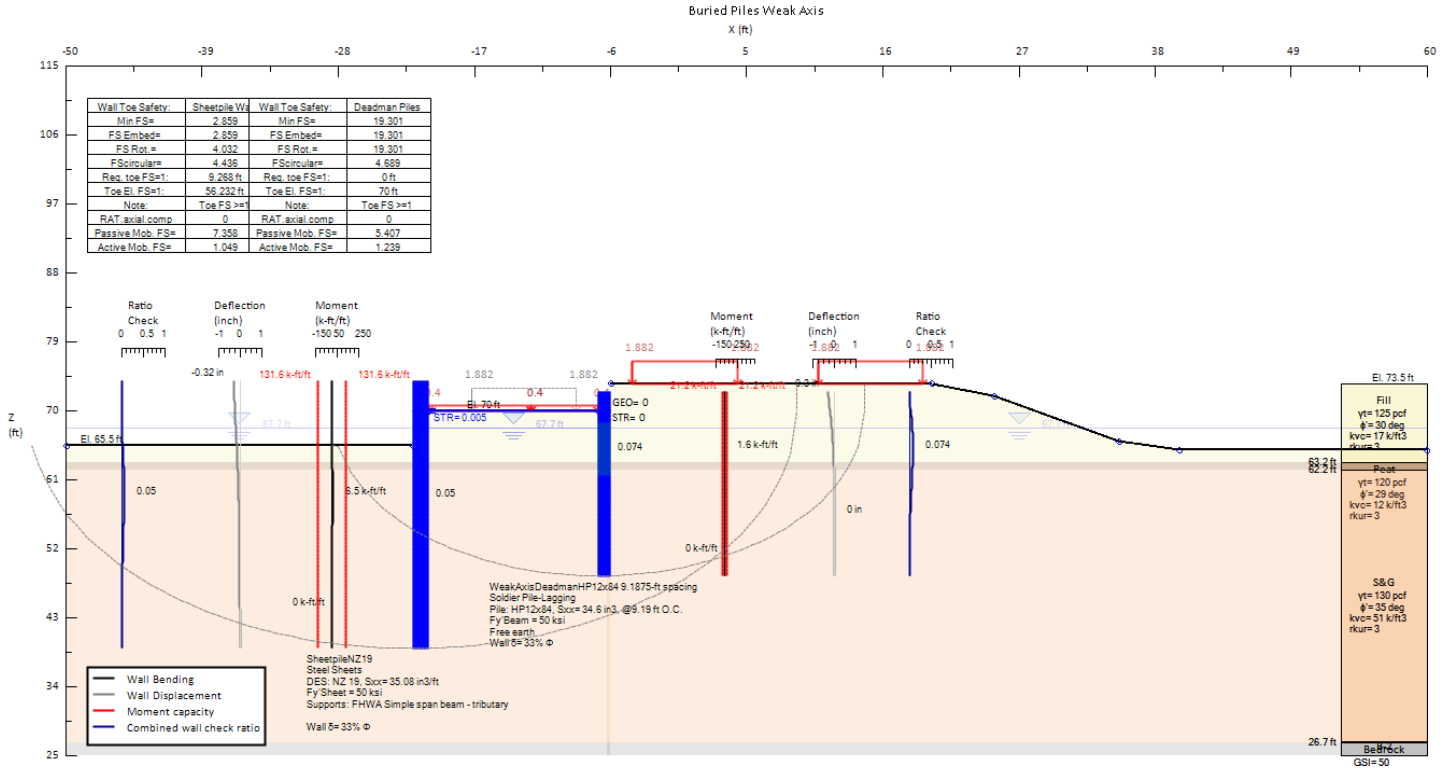




Attachment 1: Station 46+25

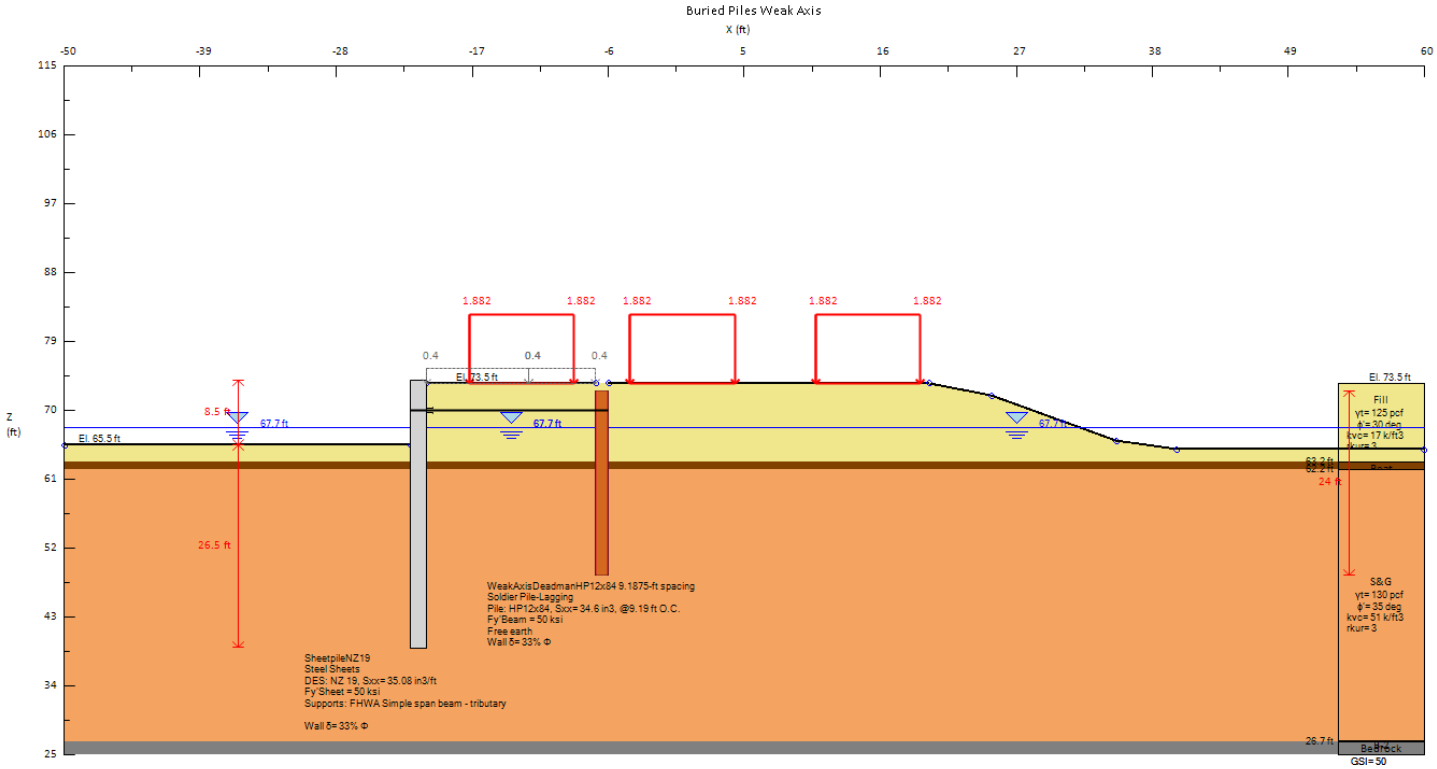
Stage 3: Install Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 24 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

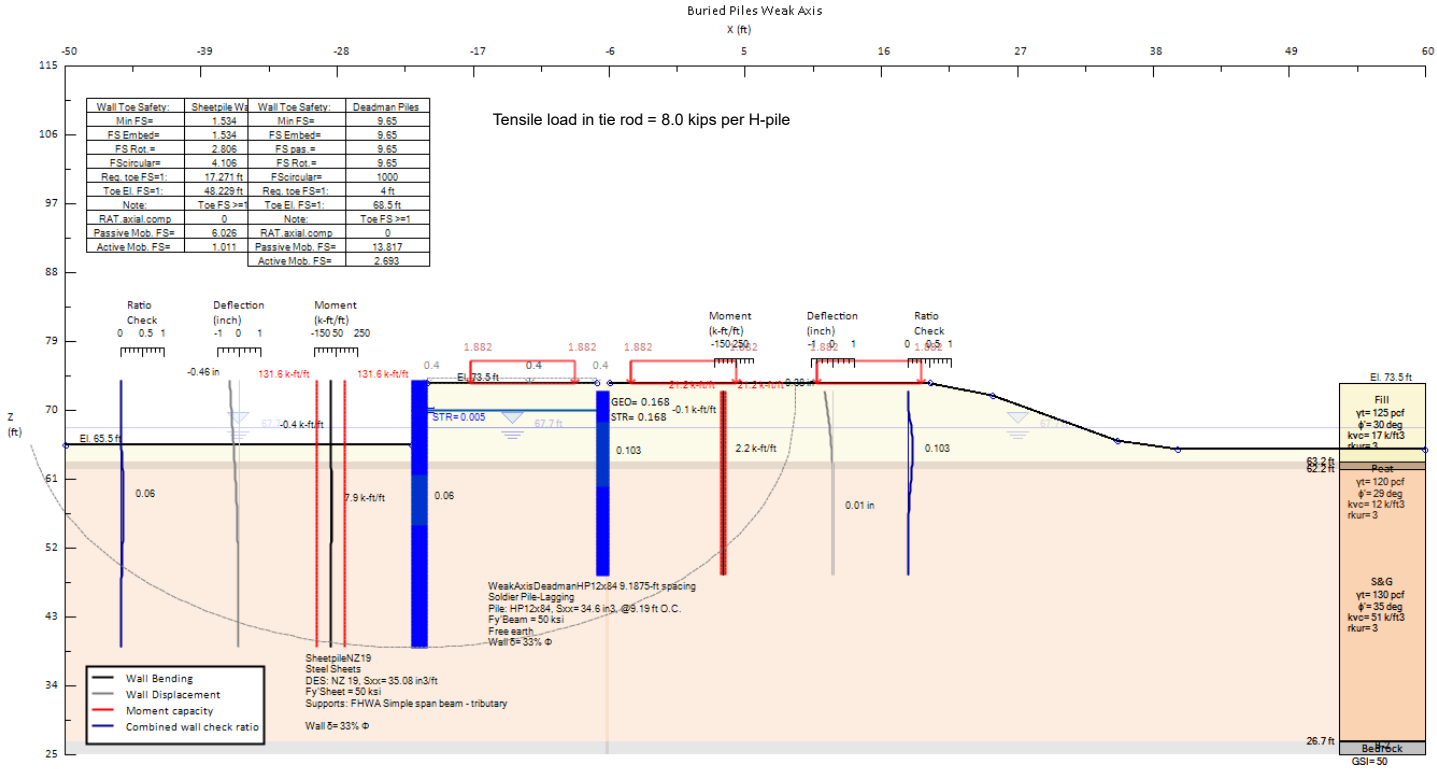




Attachment 1: Station 46+25

Stage 4: Backfill Tierod to Final Conditions (No Corrosion)						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 24 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

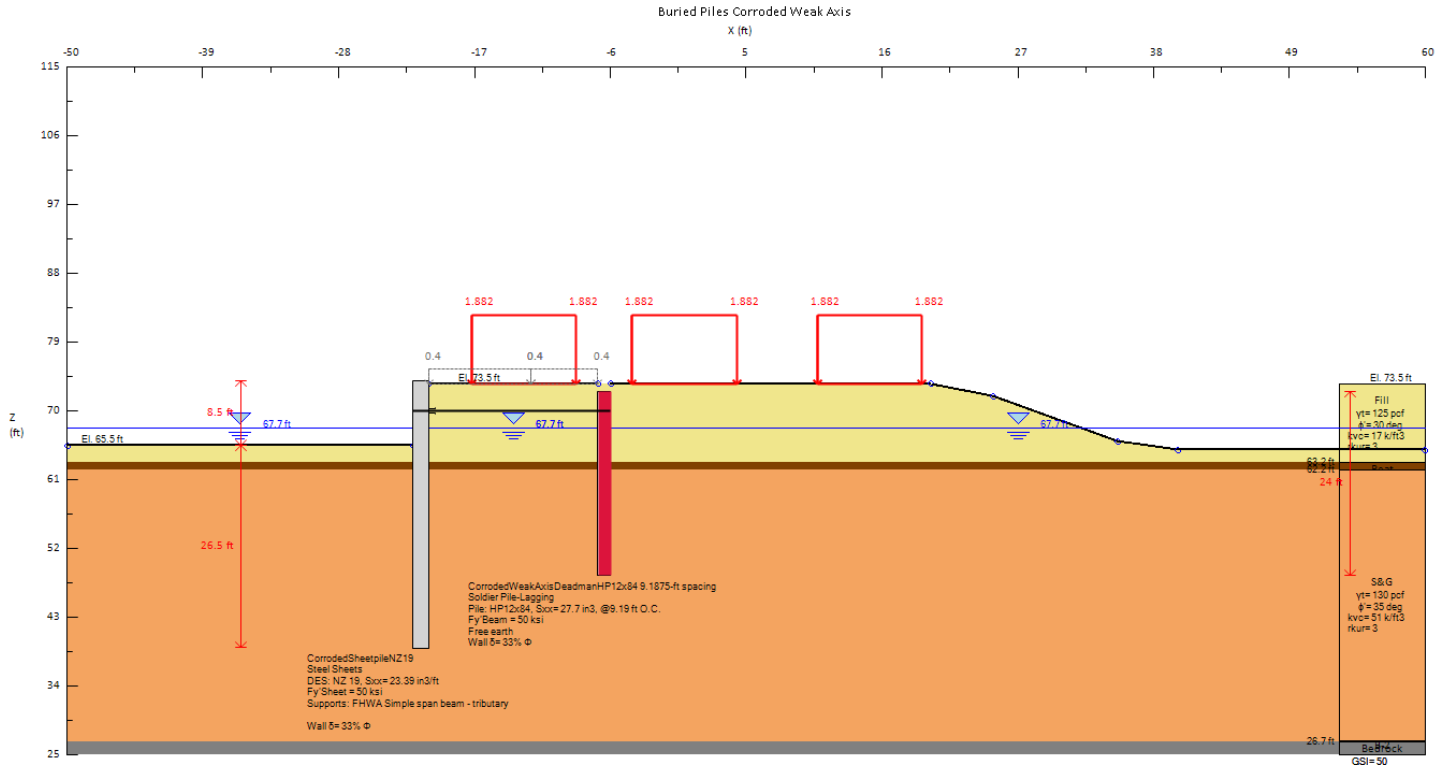


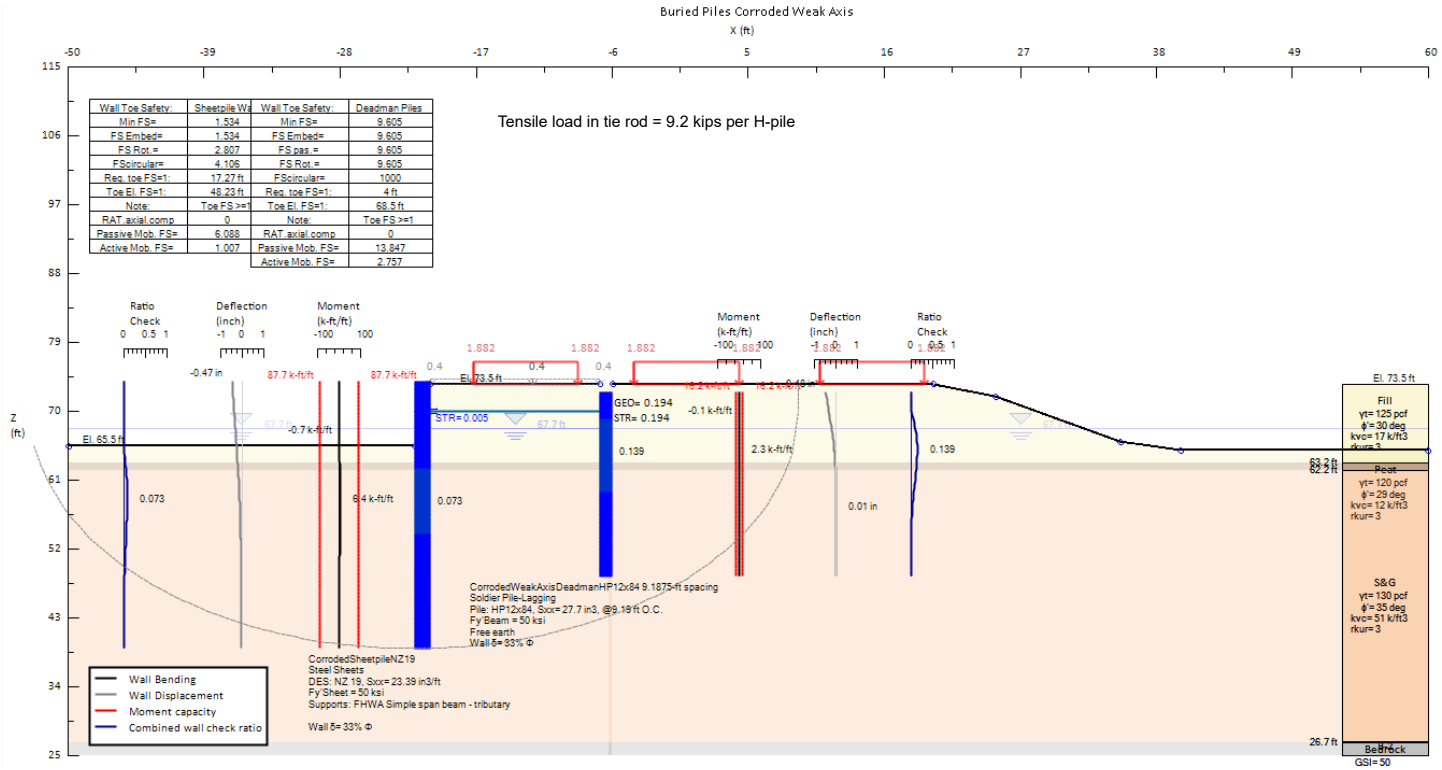


Wall Toe Safety:	Sheetpile Wa	Wall Toe Safety:	Deadman Piles
Min FS=	1.534	Min FS=	9.65
FS Embed=	1.534	FS Embed=	9.65
FS Rot.=	2.806	FS pas.=	9.65
FScircular=	4.106	FS Rot.=	9.65
Req. toe FS=1:	17.271 ft	FScircular=	1000
Toe El. FS=1:	48.229 ft	Req. toe FS=1:	4 ft
Note:	Toe FS >=1	Toe El. FS=1:	68.5 ft
RAT axial comp	0	Note:	Toe FS >=1
Passive Mob. FS=	6.026	RAT axial comp	0
Active Mob. FS=	1.011	Passive Mob. FS=	13.817
		Active Mob. FS=	2.693

Attachment 1: Station 46+25

Stage 5: Corrosion Loss (Steel Loss of 1/16 inch per face over 75 Years)						
Sheetpiles	NZ 19, Grade 50		Total length 35 feet; penetrates 26.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 24 feet; penetrates 25 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

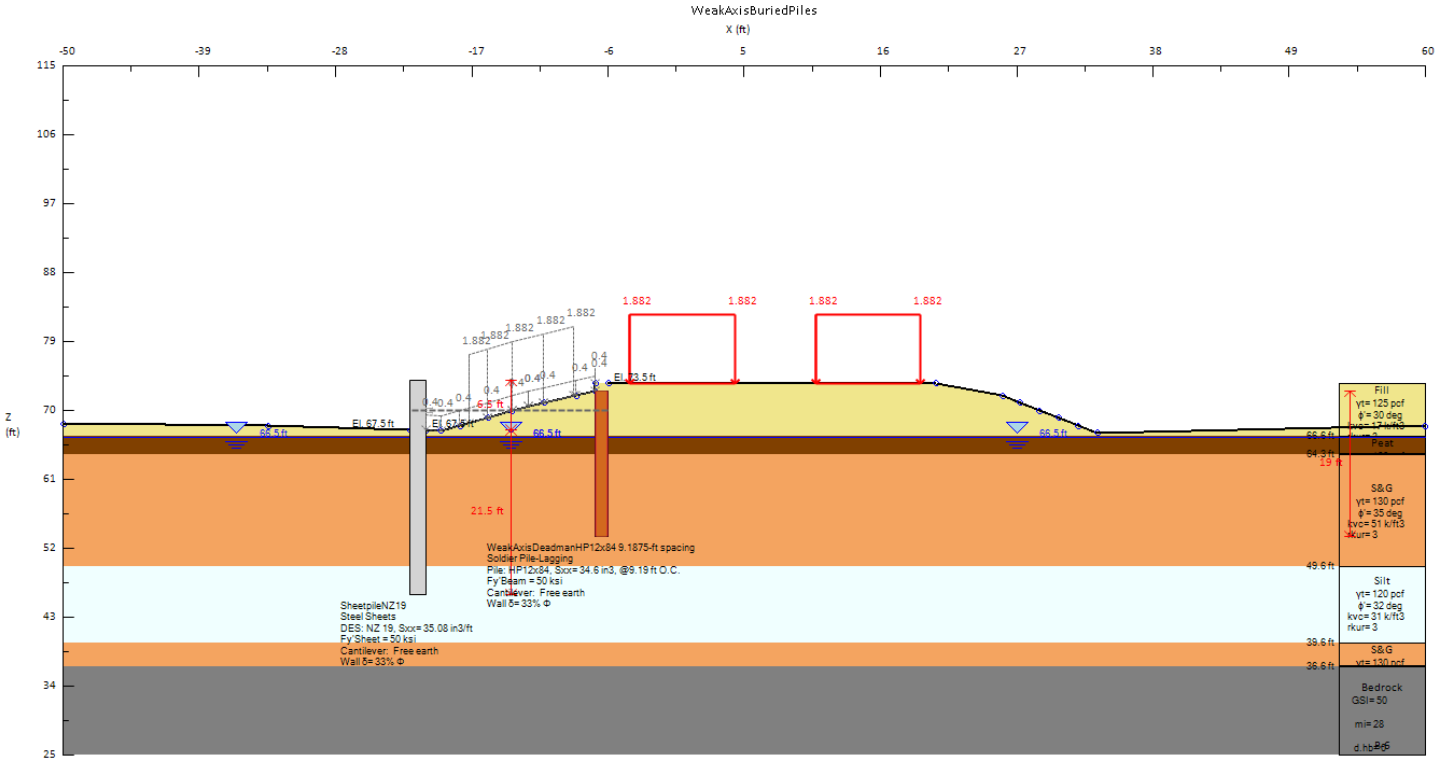


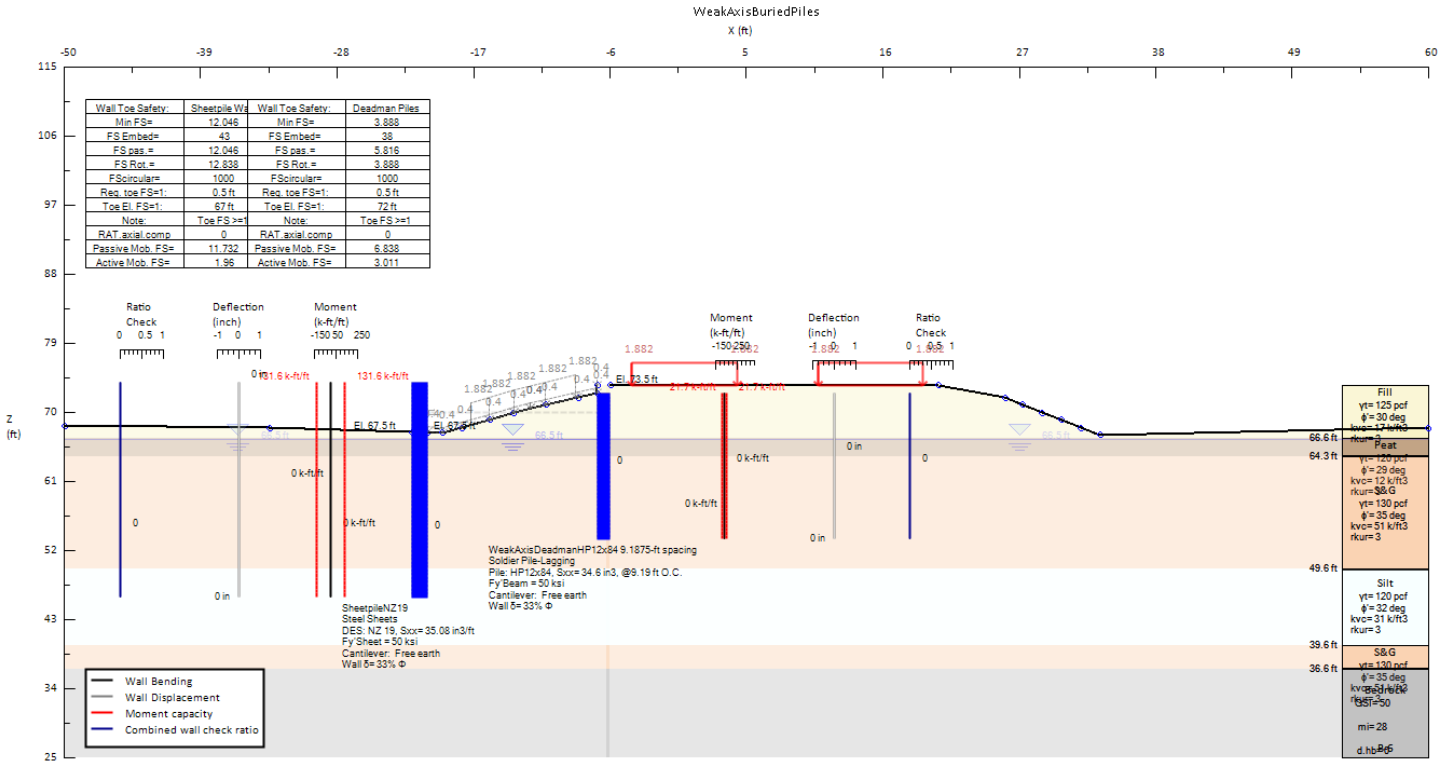


Wall Toe Safety:	Sheetpile Wa	Wall Toe Safety:	Deadman Piles
Min FS=	1.534	Min FS=	9.605
FS Embed=	1.534	FS Embed=	9.605
FS Rot.=	2.807	FS pas.=	9.605
FScircular=	4.106	FS Rot.=	9.605
Req. toe FS=1:	17.27 ft	FScircular=	1000
Toe El. FS=1:	48.23 ft	Req. toe FS=1:	4 ft
Note:	Toe FS >=1	Toe El. FS=1:	68.5 ft
RAT_axial.comp	0	Note:	Toe FS >=1
Passive Mob. FS=	6.088	RAT_axial.comp	0
Active Mob. FS=	1.007	Passive Mob. FS=	13.847
		Active Mob. FS=	2.757

Attachment 2: Station 54+00

Stage 0: Install Piles						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 19 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

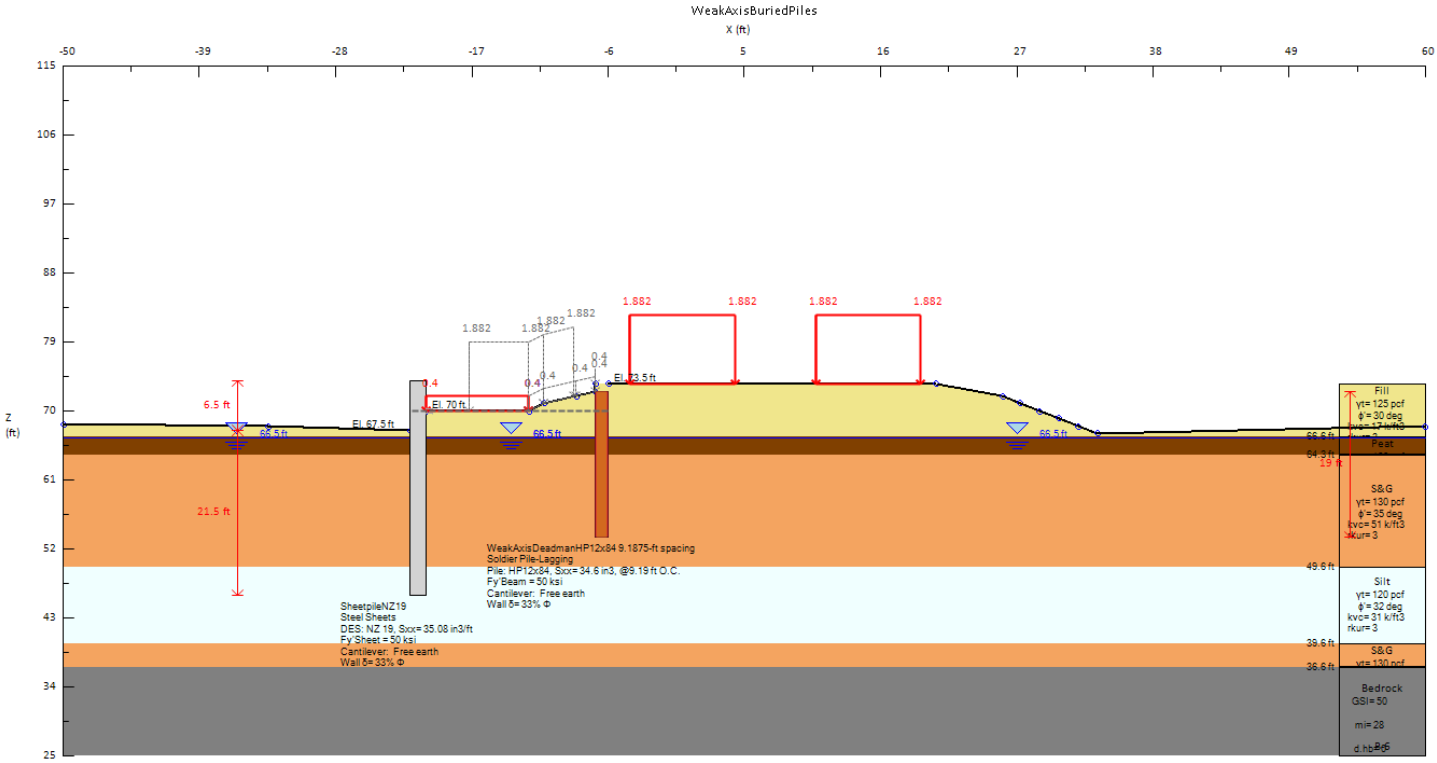


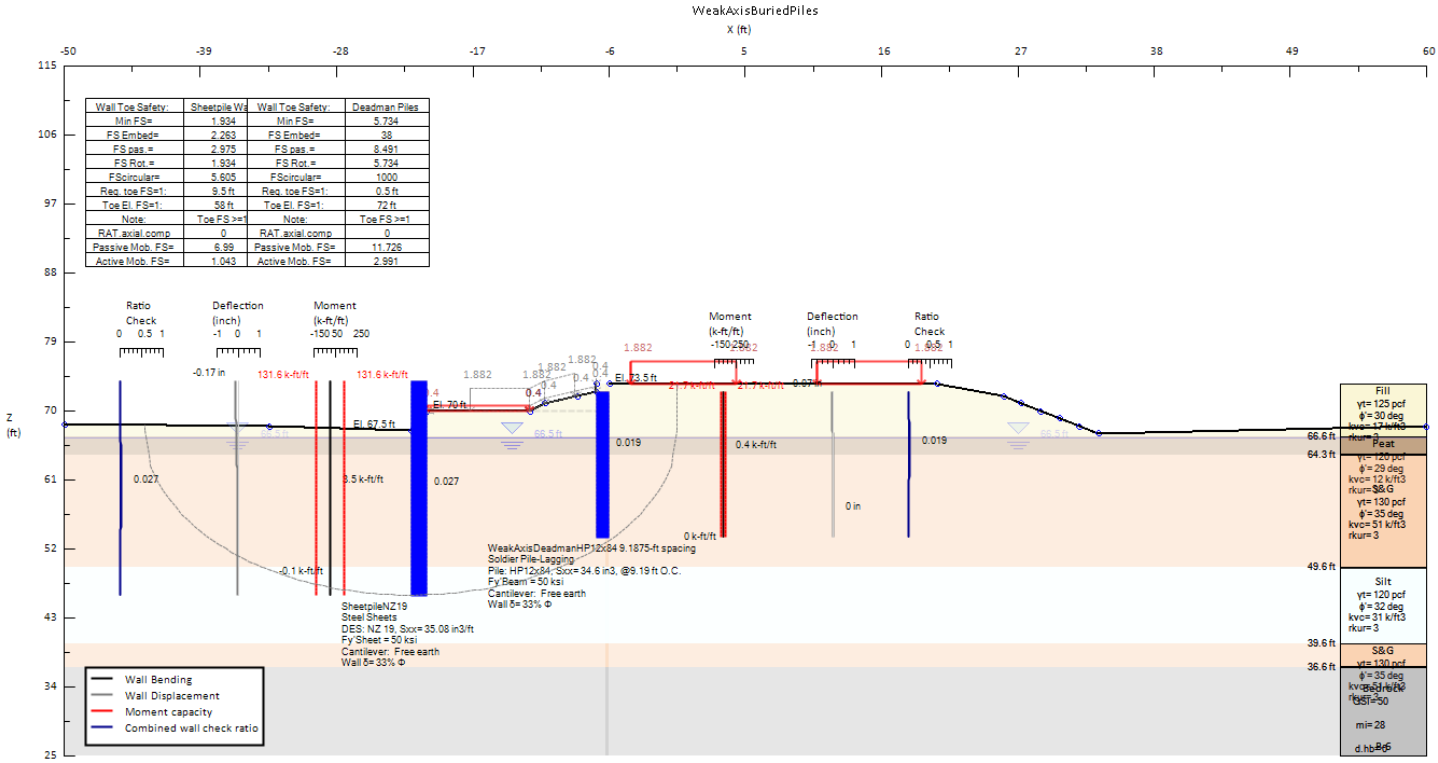


Wall Toe Safety:	Sheetpile Wa	Wall Toe Safety:	Deadman Piles
Min FS=	12.046	Min FS=	3.888
FS Embed=	43	FS Embed=	38
FS pas.=	12.046	FS pas.=	5.816
FS Rot.=	12.838	FS Rot.=	3.888
FScircular=	1000	FScircular=	1000
Req. toe FS=1:	0.5 ft	Req. toe FS=1:	0.5 ft
Toe El. FS=1:	67 ft	Toe El. FS=1:	72 ft
Note:	Toe FS >=1	Note:	Toe FS >=1
RAT.axial.comp	0	RAT.axial.comp	0
Passive Mob. FS=	11.732	Passive Mob. FS=	6.838
Active Mob. FS=	1.95	Active Mob. FS=	3.011

Attachment 2: Station 54+00

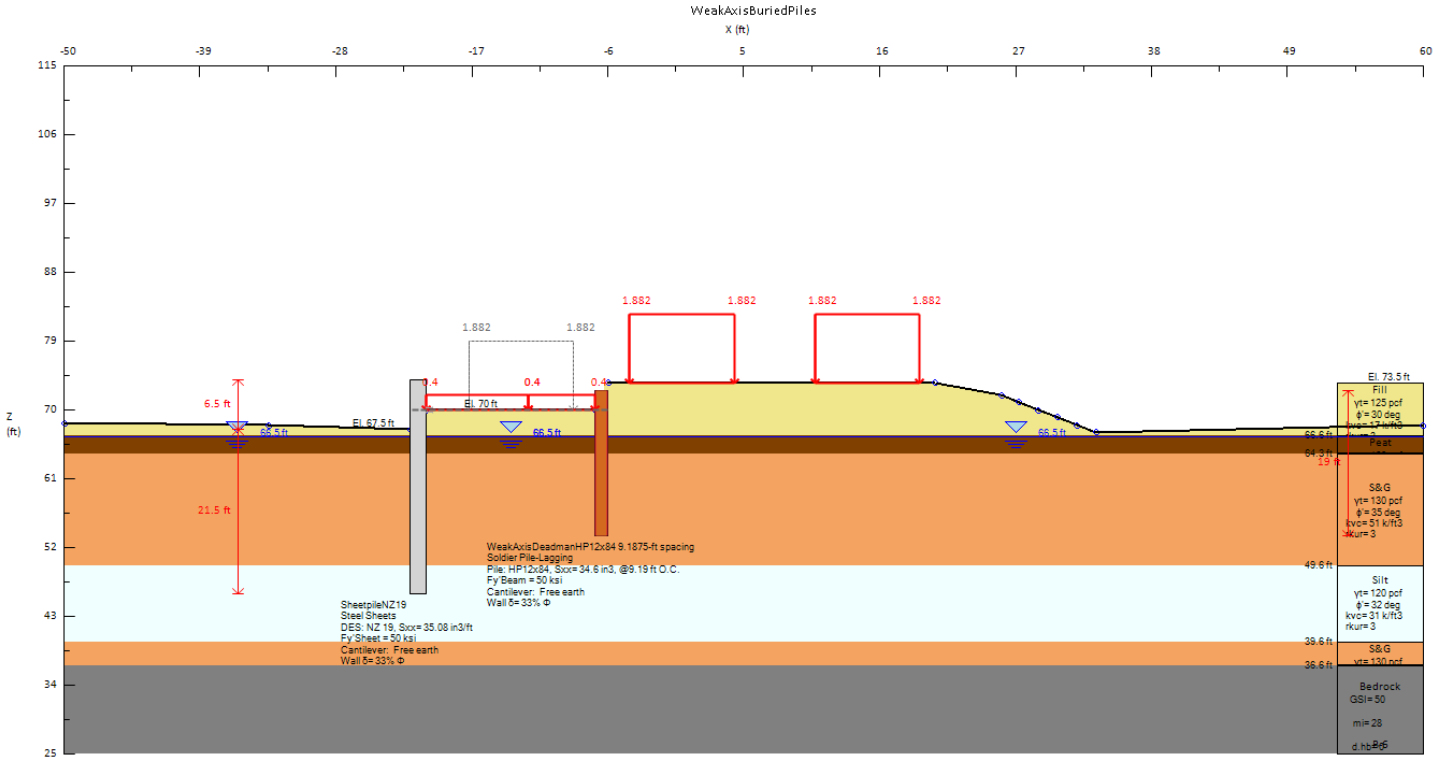
Stage 1: Backfill Sheetpiles to create Construction Travel Lane						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 19 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

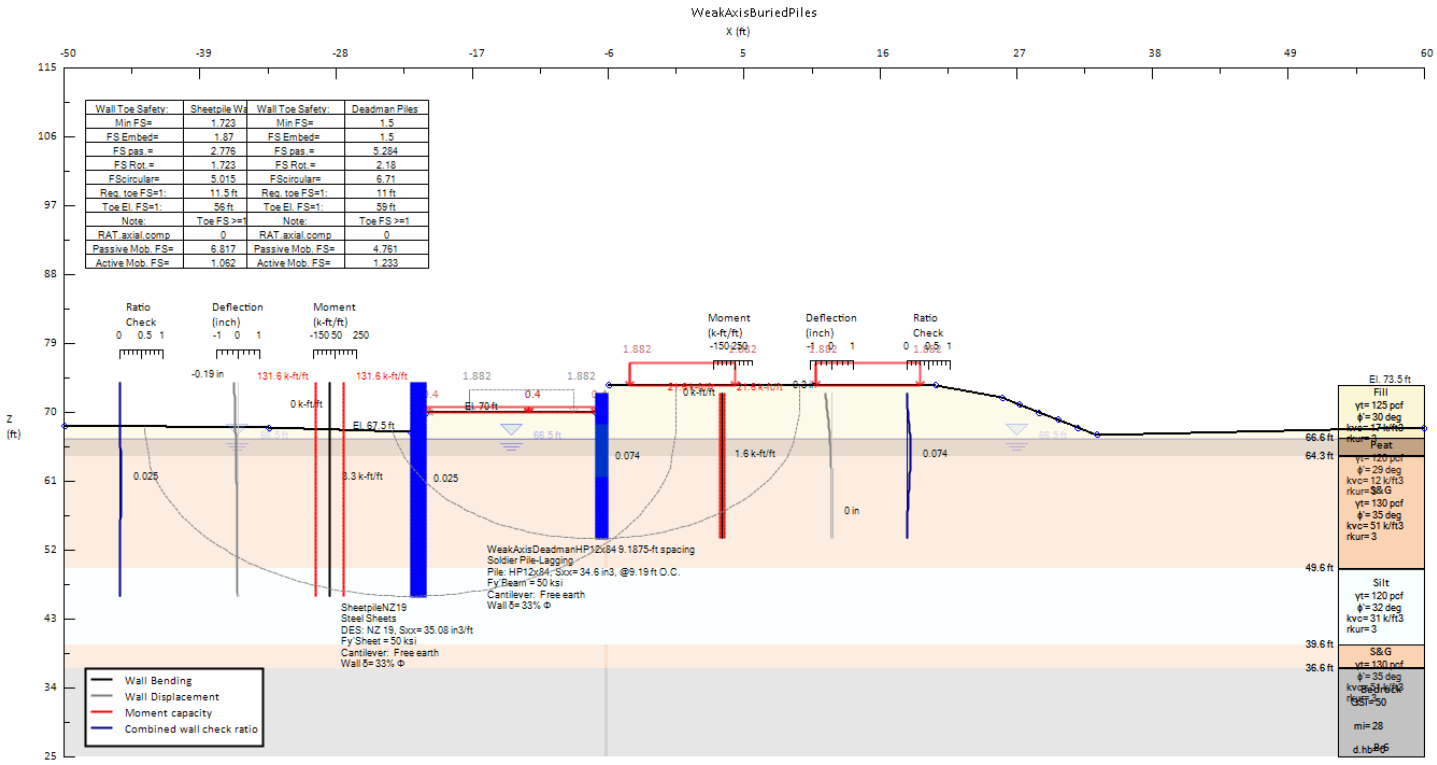




Attachment 2: Station 54+00

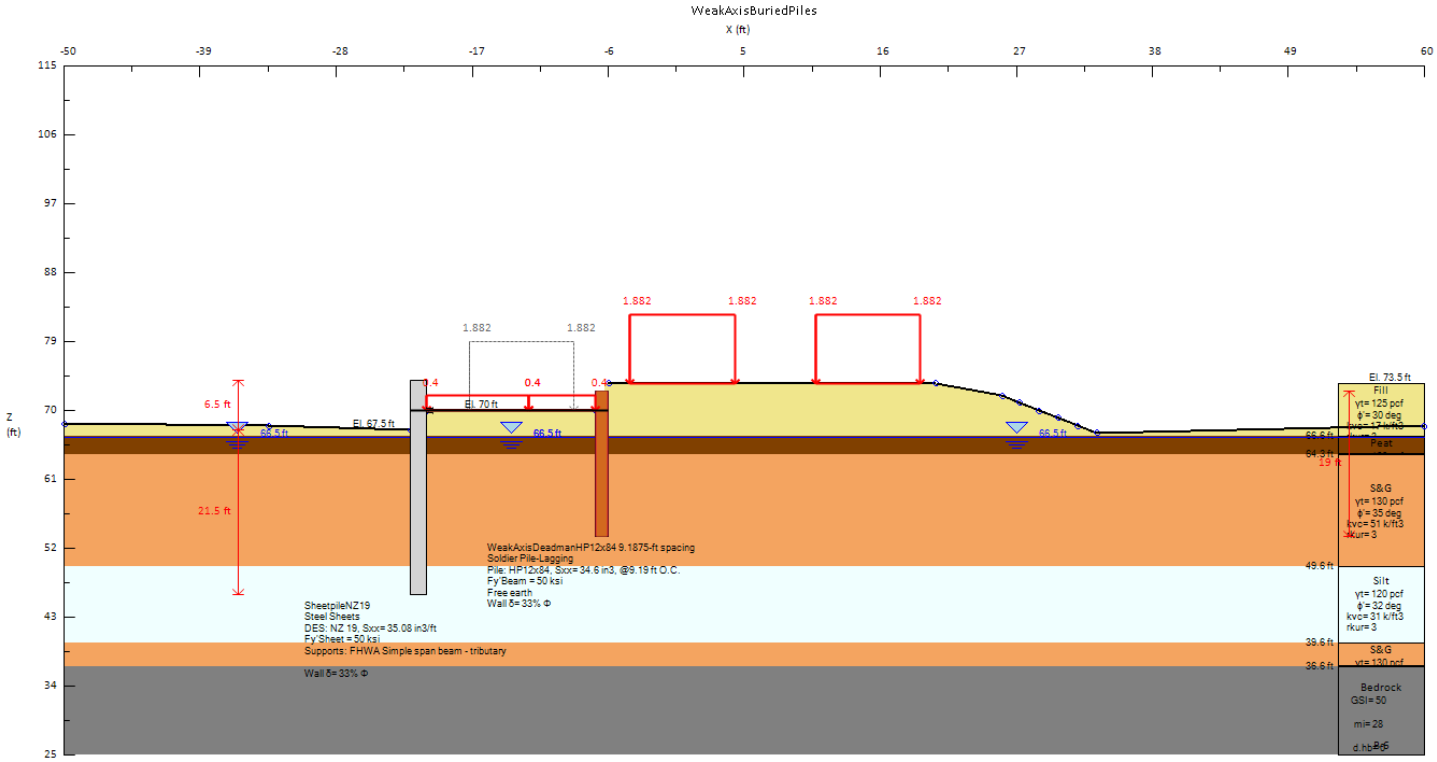
Stage 2: Excavate Trench for Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 19 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

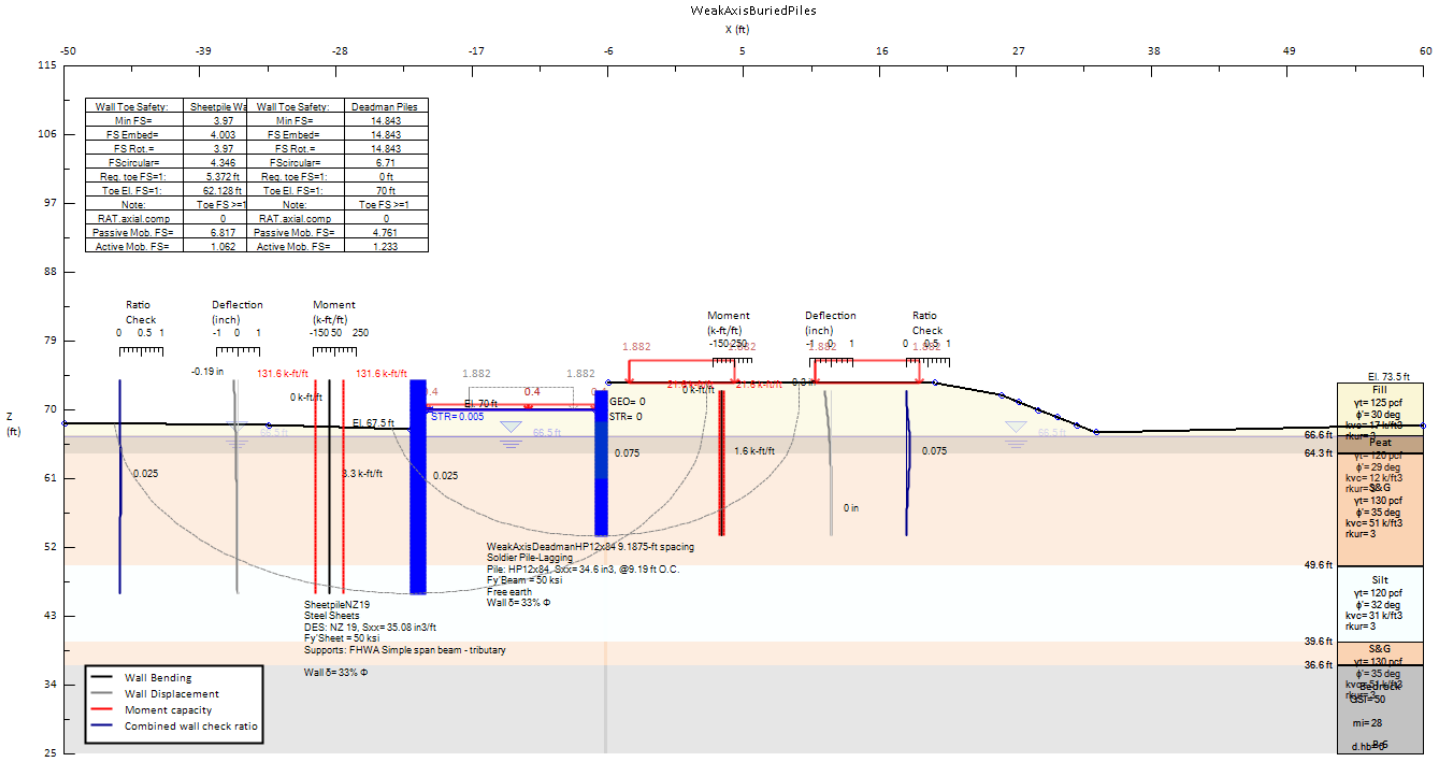




Attachment 2: Station 54+00

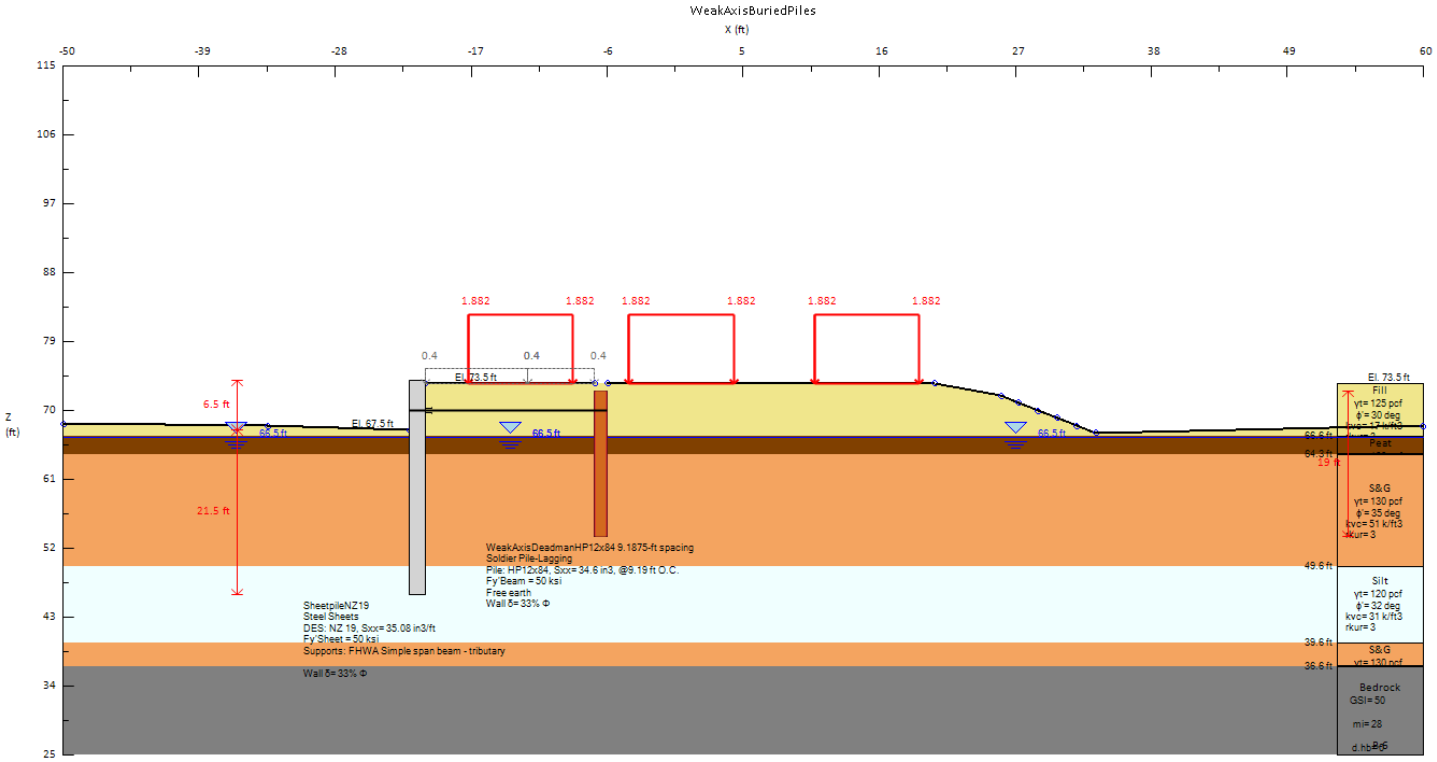
Stage 3: Install Tierod						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 19 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

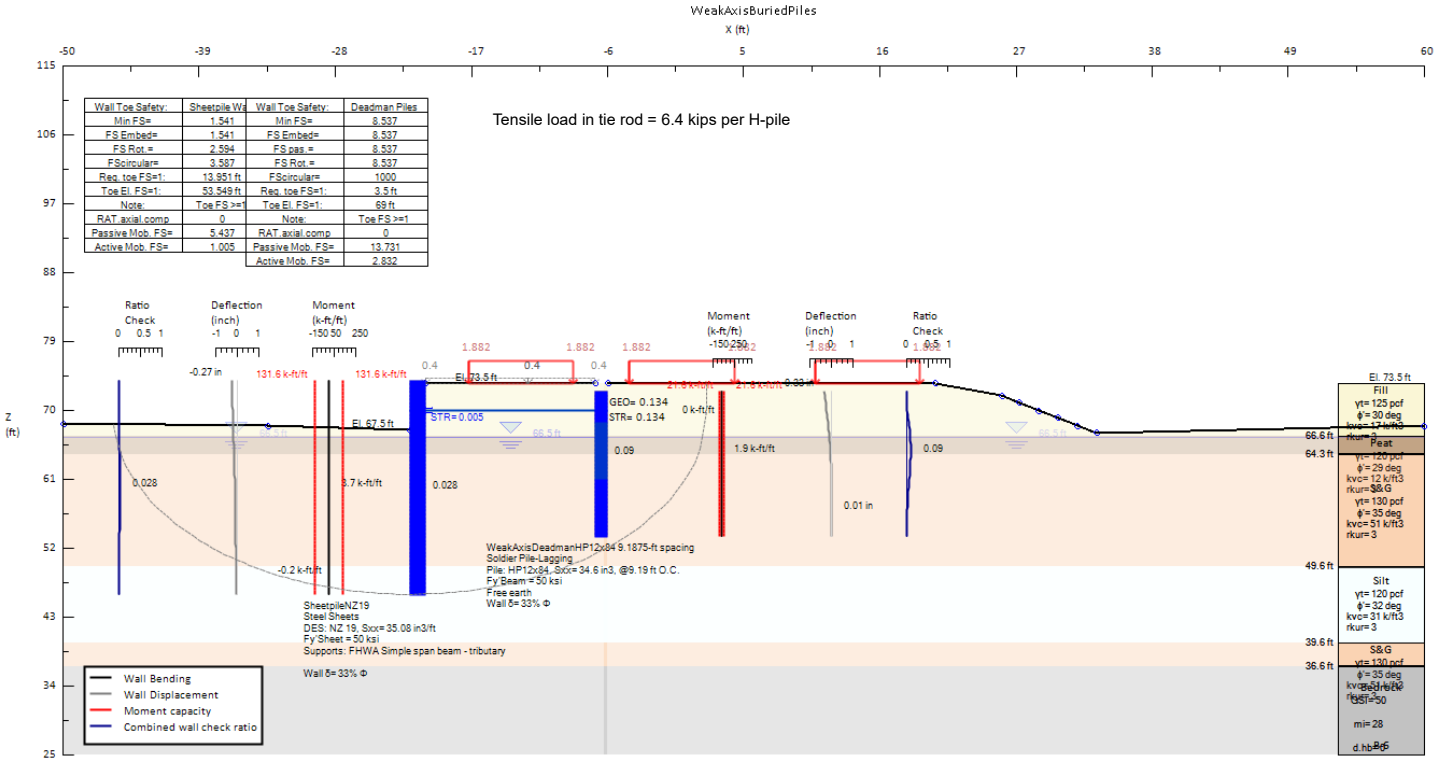




Attachment 2: Station 54+00

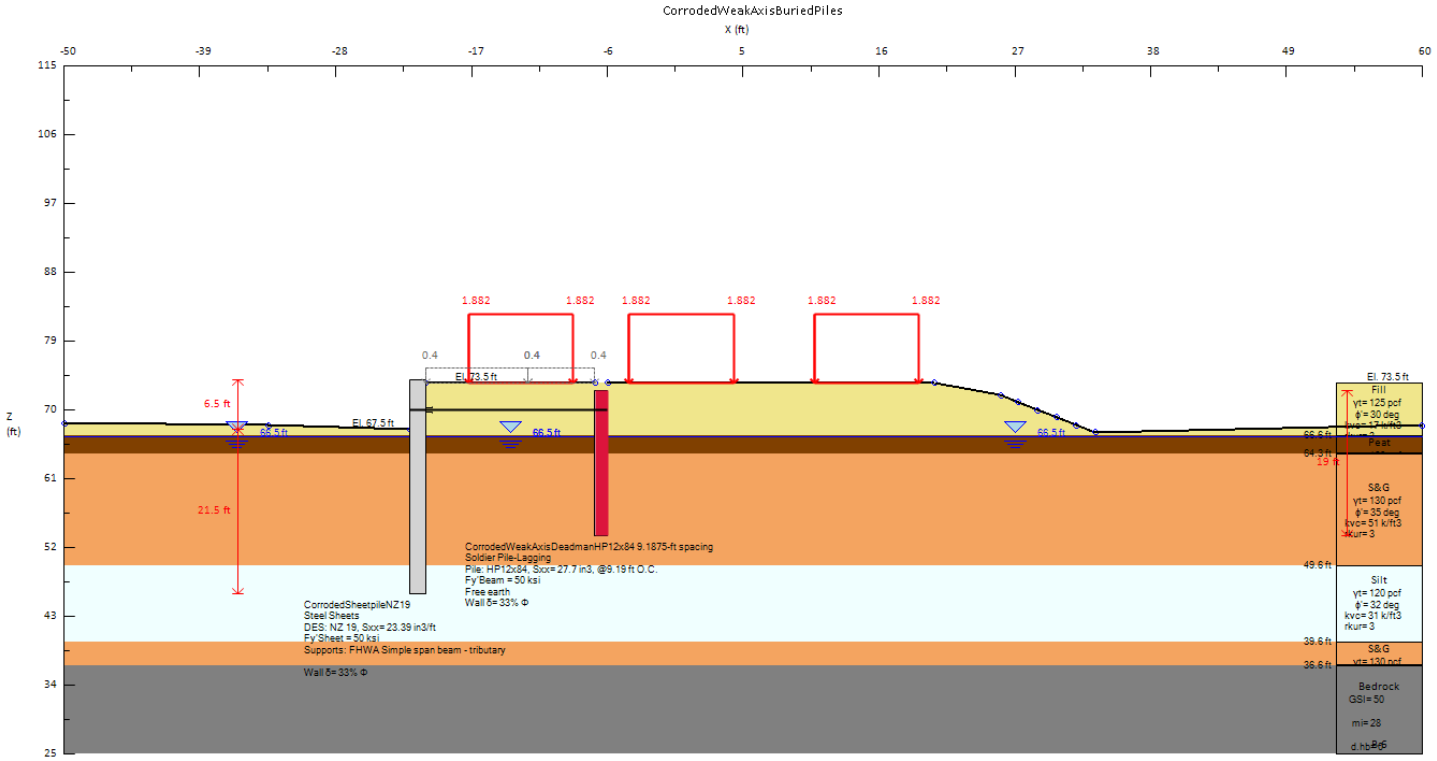
Stage 4: Backfill Tierod to Final Conditions (No Corrosion)						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 19 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

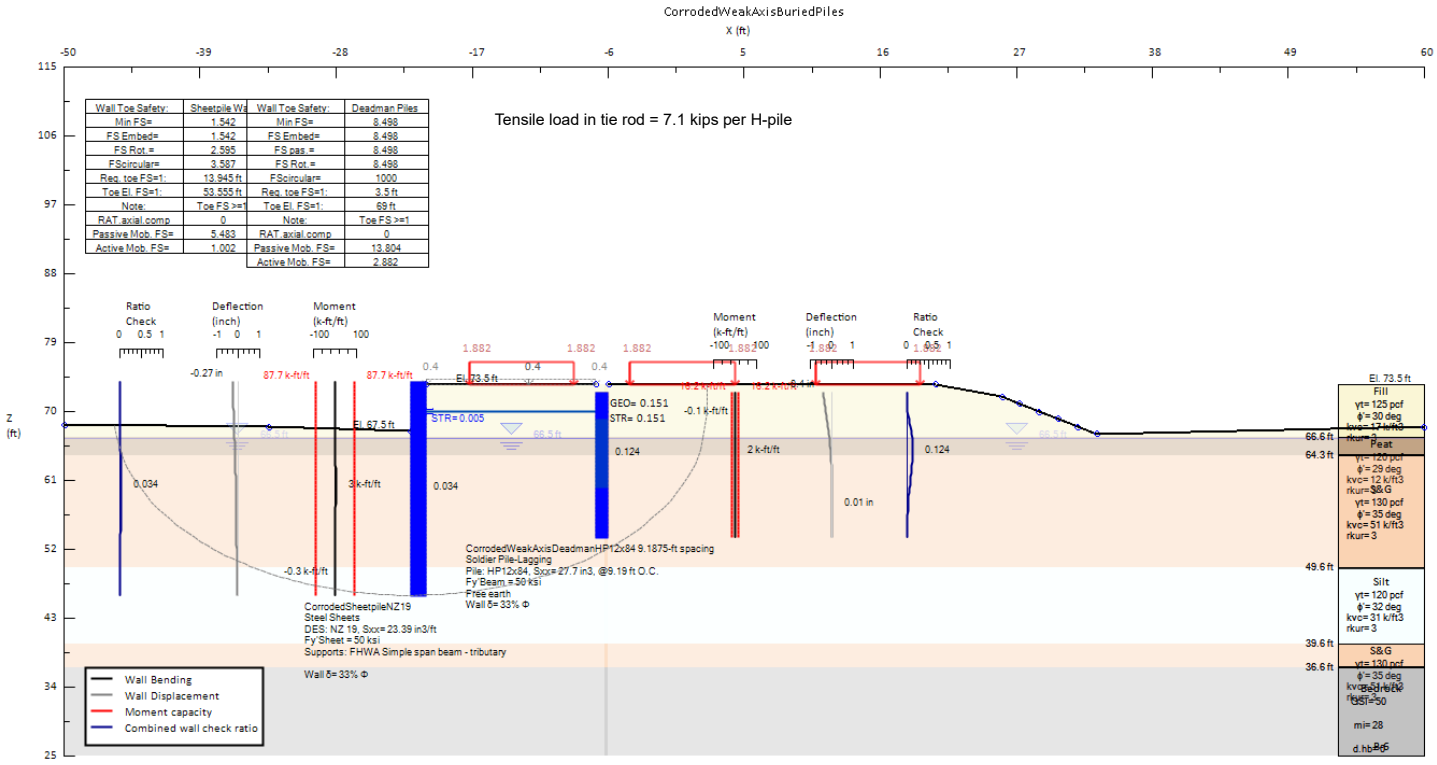




Attachment 2: Station 54+00

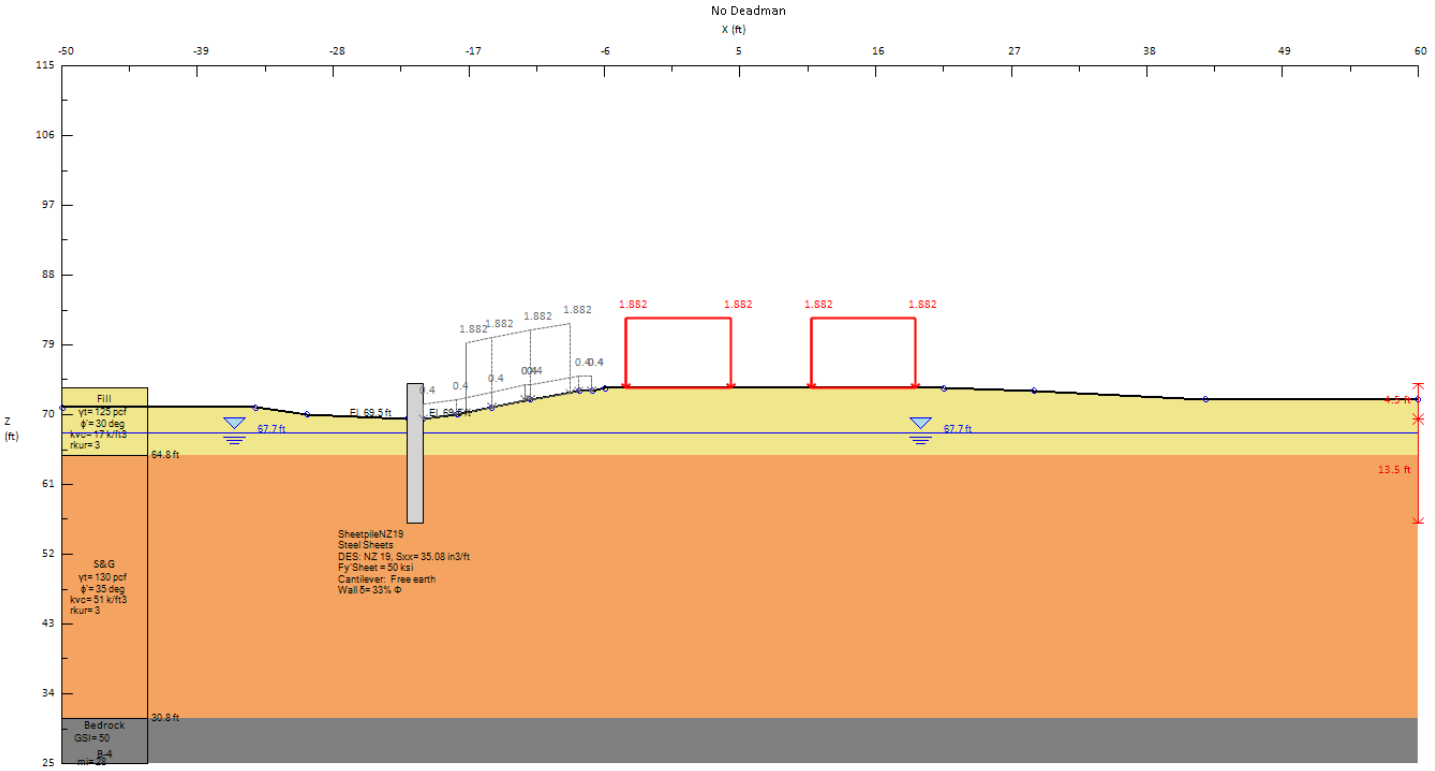
Stage 5: Corrosion Loss (Steel Loss of 1/16 inch per face over 75 Years)						
Sheetpiles	NZ 19, Grade 50		Total length 28 feet; penetrates 21.5 feet below grade at front of wall			
H-Pile Deadmen	HP 12x84, Grade 50, 9.2-ft spacing, weak axis orientation		Total length 19 feet; penetrates 20 feet below grade behind wall Location: between existing Siding track and proposed third track			
Tierods	#8 bar, Grade 60, 9.2-ft spacing		Depth 3.5 feet below grade behind wall			
Waler	Two MC 6x16.3 channel beams, spaced 4 inches apart, Grade 50, bolted to back face of wall					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

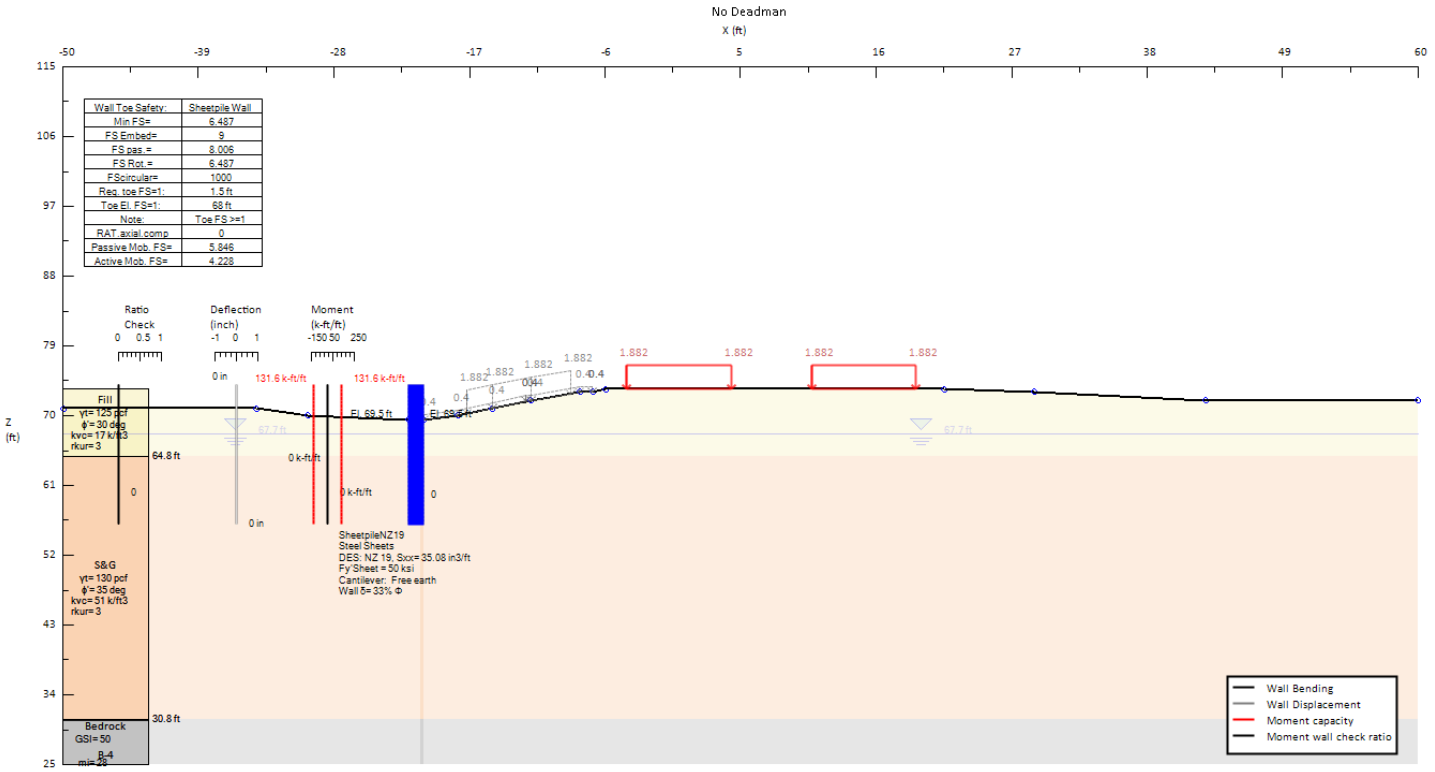




Attachment 3: Station 49+00

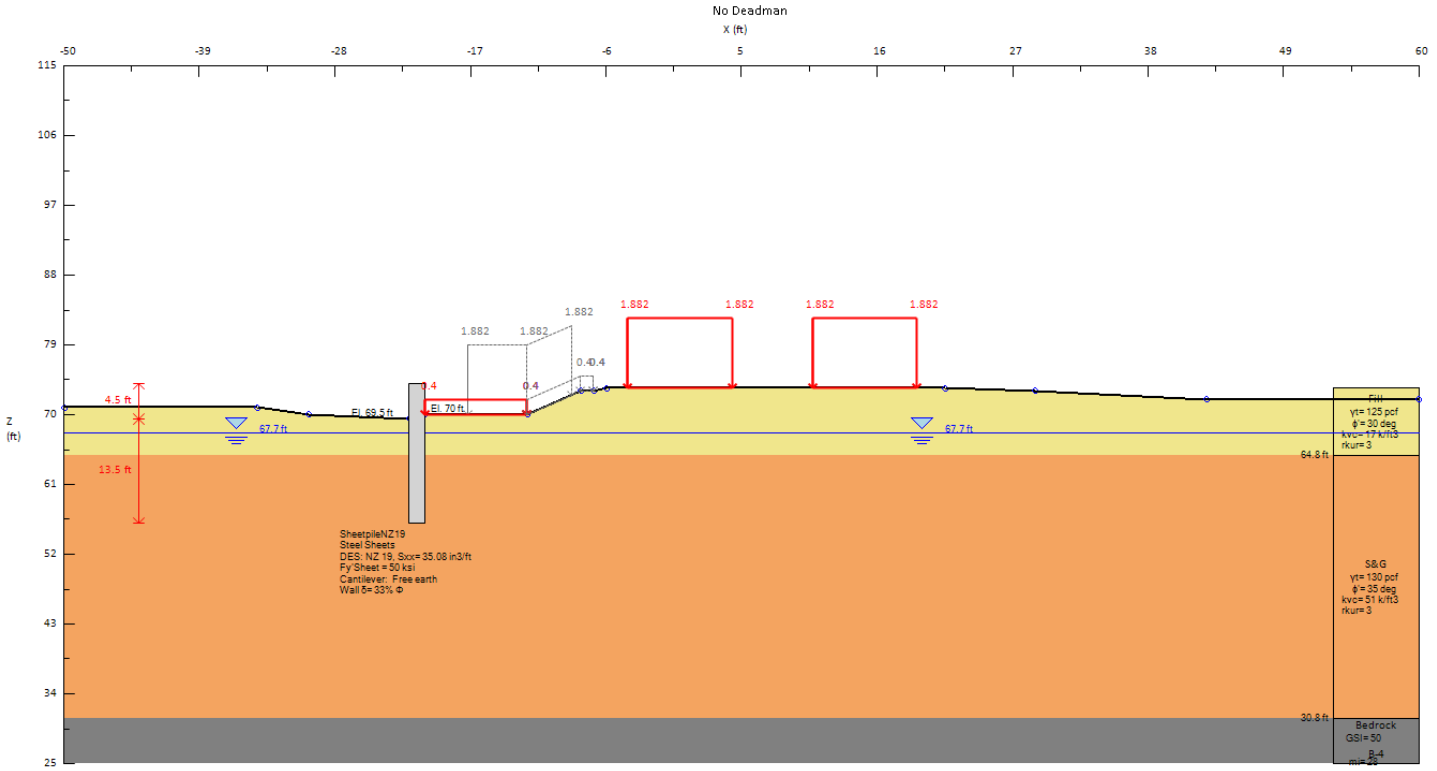
Stage 0: Install Piles						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

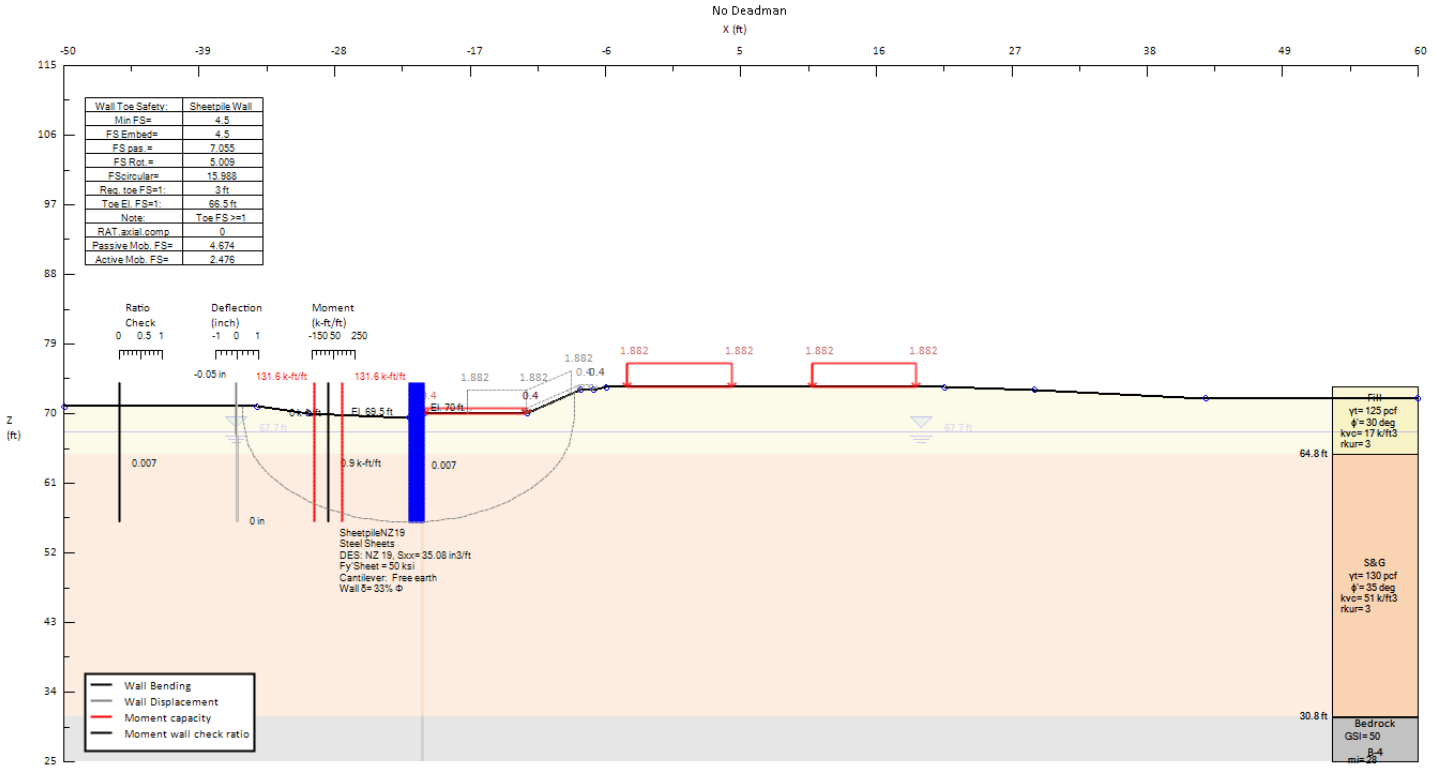




Attachment 3: Station 49+00

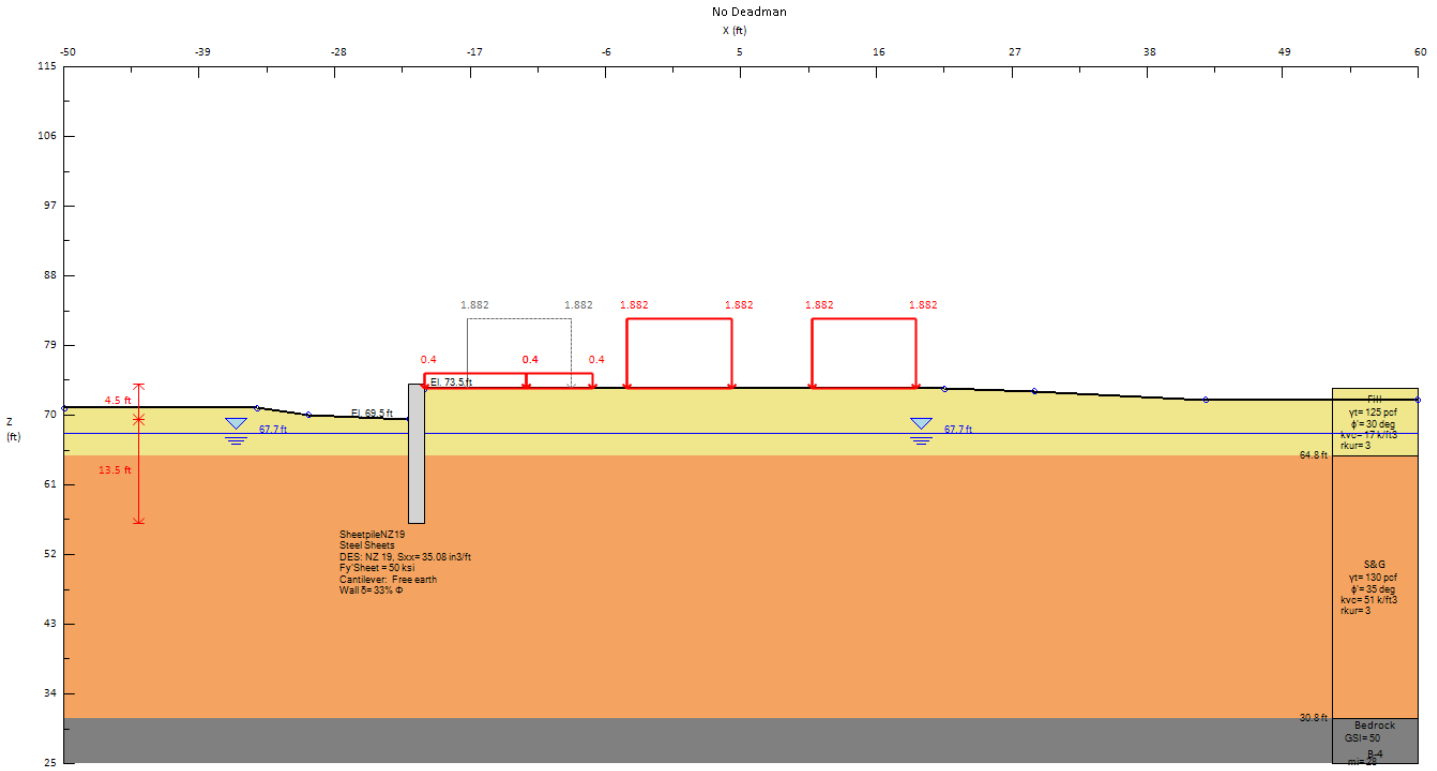
Stage 1: Backfill Sheetpiles to create Construction Travel Lane						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

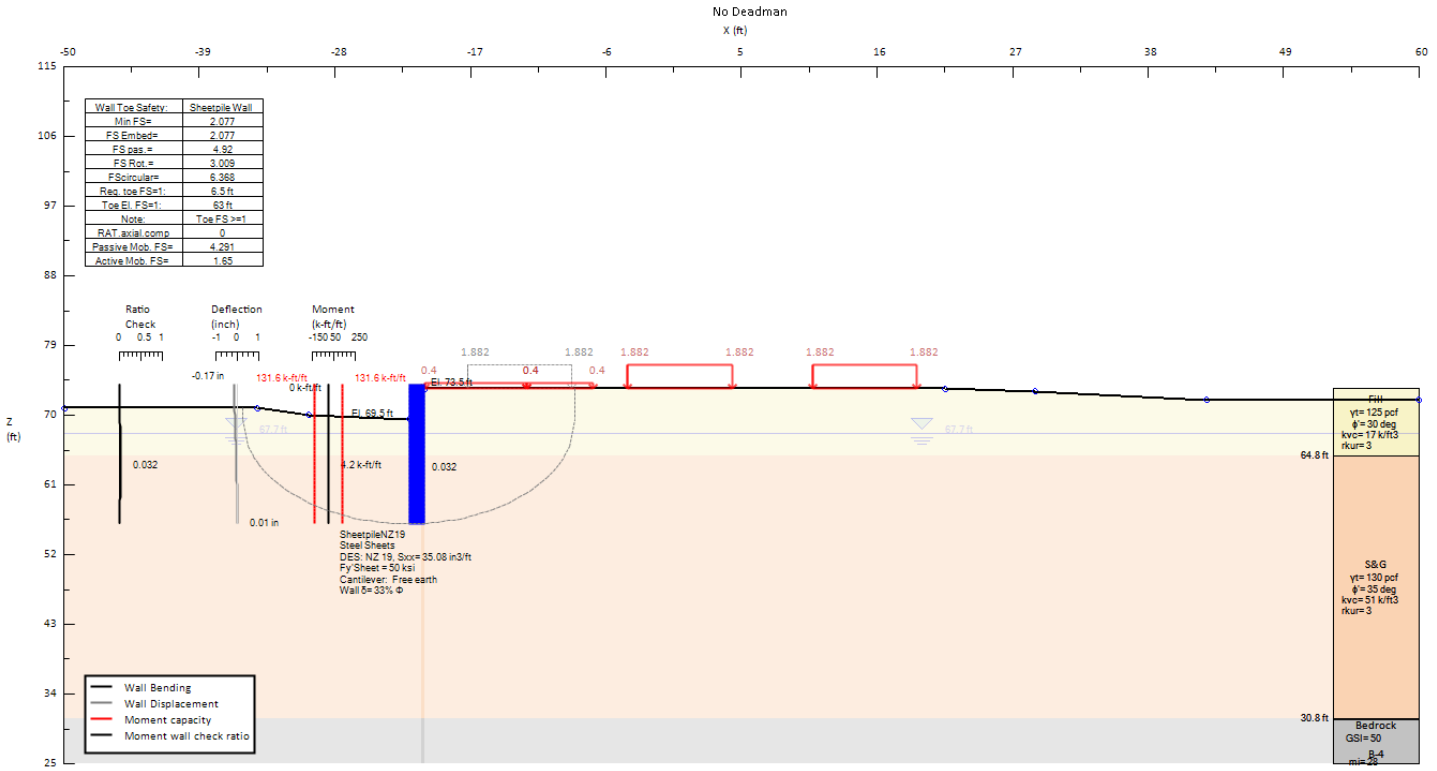




Attachment 3: Station 49+00

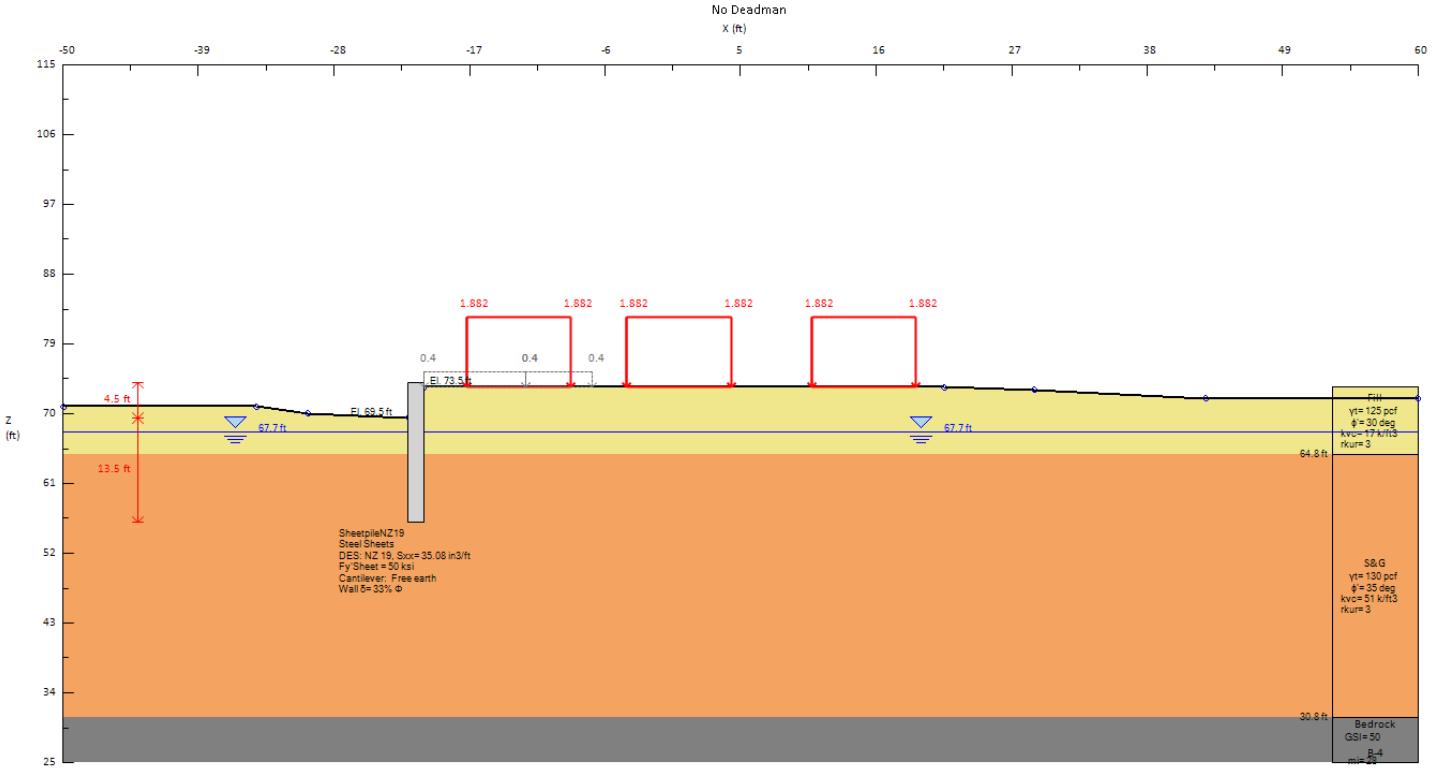
Stages 2 and 3: Construction Loading while Installing Tierods at Nearby Wall Segments						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		400 psf	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

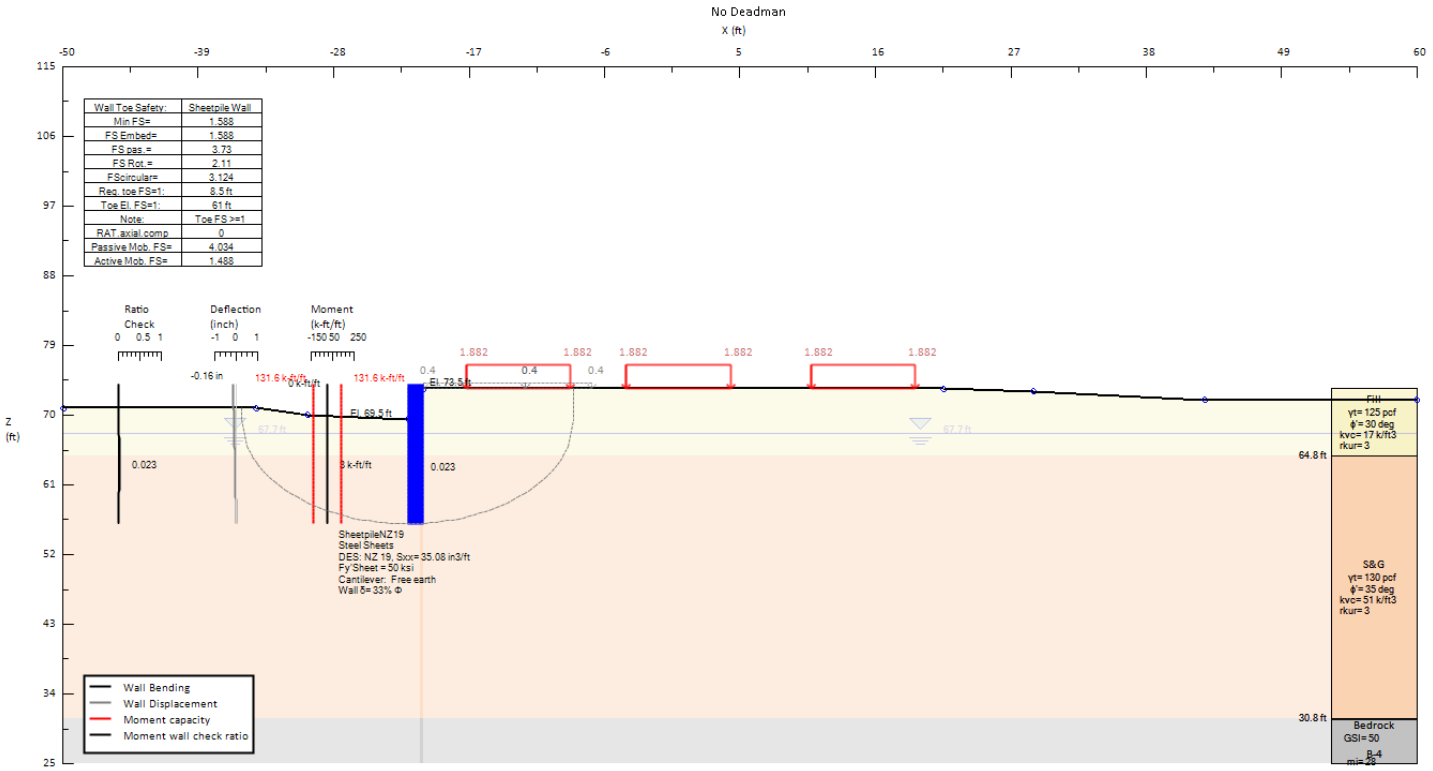




Attachment 3: Station 49+00

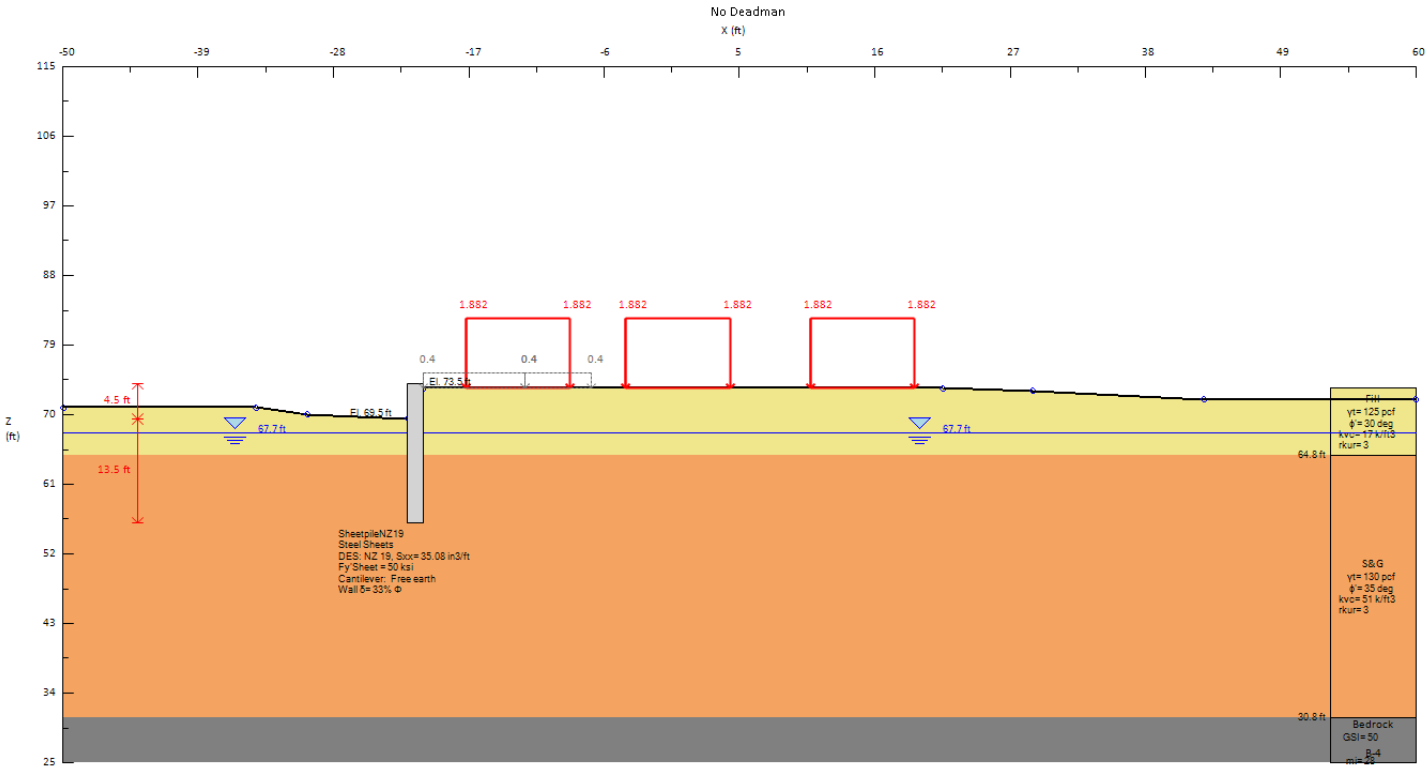
Stage 4: Final Conditions (No Corrosion)						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$

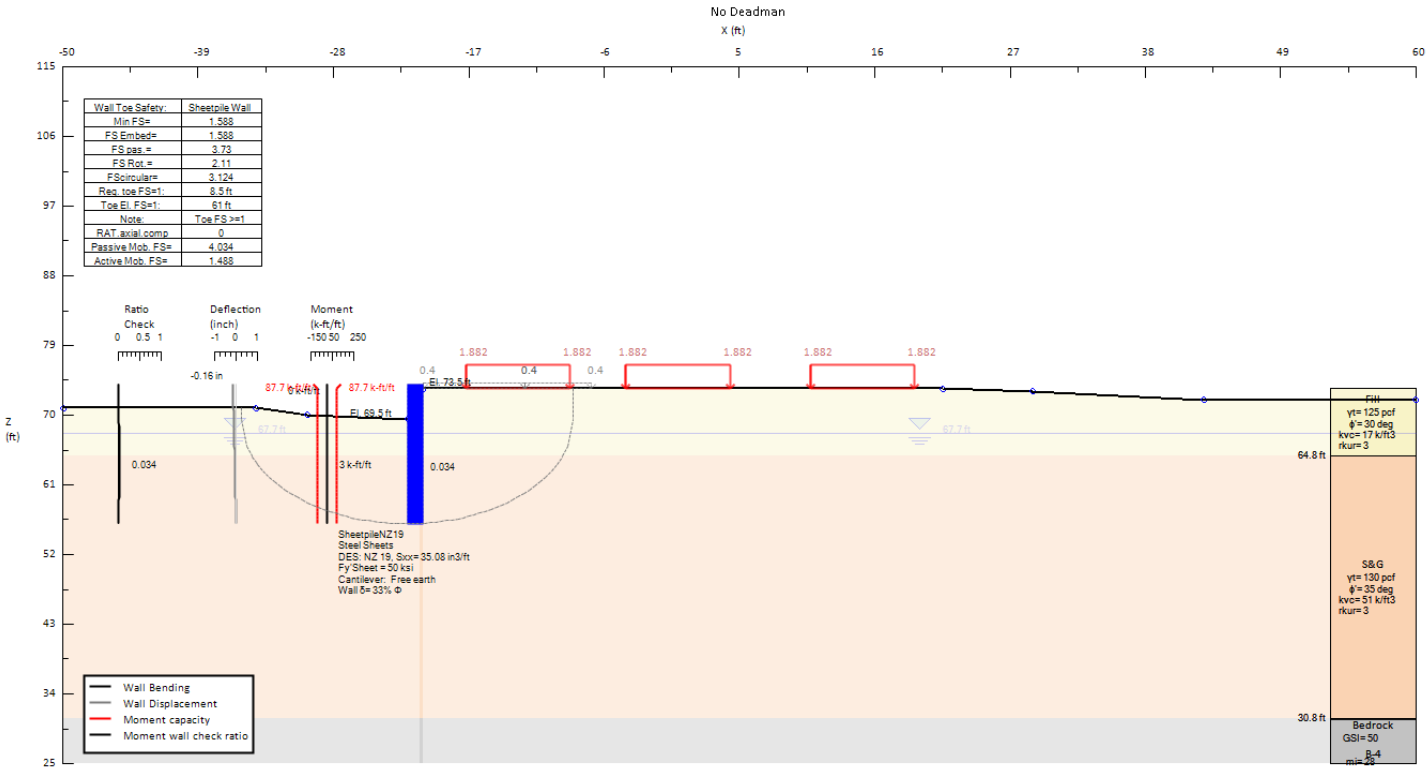




Attachment 3: Station 49+00

Stage 5: Corrosion Loss (Steel Loss of 1/16 inch per face over 75 Years)						
Sheetpiles	NZ 19, Grade 50		Total length 18 feet; penetrates 13.5 feet below grade at front of wall			
H-Pile Deadmen	N/A		N/A			
Tierods	N/A		N/A			
Waler	N/A					
Train Load	Cooper E80		**Construction Surcharge Load**		N/A	
Design FS	*Wall Overturning*	FS ≥ 1.5	*Sheetpile Capacity*	FS ≥ 2.0	*Tierod Capacity*	$0.55F_y$





THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT B00420

PROPOSAL

For: MASSDOT RAIL DIVISION CAPE MAIN IMPROVEMENTS AT MP 44.27, 44.29, 68.00, AND 71.66
COMMONWEALTH OF MASSACHUSETTS
LOCATION: Rochester and Barnstable, MA

The work referred to herein is in Rochester and Barnstable, in the Commonwealth of Massachusetts, and is shown by the locus map (Document 00331) in the Proposal Pamphlet, the work locations extend as follows:

Per the limits shown on the plans

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 substantial completion thereof **BY MAY 22, 2026 and project completion by JUNE 30, 2026.** The Work of this Project is described by the following Items and quantities.

The undersigned, identified as Bidder, declares that Bidder has carefully reviewed and examined the Contract Documents including Notice to Bidders, Bid Form, Special Provisions, General Contract Provisions, Schedule of Prevailing Wage Rates, RAILROAD Timetable, RAILROAD On Track Safety Manual, RAILROAD Procedures for the Installation, Adjustment, Maintenance and Inspection of CWR as Required by 49 CFR 213.118, MassDOT MW-1, Environmental Permits, Plans and other supporting documents (including Addenda thereto), and that Bidder has examined the site upon which the Project Work is to be performed.

After review of all Contract Documents and attesting to understanding and acceptance of same, the undersigned Bidder proposes to furnish all necessary labor, materials (other than those materials stipulated in the Special Provisions as being furnished by Owner), equipment, machinery and tools required to complete the Work as described and specified in the Contract Documents. Bidder understands and agrees that current prevailing wage rates are to be paid in accordance with applicable laws, the General Contract Provisions, and as set forth in this Bid Form.

This proposal includes a bid deposit in the amount of 5% of the Total Amount of Bid identified herein.

In submitting this Bid, Bidder represents that:

1. Bidder has examined copies of all the Contract Documents, including the Addenda thereto:

2. Bidder has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules, and regulations) and the conditions affecting cost, progress, or performance of the Work, and has made such independent investigations as Bidder deems necessary to complete this Bid and carry out the Work in accordance therewith.

3. The Bid is based on the prevailing wage rates identified for the Work to be performed as set forth in the Contract Documents, and as required by applicable laws.

4. This Bid is genuine and not made in the interest or on behalf of any undisclosed person, firm, or corporation; the Bid is not submitted in conformity with any agreement of rules of any group,

association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or a corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for Bidder any advantage over any other Bidder.

(Remainder of Page Intentionally Left Blank)

The undersigned further agrees to perform the Work in its entirety in accordance with the Contract Documents within the prescribed time, and to the total and complete satisfaction of Owner (in consultation with their Authorized Representatives), at the identified Unit Prices and Lump Sum Amounts as set forth below:

Project # 614096 Contract # 130500				
Location: Rochester and Barnstable, MA				
Description: Cape Main Improvements at MP 44.27, 44.29, 68.00, and 71.66				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
233.1	1	CULVERT AT MP 44.27 REPLACEMENT AT _____ LUMP SUM		
233.2	1	CULVERT AT MP 44.29 REPLACEMENT AT _____ LUMP SUM		
234.1	1	CATTLE PASS RETIREMENT AT MP 68.00 AT _____ LUMP SUM		
234.2	1	CATTLE PASS RETIREMENT AT MP 71.66 AT _____ LUMP SUM		
493.1	1	MISCELLANEOUS WORK AS DIRECTED BY THE ENGINEER AT **Six Hundred Forty-Four Thousand, Four Hundred Forty-Four Dollars max** ALLOWANCE	$644,444.00	$644,444.00
996.01	1	RETAINING WALL STRUCTURE AT _____ LUMP SUM		
1000.1	1	ENVIRONMENTAL ALLOWANCE AT **Sixty Thousand Dollars max** ALLOWANCE	$60,000.00	$60,000.00

The Total Amount of Bid based upon the Contract Documents and proposed Bid Item Unit Prices; Lump Sum Amounts; and Allowances is:

TOTAL AMOUNT OF BID _____

(Summation of All Bid Items) Written in Words

TOTAL AMOUNT OF BID _____

(Summation of All Bid Items) Written in Figures

By submitting this Bid, Bidder specifically acknowledges that:

A. The quantities shown on this Bid Form are estimates only and will be used to determine the Total Amount Bid.

B. Owner reserves the right to reject any and all bids, or any bid item, to advertise for new proposals for the project, to waive technicalities as to form, or to proceed to do the work otherwise, as may be deemed in the best interest of Owner. Nothing herein shall be construed as depriving Owner of the right to reject any bid when such bid does not fully comply with the specifications for the project or the applicable bidding laws and regulations, or if Bidder is otherwise not qualified or eligible to receive award of the contract. A bid will be considered irregular and will be rejected if it is determined that any of the unit prices are materially unbalanced to the detriment of Owner. The bidder will be required to justify in writing the price or prices bid for the work in question before MassDOT decides to award the contract or reject the bid.

C. Bidder has prequalification in Class 1 – General Transit Construction under the MBTA and prequalification for Class 3 – Trackwork under the MBTA as of the bid opening. Subcontractors are to be submitted for approval by MassDOT.

D. Subject to the reservations contained in the preceding paragraphs, the contract shall be awarded to the lowest responsible and eligible bidder. The "lowest responsible and eligible bidder" shall mean Bidder who submits a complete bid in accordance with the requirements of the Bid Documents, and whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work.

E. The Bid shall remain effective for a period of not less than ninety (90) days.

Bid submitted by _____
Name of Bidder

Signed by _____ _____
Duly Authorized Representative of Bidder Date

Required Documents to be Submitted by Bidder

The Contractor bidding on this project must be experienced in construction projects involving work on and around an active railroad; railroad track construction; railroad tie replacement; raising, lining and surfacing of railroad track; and heavy civil construction work.

The following bonds, forms, certificates and additional documents must be provided and/or completed and submitted as part of this Bid Form and Contractor's Bid Package:

A. Bid Deposit

1. Bid deposit in the amount of 5% of the bid. The bid deposit shall be a bid bond in a form satisfactory to the Department furnished by a surety company incorporated pursuant to Chapter 175, Section 105 of the General Laws or authorized to do business in the Commonwealth under Chapter 175, Section 106 of the General Laws and satisfactory to the Department; or cash; or a certified check drawn on a responsible bank or trust company (or a treasurer's or cashier's check issued by such bank or trust company), payable to the Massachusetts Department of Transportation.

B. Forms and Certifications

1. Certificate of Non-Collusion
2. Certificate of Independent Price Determination
3. Certificate of Compliance with Massachusetts Employment Security Law
4. Certification of Work in Harmony and OSHA Training
5. Affidavit of Compliance; Out of State Certificate
6. Vote of Corporation; Authorized Signatory
7. Executive Order 481 – Certification
8. Certificate Regarding Wage Rates; Statement of Compliance

C. Additional Documents

1. Preliminary Construction Schedule, including key benchmarks.
2. Approved Drug and Alcohol testing plan in compliance with all statutes and regulations administered by the Federal Railroad Administration (FRA) in implementing the required 49 CFR Part 219 Drug and Alcohol Program.
3. List of Equipment which will be used in the performance of the Work on the MassDOT & Track and ROW Rehabilitation Project.
4. Please include the following information:
   - Type of Equipment
   - Manufacturer
   - Model
   - Approximate Year
   - Approximate Hours
   - Operator Requirements

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

BID BOND

KNOW ALL MEN BY THESE PRESENTS: that we the undersigned,

_____

(Name of Contractor)

_____

(Address of Contractor)

a _____ hereinafter called Principal, and
(Corporation, Partnership, or Individual)

_____

(Name of Surety)

_____

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

_____

(Name of Owner)

_____

(Address of Owner)

hereinafter called OWNER, in the penal sum of

_____ Dollars, ($_____)

for payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this _____ day of _____, 20___.

WHEREAS, the Principal has submitted to _____ a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the

_____

_____

_____

\

NOW, THEREFORE,

A. If said BID shall be rejected, or

B. If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his or her faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other aspects perform the agreement created by the acceptance of said bid,

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which OWNER may accept such BID and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____
(Principal)

_____
(Surety)

By: _____

IMPORTANT – An appropriate Power of Attorney, dated the same date as the BOND, and evidencing the authority of the Attorney-in-Fact to act on behalf of the corporation shall be attached to the BID BOND.

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Certificate of Non-Collusion

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

_____

Signature of Authorized Signatory

_____

Name of Company

_____

Date

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Certificate of Independent Price Determination

A. By submission of this bid or proposal, each Bidder or offeror certifies, and in the case of a joint bid or proposal, each party thereto certifies as to its own organization, that in connection with this procurement:

- The process in this bid or proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Bidder or offeror or with any competitor;
- Unless otherwise required by law, the prices which have been quoted in this bid or proposal have not been knowingly disclosed by Bidder or offeror and will not knowingly be disclosed by Bidder offeror prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other Bidder or offeror or to any competitor; and
- No attempt has been made or will be made by Bidder or offeror to induce any other person or firm to submit or not to submit a bid or proposal for the purpose of restricting competition.

B. Each person signing this bid or proposal certifies that:

- They are the person in Bidder's organization responsible within that organization for the decision as to the prices being bid or offered herein and that they have not participated, and will not participate, in any action contrary to (A)(1) through (A)(3) above; or
- He or She is not the person in Bidder's or offeror's organization responsible within that organization for the decision as to the prices being bid or offered herein but that he or she has been authorized in writing to act as agent for the persons responsible for such decision(s) and to certify that such persons have not participated, and will not participate, in any action contrary to (A)(1) through (A)(3) above, and as their agent does hereby so certify; and they have not participated, and will not participate, in any action contrary to (A)(1) through (A)(3) above.

(Print Name)	(Company)
(Signature)	(Date)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Compliance with Massachusetts Employment Security Law

In accordance with the provisions of Section 19A(b) of Chapter 151A of the Massachusetts General Laws,

I,_____,
[Name & Title]

signing on behalf of _____
[Name of Company / Employer]

hereby certify that the aforementioned employer has complied with all employment security laws of the Commonwealth of Massachusetts relating to contributions and payments in lieu of contributions.

Signed under the pains and penalties of perjury this_____day of_____2026.

_____
Signature

_____
Notary Public

_____
My Commission Expires

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Certification of Work in Harmony and OSHA Safety Training

In accordance with the provisions of Massachusetts General Laws Chapter 30, Section 39S, the undersigned certifies under penalties of perjury:

- that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;
- that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and
- that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration.

Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration shall be subject to immediate removal.

The attorney general, or his designee, shall have the power to enforce this section including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts in all cases where, after investigation of the facts, he has made a finding that the award or performance has resulted in violation, directly or indirectly, of subsection (b), and he shall not be required to pay to the clerk of the court an entry fee in connection with the institution of the proceeding.

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Certificate of Compliance Issued by Commonwealth of Massachusetts Secretary of State to Foreign (Out of State) Corporations

"The Commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a Contract for the work with, and shall not approve as a Subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with the awarding authority a certificate of the state secretary stating that such corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D." M.G.L. c. 30, Section 39L.

If Bidder is a foreign corporation, it shall attach the certificate issued by the Massachusetts Secretary of State showing its compliance with the foregoing statutes.

SIGNED UNDER THE PENALTIES OF PERJURY THIS____day of_____, 20____

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Vote of Corporation: Authorized Signatory

At a meeting of the Board of Directors of _____
[Name of Company]
held on the_____day of_____20___, at which all the Directors were present or

waived notice, it was VOTED, that,_____, who is the duly
[Name of Officer]
elected_____of this company be and hereby is authorized to execute
[Title of Officer]
contracts, bonds and other instruments in the name of and behalf of said company and affix its corporate

seal thereto; and such execution by said_____of any contract
[Name of Officer]
or other instrument or obligation in this company's name and on its behalf by such_____
[Title of Officer]
of the company under seal, shall be valid and binding upon this company.

A True Copy Attest:

Clerk _____
[Signature]

_____
[Print Name &Title]

_____
[Business Address]

_____
[Date]

I,_____, hereby certify that I am the Clerk of _____
[Name of Clerk] [Name of Company]
and that_____is the duly elected _____
[Name of Officer] [Title of Officer]
of said company, and that the above vote has not been amended or rescinded and remains in full force and effect as of this date.

_____
Clerk [Corporate Seal]

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Executive Order 481

INSTRUCTIONS

Executive Order 481 applies to all state agencies in the Executive Branch, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established. As it is the policy of the Executive Branch to prohibit the use of undocumented workers in connection with the performance of state contracts, all contracts entered into after February 23, 2007 require that contractors, as a condition of receiving Commonwealth funds under any Executive Branch contract, make the following certification:

CONTRACTOR CERTIFICATION

As evidenced by the signature of the Contractor's Authorized Signatory below, the Contractor certifies under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in connection with the performance of all Executive Branch contracts; that pursuant to federal requirements, the Contractor shall verify the immigration status of all workers assigned to such contracts without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker(s). The Contractor understands and agrees that breach of any of these terms during the period of each contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

Contractor Authorizing Signature	Date
Print Name	
Title	
Email	Telephone

The Contractor is required to sign this Certification only once and may provide a copy of the signed Certification for any contract executed with an Executive Branch Department. A copy of this signed Certification must be attached to the "record copy" of all contracts with this Contractor that are filed with the contracting Department.

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Wage Rates

In accordance with the provisions of Massachusetts General Laws, Chapter 30, Section 39M and Chapter 149, Sections 26 to 27H, the undersigned certifies under penalties of perjury, that

_____
Name of Company

shall comply with prevailing wage requirements as set forth in M.G.L. Chapter 149, Sections 26 to 27H.

Further, the undersigned acknowledges that he / she has read and understands the additional information pertaining to these requirements provided below, including the prevailing wage sheets, payroll certification statements, and payroll certification forms.

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Wage Rates Statement of Compliance

Date: _____

I,_____, do hereby state:
(Name of signatory) (Title)

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

_____pertaining to
(Contractor or Subcontractor)

_____
(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.

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

The above-referenced copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to MassDOT's Rail and Transit Division for such inspection.

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 Contractor. 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 than two (2) weeks before the anniversary of the Notice to Proceed date of the contract to allow for adequate processing by the Division of Occupational Safety (DOS). 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 DOS.

All Bidders and Contractors 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 and contractors are cautioned to carefully read the relevant sections of the Massachusetts General Laws (most recently amended August, 2008).

(Remainder of Page Intentionally Left Blank)

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT B00421

DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Additional Required Documents to be Submitted by Apparent Successful Bidder

The Apparent Successful Bidder will be required to provide and/or complete and submit additional documents after notification of successful bid in order to execute the Contract. The additional required documents include, but are not limited to, the following:

A. Bonds
   1. Completed Performance Bond in the amount of 100% of the Contract Price
      - Form is attached*
   2. Completed Payment Bond in the amount of 100% of the Contract Price
      - Form is attached*

   *The Performance Bond and the Payment Bond shall be in a form satisfactory to the Department, furnished by a surety company incorporated pursuant to Chapter 175, Section 105 of the General Laws or authorized to do business in the Commonwealth under Chapter 175, Section 106 of the General Laws and satisfactory to the awarding authority. The name of the agency or agent writing these bonds shall be identified with or on the bond.

B. Forms and Certifications
   1. Certificate of State Tax Compliance
      - Form is attached
   2. Insurance / Surety Powers of Attorney
   3. Insurer's Affidavit for Worker's Compensation
   4. Certification of Construction Equipment Standard Compliance
   5. Diesel Construction Equipment Data Sheet
   6. Contract
   7. Power of Attorney
   8. Insurer's Affidavit as to Worker's Compensation Insurance
   9. Certification of Contractor

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

PERFORMANCE BOND

Know all men by these presents, that _____, a corporation duly organized under the laws of the Commonwealth of Massachusetts and having a usual place of business in _____, _____ as principal, and _____ as surety, are held and firmly bound upon the Massachusetts Department of Transportation in the sum of _____ **($_____)** lawful money of the United States of America, to be paid to the Massachusetts Department of Transportation, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly be these presents.

Whereas, the said principal has made contract with the Massachusetts Department of Transportation, bearing date of _____, 2026, for the construction of Contract Number **130500 – Cape Main Improvements at 44.27, 44.29, 68.00, and 71.66 Project.**

Now the condition of this obligation is such that if the principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms, and conditions of the said contract on its part to be kept and performed during the original term of said contract and any extensions thereof that may be granted by the Massachusetts Department of Transportation, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said contract that may hereafter be made, notice to the surety of such modifications, alterations, changes or additions being hereby waived, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In the event that the contract is abandoned by the Contractor, or is terminated by the Massachusetts Department of Transportation, under the provisions of Sec. 8.12 of the Standard Specifications for Highways and Bridges, said surety hereby further agrees that, if required in writing by the Massachusetts Department of Transportation, said surety shall take such action as is necessary to complete said contract.

In witness whereof we hereunto set our hands and seals this _____ day of _____, 2026

_____

Principal

_____

Corporate Seal

_____

_____

Surety

Corporate Seal

_____

_____

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

PAYMENT BOND

Know all men by these presents, that_____, a corporation duly organized under the laws of the Commonwealth of Massachusetts and having a usual place of business in _____, _____, and _____
as surety, are held and firmly bound unto the Massachusetts Department of Transportation in the sum of _____ **($_____)** lawful money of the United States of America, to be paid to the Massachusetts Department of Transportation, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executor administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the said principal has made a contract with the Massachusetts Department of Transportation bearing date of_____, 2026, for the construction of Contract Number **130500 – Cape Main Improvements at 44.27, 44.29, 68.00, and 71.66 Project.**

Now the condition of this obligation is such that if the principal shall pay for all labor performed or furnished and for all materials used or employed in said contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said contract that may hereafter be made, notice to the surety of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes or items set out in, and to be subject to, the provisions of Massachusetts General Laws, (Ter. Ed.), Chapter 30, Section 39A as amended and Chapter 149, Section 29 as amended, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In witness whereof we hereunto set our hands and seals this_____day of_____, 2026

_____Principal

BY_____Corporate Seal

_____

_____Surety
Corporate Seal

_____

Name and Address of Agent or Agency receiving commission on this Performance and Payment Bond.

_____

_____

Name and Address of Resident Agent, if any, of Surety, or other Agent appointed by Surety to

Whom Notice should be sent (Must be completed by Attorney-in-Fact of Surety).

Surety
Corporate Seal

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Certificate of State Tax Compliance

In accordance with the provisions of Chapter 62C, Section 49A(b) of the Massachusetts

General Laws, I, _____
[Name & Title]

authorized signatory for _____
[Name of Company]

which has a principal place of business at _____

_____

do hereby certify under the pains and penalties of perjury that _____
[Name of Company]

has complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting of child support..

_____
Authorized Signature

_____
Print Name and Title

_____
Company

_____
Date

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Diesel Construction Equipment Data Sheet

Contractor Name: _____ Contract Number: _____

Description: _____

Location (City/Town): _____

Equip. Type	Own/Rent	Equip. Make	Equip. Model & Year	Fuel Type	Equip. VIN	Equip. HP Rating	ECD Type DOC/DPF	ECD Manufact.	ECD Make	ECD Model	ECD Certif.	ECD Installation Date

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Contract

Clause 1. This agreement made _____ (Contract Execution Date), between the Commonwealth of Massachusetts, by the Massachusetts Department of Transportation – Rail & Transit Division, for the said Commonwealth, and

_____ (Contractor Name),

☐ *[OPTION 1 – LLC or JV]* a _____ (Type of Business Structure) registered to do business in the Commonwealth of Massachusetts under MGL Chapter 156C and having a usual place of business in

_____ (Contractor Town/City),

_____ (Contractor State), herein called the Contractor.

or

☒ *[OPTION 2 – In-State Contractor]* a _____ (Type of Business Structure) duly organized under the laws of the Commonwealth of Massachusetts and having a usual place of business in _____ (Contractor Town/City), Massachusetts, herein called the Contractor.

or

☐ *[OPTION 3 – Out-of-State Contractor]* a _____ (Type of Business Structure) duly organized under the laws of _____ (Contractor State) and registered to do business in the Commonwealth of Massachusetts and having a usual place of business in_____ (Contractor Town/City),

_____ (Contractor State), herein called the Contractor.

Clause 2. Witnesseth, That the parties to this agreement, each in consideration of the agreements on the part of the other herein contained, do hereby agree, the Commonwealth of Massachusetts for itself, and said Contractor for itself and its successors and assigns as follows: The contractor agrees to furnish all equipment, machinery, tools and labor and furnish and deliver all materials required to be furnished and delivered in and about the improvement and to do and perform all work in

MassDOT Cape Main Improvements at MP 44.27, 44.29, 68.00, and 71.66 in the Towns of Rochester and Barnstable (Project Name)

in strict conformity with the provisions herein contained and of the Notice to Contractors, Proposal and Special Provisions hereto attached, and the applicable 2025 MassDOT Highway Division Standard Specifications for Highways and Bridges Division I, as amended herein, certain subsections of Divisions II and III referenced herein, Supplemental Specifications thereto (March 31, 2025), the 2024 edition of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering, and the plans referred to herein. All said plans, Standard Specifications, Supplemental Specifications, AREMA Manual for Railway Engineering Special Provisions, Notice to Contractors and Proposal are hereby made a part of this contract.

Clause 3. In consideration of the foregoing premises the Commonwealth agrees to pay and the Contractor agrees to receive as full compensation for everything furnished and done by the

Contractor under this contract, including all work required but not shown on the plans for the

1. CONTRACT

items herein mentioned, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any delay or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all risks of every description connected with the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work as herein specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, such unit prices are set out in the accompanying proposal, and for all work required, for which there is no item in the proposal, such compensation as is provided for in the aforesaid specifications.

In witness whereof, the said Contractor has caused these presents to be signed in its name and behalf and its corporate seal to be hereto affixed by

_____(Authorized Signatory Name)

its _____(Authorized Signatory Title)

thereto duly authorized, and the said Commonwealth has executed these presents by The Massachusetts Department of Transportation on the year and day above written.

X_____(Authorized Representative Signature)
Massachusetts Department of Transportation

BY X_____(Authorized Signature)

_____(Authorized Signatory Name)

_____(Contractor Name)

Contractor Corporate Seal

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Power of Attorney

KNOW ALL MEN BY THESE PRESENTS, THAT (insurance company) Insurance Company, a corporation duly organized and existing under laws of the State of (state), and having its principal office in (office location), and (insurance company) Insurance Company a corporation organized and existing under the laws of the State of (state) and having its principal office in (office location), and (insurance company) Insurance Corporation, organized under the laws of the State of (state), and having its principal office in (office location) each does hereby make, constitute and appoint:

(name(s) of attorney)

its true and lawful Attorney(s)-in-Fact, to make, execute, seal and deliver, for and on its behalf and as its act and deed, bonds or other writings obligatory in the nature of a bond on behalf of each of said Companies, as surety, on contracts of suretyship as are or may be required or permitted by law, regulation, contract or otherwise, provided that no bond or undertaking or contract or surety ship executed under this authority shall exceed the contract amount.

This Power of Attorney is granted and is signed by facsimile under and by the authority of the following Resolutions adopted by the Boards of Directors of _____ Insurance Company and _____ Insurance Company at meetings duly called and held on _____ and _____ Insurance Corporation by written consent of its Executive Committee dated _____.

"RESOLVED, that any two of the President, any Senior Vice President, any Vice President, any Assistant Vice President, the Secretary or any Assistant Secretary be, and each or-any of them hereby is authorized to execute a Power of Attorney qualifying the attorney named in the given Power of Attorney to execute on behalf of the Company bonds, undertakings and all contracts of surety, and that each or any of them hereby is authorized to attest to the execution of any such Power of Attorney and to attach therein the seal of the Company; and it is

FURTHER RESOLVED, that the signature of such officers and the seal of the Company may be affixed to any such Power of Attorney or to any certificate relating thereto by facsimile, and. any such Power of Attorney or certificate bearing such facsimile signatures or facsimile seal shall be binding upon the Company when so affixed and in the future with regard to any bond, undertaking or contract of surety to which it is attached."

CORPORATE SEAL By: X_____ CORPORATE SEAL

By: X_____

IN WITNESS WHEREOF, _____ Insurance Company, _____ Insurance Company and _____ Insurance Corporation have caused their official seals to be hereunto affixed, and these presents to be signed by their authorized officers this this _____ day of _____, _____.On this _ day of _, _ before me, a Notary Public personally appeared _____, _____ of _____ International Insurance Company and _____ , _____of _____ Insurance Company and _____ , _____ of _____ Insurance Company personally known to me; who being by me duly sworn, acknowledged that they signed the above Power of Attorney as officers of and acknowledged said instrument to be the voluntary act and deed of their respective companies.

I, _____, the duly elected _____ of _____ Insurance Company do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney given by said North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation which is still in full force and effect.

IN WITNESS WHEREOF, I have set my hard and affixed the seals of the Companies this day of _____ , _____.

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Insurer's Affidavit as to Workers' Compensation Insurance

I, _____ (Signatory Name), of _____ (Company) am:

☐ an authorized representative of _____Insurance Company (a producer[2] in the voluntary market)[3]

☐ an authorized agent of _____Insurance Company (an agent in the voluntary market, authorized to sign on behalf of a producer)[2]

☐ an authorized signatory of_____, the Prime Contractor (an insured of a producer in the involuntary market pool)[4]

☐ an authorized signatory of _____, the Sub-Contractor (an insured of a producer in the involuntary market pool, group, or otherwise insured)[3]

located at _____ (Company Address) and do hereby aver that effective _____ (Policy Effective Date), _____ (Contractor Name), the Prime or Sub-Contractor, is insured for Workers' Compensation insurance with _____ (Insurance Company Name) Insurance Company under Policy No[s]. _____ (Policy Number[s]), pursuant to the attached Certificate of Insurance, and in accordance with Massachusetts General Laws, Chapter 152 and Subsection 7.05A of the Standard Specifications for Highways and Bridges of the Highway Division of the Massachusetts Department of Transportation.

X_____
(Signature)

_____
(Signatory Title)

On this _____ (Notary Signature Date), before me, the undersigned notary public, personally appeared _____ (Signatory Name), proved to me through satisfactory evidence of identification, which was/were _____ (Evidence of Identification), to be the person who signed the preceding or attached document in my presence, and who swore or affirmed to me that the contents of the document are truthful and accurate to the best of their knowledge and belief.

X_____
Notary Signature

_____
Notary Printed Name
Commission Expiration Date: _____

[2] A producer is an insurance company that provides insurance policies directly, not an insurance agent.
[3] For Prime or Sub-Contractor companies insured through the voluntary market, this Affidavit must be completed by the insurer or an authorized agent of the insurer.
[4] If the Prime or Sub-Contractor is insured through the involuntary insurance market, a pool, such as the Worker's Compensation Inspection and Rating Bureau, or is otherwise insured they may provide a Certificate of Insurance and this Affidavit which may be signed by an authorized signatory (company officer) of the Prime or the Sub-Contractor.

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT CAPE MAIN IMPROVEMENTS AT MP 44.27, 47.29, 68.00 & 71.66

Certification of Contractor

I hereby certify that I am the _____(Authorized Signatory Title)

and duly authorized representative of the firm of

_____(Contractor Name)

whose address is _____ (Contractor Address)

CONSTRUCTION EQUIPMENT STANDARD – HIGHWAY SPECIFICATION 7.02

DEP Mass Clean Diesel Program, whereby any and all large non-road (greater than 50 horsepower) diesel construction equipment (DCE) to be used in this contract has emission control devices installed, such as oxidation catalysts or particulate filters, on the exhaust system side of the diesel combustion engine equipment. Contractor further agrees to provide a list of said DCE to the Massachusetts Department of Transportation – Rail & Transit Division prior to its actual use in connection with this Contract, including but not limited to the number of vehicles subject to this certification and the number of vehicles retrofitted by vehicle type.

I acknowledge that this certificate is furnished as a requirement under this Contract, and is subject to applicable, State and Federal Laws, both criminal and civil.

X_____
Authorized Signature Title of Authorized Signatory

X_____
Name of Authorized Signature Contract Execution Date

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT B00842

SCHEDULE OF PARTICIPATION
BY MINORITY OR WOMEN BUSINESS ENTERPRISES (M/WBE)

MASSDOT PROJECT NUMBER:_____

PROJECT LOCATION: _____

DATE OF BID OPENING: _____

NAME OF PRIME BIDDER: _____

Name Address and Phone Number of M/WBE	Name of Activity	(a) M/WBE Contractor Activity Amount	(b) M/WBE Other Business Amount	(c) Total amount eligible for credit under rules in Section VIII of the Special Provisions
Total Bid Amount $	TOTALS: M/WBE Percentage of Total bid:	$ %		$ %

Column (a) must be at least one-half of the M/WBE percentage goal.

SIGNATURE: _____Date: _____Tel No:_____

NAME AND TITLE (PRINT): _____

BIDDERS ARE CAUTIONED TO REVIEW DOCUMENT 00718 -- SPECIAL PROVISION FOR PARTICIPATION BY MINORITY OR WOMEN BUSINESS ENTERPRISES AND SERVICE DISABLED VETERAN OWNED BUSINESS ENTERPRISES.

*** END OF DOCUMENT ***

REST OF PAGE INTENTIONALLY LEFT BLANK

DOCUMENT B00843

MINORITY OR WOMEN'S BUSINESS ENTERPRISE PARTICIPATION LETTER OF INTENT PAGE 1 OF 2

MASSDOT PROJECT NUMBER: _____

PROJECT LOCATION: _____

DATE OF BID OPENING: _____

FROM _____
(Minority or Women's Business Enterprise Company)

TO: _____
(Name of Prime Contractor)

My company is currently certified as an MBE or WBE by the Massachusetts Supplier Diversity Office, formerly known as the State Office of Minority and Women Business Assistance (SOMWBA). There have been no changes affecting the ownership, control or independence of my company since my last certification review.

If any such change occurs prior to my company's completion of this proposed work, I will give written notification to your firm and to the Massachusetts Department of Transportation (MassDOT).

(For contractor activity only.) My firm will provide to you, upon request, for the purpose of obtaining subcontractor approval from MassDOT; (1) a resume stating the qualifications and experience of the superintendent or foreperson who will supervise on site-work; (2) a list of equipment owned or leased by my firm for use on the project; (3) a list of all projects (public or private) which my firm is currently performing, is committed to perform, or intends to make a commitment to perform. I shall include, for each project, the names and telephone number of a contact person for the contracting organization, the dollar value of the work, a description of the work, and my firm's work schedule for the Project.

If you are awarded the Contract, my company intends to enter into an agreement with your firm to perform the items of work or other activity described on the following sheet for the prices indicated.

My firm has the ability to manage, supervise and perform the activity described on the following page.

_____ _____
M/WBE Authorized Signature Date

MINORITY OR WOMEN'S BUSINESS ENTERPRISE PARTICIPATION LETTER OF INTENT
PAGE 2 OF 2

MASSDOT PROJECT NUMBER: _____

PROJECT LOCATION: _____

DATE OF BID OPENING: _____

NAME OF PRIME BIDDER: _____

Item number if applicable	Description of Activity with notations such as Installation Only, Material Only, or Complete	Quantity	Unit Price	Amount
		TOTAL AMOUNT:		

M/WBE COMPANY NAME: _____

M/WBE AUTHORIZED SIGNATURE: _____

NAME AND TITLE (PRINT): _____

TELEPHONE NUMBER: _____ FAX NUMBER: _____

Rev'd 9/20/19

*** END OF DOCUMENT **

DOCUMENT B00846

M/WBE OR SDVOBE JOINT CHECK ARRANGEMENT APPROVAL FORM
(to be submitted by Prime Contractor)

Contract No: 130500 **Project No.** 614096

Location: _____

Bid Opening Date: _____

Project Description: **Cape Main Improvements at 44.27, 44.29, 68.00, and 71.66**

We have received the attached request for the use of a joint check arrangement from _____, a M/WBE or SDVOBE on the above- referenced Contract and _____, a Material Supplier/Vendor for the subject Contract. The M/WBE or SDVOBE has complied with the requirements of Special Provision Document 00718. In particular, the M/WBE or SDVOBE 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 M/WBE or SDVOBE) for payment of sums due pursuant to invoices from the Supplier/Vendor and M/WBE or SDVOBE.

Contractor:

Company Name	Signature Duly Authorized
	Printed Name
Date	Title

SubContractor:

Company Name	Signature – Duly Authorized
	Printed Name
Date	Title

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT B00847

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 MBE/WBE, 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 MBE/WBE Venturer; (4) the commitment of management, supervisory and operative personnel employed by the MBE/WBE 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): _____

_____

3. Other applicable ownership interests, including ownership options or other agreements, which restrict or limit ownership and/or control:

_____

_____

4. Provide copies of all other written agreements between firms concerning bidding and operation of this Project or projects or contracts.

5. 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.):

Joint Venture check signing:

_____

_____

Authority to enter Contracts on behalf of the Joint Venture:

_____

_____

Signing, co-signing and/or collateralizing loans:

_____

_____

Acquisition of lines of credit:

_____

_____

Acquisition and indemnification of payment and performance bonds:

_____

_____

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, MBE/WBE 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***